INTRODUCTION

The UNESP 160 motorcycle (Fig. 1) boasts increased cross-country capability. Its structural features are beneath triple shock, mono-gear, four-stroke overhead valve engine and multi-tyre collaboration. The motorcycle is comfortable with a high-speed, road-gauged frame, simplicity and ease of control, high dynamic qualities, comfort, relatively little maintenance effort and economical operation.

Fig. 1. Single motorcycle

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SAFETY PRECAUTIONS AND WARNINGS

IMPORTANT: During the first 3000 km of use, all the machineries of the motorcycle will act to become well aligned. This time is to be considered as the "running-in" period, and therefore, to be treated with caution. It is also a good time to familiarize yourself with the controls and features of your motorcycle.

1. Avoid sudden acceleration or braking.
2. Maintain a safe speed for your skill level and road conditions.
3. Keep a safe distance from other vehicles.
4. Check your motorcycle regularly for maintenance.

Remember that it is important to respect the manufacturer's guidelines for the first 3000 km to ensure that your motorcycle performs optimally after its initial running-in period.

SPECIFICATIONS

**General Data**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Chain sprocket</td>
<td>1250</td>
</tr>
<tr>
<td>Wheel size, mm, extr. greater than</td>
<td>1510</td>
</tr>
<tr>
<td>Tread, mm, extr. greater than</td>
<td>1300</td>
</tr>
<tr>
<td>Maximum speed, km/h, extr. greater than</td>
<td>250</td>
</tr>
<tr>
<td>Oil consumption per 100 km, l, extr. greater than</td>
<td>0.2</td>
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### Engine and Fuel System

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Engine type</td>
<td>8-120 HP, V-shaped, overhead cam, carbureted, electric starter, direct drive, constant speed fan, automatic clutch, manual transmission, 4-speed, 322 cu. in. (5.3 L)</td>
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<tr>
<td>Displacement, cu. in.</td>
<td>322</td>
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<tr>
<td>Compression ratio</td>
<td>7:1</td>
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<tr>
<td>Bore, mm</td>
<td>86</td>
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<tr>
<td>Stroke, mm</td>
<td>86</td>
</tr>
<tr>
<td>Displacement, cu. ft.</td>
<td>5.3</td>
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<tr>
<td>Horsepower, bhp @ rpm</td>
<td>165 @ 2000</td>
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<tr>
<td>Transmission</td>
<td>4-speed, overdrive, manual, electric start, fully synchronized, torque converter</td>
</tr>
</tbody>
</table>

### Transmission

- **Clutch**: Dry, single-disc, multi-plate, with reverse
- **Gear Ratios**: 1st gear: 5.11, 2nd gear: 2.58, 3rd gear: 1.20, 4th gear: 0.87
- **Main Drive Gear**: 1:1 ratio, bevel gear with circular track

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*For specification details and service manuals, please contact the manufacturer.*
<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame</td>
<td>double wall, with drop-out.</td>
</tr>
<tr>
<td>Rear wheel suspension</td>
<td>leaf spring, shock absorber, spring-loaded.</td>
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<tr>
<td>Fork</td>
<td>with drop-out, spring-loaded.</td>
</tr>
<tr>
<td>Head</td>
<td>with built-in headlight.</td>
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<tr>
<td>Brakes</td>
<td>dual-circuit, hydraulic, dual-circuit, hydraulic, dual-circuit.</td>
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<td>Tyres</td>
<td>2.75 x 19, tubeless</td>
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<td>Saddle</td>
<td>steel, square, passenger-type</td>
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<td>Frame</td>
<td>stainless steel, double wall, with drop-out.</td>
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<tr>
<td>Handlebars</td>
<td>stainless steel, wrap-around.</td>
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<tr>
<td>Brakes</td>
<td>dual-circuit, hydraulic</td>
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<tr>
<td>Electrical Equipment</td>
<td>600W/24V motor, 24V/12V generator, battery-type, 12V, with</td>
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<tr>
<td></td>
<td>handlebar-mounted generator.</td>
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</table>

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Handle 8 serves to control the governor's throttle. Turning the handle 8 to the right will start the engine, and the engine speed will increase. Turning the handle 8 to the left will slow the engine. To start the engine, turn handle 8 to the right, and the engine will start immediately. The engine speed can be adjusted by turning the handle 8 to the left or right. When the engine is running, it should be kept at a moderate speed. If the engine runs too fast, it may overheat and cause damage. When the engine is stopped, turn handle 8 to the left, and the engine will stop immediately.

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Starting mechanisms over 12 unit to start the engine is arranged at the rear side of the tank side.

Shift paddles [13] is fixed at the left-hand side of the gearbox and box two braking pads. The entire shift paddles are made of cast iron having gear tooth surface being hardened and polished for smooth gear shifting. The first gear is the only one having the same tooth count as the second gear, making it a doublet. When engaging the brake pads with the spinning wheel, the free wheel, is being attached to the wheel, making it spin freely.

Any given elevation on the paddles, the latter moves to the neutral position. The shift paddles device the shift bar, which prevents the rider from shifting in reverse when the engine is running.

The anti-theft device is to be used during starting off, without any gear shifting.


design operation and adjustment of motorcycle
major assembly and maintenance

As regards its design features and technical characteristics, the engine (Fig. 4-1, 5, 6) is classified as a multi-cylinder-in-line, two-stroke, water-cooled engine. The displacement is approximately 600 cm³. It develops a maximum power of 55 HP at 8000 rpm. The gearbox is a five-speed, constant-mesh unit, with a final drive ratio of 1:1.6. The clutch is a dry, multi-plate type, with a combination of a wire and a rubber band, as well as two clutches.

The crankshaft is connected to the engine crankshaft through the main bearing and a thrust washer, located at the rear end. The main bearing consists of a fixed and a rotating part, each with a rubber band and a metal plate. The flywheel is a cast-iron unit, with a friction plate and an oil seal.

The exhaust system consists of a muffler, a silencer, and an exhaust pipe. The exhaust pipe is connected to the muffler, which is mounted on the frame. The exhaust system is designed to reduce noise levels and improve fuel economy.
sliding bearings features a considerable service life. However, in case of engine overhaul it is advisable to replace connecting-rod bearing bushings. This will prevent premature wear of the crankshaft crankpins.

Connecting rods are assembled with bushings. The connecting rods are steel, forged, H-section type. Press-fitted into the connecting rod small ends is a bronze bushing with a precision-machined hole for correct fit of a piston pin. The connecting rod big end is asymmetrical, detachable, with thin-walled interchangeable bushings. For correct mounting of connecting rods on the crankshaft, the connecting rod shanks are provided with protrusions which must be outwardly directed with respect to the crankshaft web (for the right-hand connecting rod, the protrusion is directed towards the flywheel, for the left-hand one, towards the crankcase).

The connecting rod caps are not interchangeable. The connecting rod bolt nuts are to be tightened and locked.

Piston, piston rings and piston pins. Engine piston 15 (Fig. 5) consists of a crown, skirt and bosses. The piston has four grooves in which piston rings are fitted. Two upper rings 14 (compression) provide the required air-tightness in the cylinder and prevent the gases from breaking through from the combustion chamber into the crankcase. Two lower rings 13 (oil scraper) serve to remove excess oil from the cylinder walls.

In the third groove fitted is a steel oil scraper ring consisting of four elements: two steel disks, axial and radial spacers.

The lower groove is fitted with cast iron oil scraper ring.

The axis of the piston pin hole is displaced by 1.5 mm from the piston diametral plane, owing to which the piston moves smoothly, without impact, within the clearance between the piston skirt and cylinder walls upon changing the direction of travel in the top dead center. Stamped on the piston head is an arrow to indicate the correct arrangement of the piston in the cylinder when mounting, ensuring that the arrows on both pistons point forward, i.e., towards the crankcase.

The compression piston rings are made from special cast iron and have straight locks. The piston ring gap (when fitting into the cylinder) must be within 0.25–0.50 mm.

When installing cylinders on the pistons, see that compression rings are turned with their locks to different sides in order to diminish the gas leakage.

Piston 16 (Fig. 7) is linked with the connecting rod by means of a floating pin whose axial displacement is limited by two spring lock rings 17 inserted into the annular recesses of piston bosses.

Crankcase. Crankcase 3 (Fig. 5) which is cast from aluminium alloy is the main base member of the engine.

Installed on, and secured to, the crankcase are the cylinders with head and auxiliary mechanisms. In addition, the crankcase serves as an oil reservoir. Rotating inside the crankcase are the crankshaft and camshaft, the timing gear.
box is mounted in the front portion of the crankcase and at the top the generator is arranged.

On the underside the crankcase is closed with stamped sump 10. Fitted between the crankcase and sump is sealing gasket 11.

During engine operation, some portion of the air-fuel mixture and exhaust gases force their way into the crankcase through piston ring clearances. Besides, as the pistons move to the lower dead centre, the gases in the crankcase space are compressed and under their pressure the oil may leak out from the crankcase to-cover joint and through the glands. To prevent this, forced ventilation of the crankcase is used. To open the crankcase inner space to atmosphere as the pistons move down and seal it off from atmosphere as the pistons move upward, breather 15 (Fig. 6) is provided, which is located in the central hole of cover 40 of the timing gear box.

The gases escaping through the breather from the crankcase contain water vapours, owing to which, during operation in winter time, an ice block preventing the gases from leaving the crankcase may form in the rubber pipe connecting the breather to the air filter. This may cause oil leakage through the glands. For this reason, it is advisable to remove the rubber pipes during operation in winter time at a temperature of 0°C and below zero.

Cylinders. The engine has identical interchangeable bimetallic cylinders 6 (Fig. 7). The cylinder is essentially an aluminium jacket with a cast iron sleeve. The lower portion of the cylinder is provided with a flange having holes passing through all the fins, for anchor studs fastening the cylinders and their heads to the crankcase. The cylinder upper portion has an annular collar entering the recess in the head.

Fitted between the cylinder and head is sealing gasket 4.

Cylinder heads. Cylinder heads 3 and 12 manufactured from aluminium alloy have fins on the outside to increase the cooling surface. The combustion chamber of the head is hemispherical in shape. On the side opposite to the combustion chamber, the head has our brackets with holes to which rockers are fastened. A threaded hole for the spark plug is made in the upper part of the head.

Care of Crank Gear

During daily maintenance, clean the crankcase, cylinders and cylinder heads to remove dirt and dust, doing so, make sure the fins are clean since the fins clogged up with dirt will deteriorate engine cooling. Check to see that there is no oil leakage in the inner space of the engine crankcase.

If air-tightness is disturbed due to improper fitting or damage caused to paper or rubber gaskets, gland seals, air will leak in and the pressure will rise in the engine crankcase; this will lead not only to oil leakage at the joints and through gland seals, but also to premature oil contamination and increased wear of engine parts.

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After 10 000 km run, clean off the carbon from the combustion chambers of cylinder heads, pistons, piston rings and valves. The presence of carbon in the engine may cause knocks reducing the engine service life.

If oil consumption in the engine exceeds 0.25 l per 100 km run, replace the piston rings.

**VALVE TIMING GEAR**

The valve timing gear controls the opening and closing of the outlet and inlet valves at the appropriate instants corresponding to a definite crankshaft rotation angle. The valve timing gear consists of camshaft (Fig. 8), tappets 4 (Fig. 3), rods 1, rockers 21 (Fig. 7) and 29, adjusting bolts 23, lock nuts 24, outlet 22 and inlet 18 valves with caps 20, springs 28, 27, bearing disks 25, 28 and blocks 30. Mounted at the front part of the camshaft is driven gear 2 (Fig. 8) with which driving timing gear 4 and generator drive gear 1 move into mesh. The camshaft is installed in the engine crankcase as two ball bearings 19 (Fig. 6) and 22. The correct valve timing is ensured by matching the marks on timing gears 2 (Fig. 8) and 4 during assembly.

The engine may be fitted with tappets of another design (see ref. Nos. 17, 18, 19 and 20, (Fig. 5) whose working end is faced with a special alloy.

When operating the engine, vibrations, besides may break off the faced working surface of the tappet to a depth of 3.35 mm, that cannot exert detrimental effect on the cam-tappet pair serviceability.

**Valve Adjustment**

Normal operation of the engine is greatly dependent upon the value of expansion clearance between the valve stem and rocker end.

It should be remembered that on air-cooled engine, due to absence of a valve jacket and provision of considerable firming on the cylinder, crankcase and cylinder heads,
operation of the valve gear timing drive can be well discerned by ear. For this reason, periodic knocks of the valves and tappets with normal clearances between the valve stem (cap) and rocker end, as well as uniform (not harsh) note of high-pitch tone arising during operation of the valve timing gear drive should not be regarded as defect symptom.

Before checking and adjusting the clearance, place a tray under the cylinder head, remove the cylinder head cover and drain the oil that has accumulated. Set the piston to the top dead centre of compression stroke by turning over the crankshaft so that mark B on the flywheel is brought into coincidence with the mark on the engine crankcase; this must be watched through the peephole in the engine crankcase with the rubber plug removed (Fig. 9).

In this position, both (inlet and outlet) valves will be fully closed and their rockers must freely swing on their pins. Then, using a 0.07 mm thick flat feeler gauge, check the clearance between both rockers and valves.

If the clearance is set improperly, slacken lock nut 24 (Fig. 7) and, rotating adjusting bolt 25 in one direction or the other, set the required clearance. Following that, tighten up the lock nut. The clearance is to be adjusted on a cold engine and must be equal to 0.07 mm. If there is no clearance or the clearance is too small, the valve will not fit closely to its seat at the instant of closure; if the clearance is too large, the beginning of valve opening will lag behind and filling the cylinder with air-fuel mixture will be impaired. To adjust the clearance in the other cylinder, turn the crankshaft by one revolution (by 360°), following which check and adjust the valves as directed above.

Valve Grinding

After every 10,000 km run of the motorcycle, check the timing gear valves for good condition and, if necessary, grind them to fit their seats.

Valve grinding is necessitated by deterioration of air-tightness due to wear of chambers, appearance of pits and other defects on seat chambers and valve heads.

To check the valve head for close fitting to the seat, pour some kerosene into the inlet and outlet ducts of the cylinder head. If the kerosene seeps through the fitted valve-seat surfaces in less than 10 s, the valves have to be ground in.

To grind a valve to its seat, remove the valve, secure the cylinder head in a vice, apply a thin layer of grinding paste to the valve head chamfer and insert the valve into the cylinder head guide bushing. Fit a brace or drill on the valve stem end. Use may be made of a length of a petrol hose to be rotated between
the palms of your hands. Pressing the valve against the seat, rotate it in either direction so that a turn of the valve in one direction is approximately twice as great as a turn in the other direction, i.e., to make the valve is gradually turned through in one direction. At the moment of changing the direction of valve rotation, it is necessary to force it out of the seat.

When grinding the valve to the head seat, be careful not to remove from the working chamfers more metal than required as this will reduce the number of permissible repairs. Toward the end of the grinding, it is necessary to decrease the amount of para used and at the last stage and do the grinding by applying pure oil.

An external sign of satisfactory grinding is a one-tone dull colour of the working surfaces of the valve head and seat.

After grinding, thoroughly wash the valves, valve seats, guide bushings, filler and cylinder head compression chamber so as to completely remove the grinding paste. After this is done, check the valve fit for air-tightness, for which purpose re-install the valves and pour kerosene successively into the inlet and outlet ducts of the cylinder head. There must be no kerosene seepage within 10s. In case the kerosene begins to seep before the specified time has elapsed, an additional grinding is required.

**Ignition Timing Adjustment and Checking**

In order to facilitate the checking and adjustment of ignition timing, mark P (early ignition point) is provided on the flywheel external surface, this mark can be seen through the peephole in the crankcase (Fig. 9) when turning over the flywheel.

Before starting to check or set ignition timing, it is necessary to adjust the breaker contacts gap. Then connect a test lamp with one wire to the ignition coil low-voltage terminal (to which a wire extending to the breaker is attached) and with the other, to the frame. One can make such a checking device by oneself, using bulb A12-1, a lamp holder and two wires, preferably with alligator clips at the ends.

Take out the rubber plug closing the peephole on the engine crankcase and, turning over the crankshaft with a starting lever in the direction of its rotation, mark P on the flywheel with the mark on the engine crankcase.

Switch on the ignition and fully move apart weights: 14 (Fig. 10) of the automatic spark timer. If, at the instant the weights are drawn apart to the fullest possible extent, the test lamp will light up (the breaker contacts become open), the ignition point is set correctly.

If, with weights fully parted, the test lamp fails to light up, the ignition is late; if lights up before the weights are fully parted, the ignition is early.

In order to set the required ignition point, slacken the screws fastening the breaker and legs and fully move apart the automatic timer weights, turn breaker.
Fig. 10. Breaker TIM302A with automatic spark timer:
1 - screw; 2 - contact leg; 3 - breaker body; 4 - breaker lever; 5 - lever pin; 6 - eccentric; 7 - automatic spark timer; 8 - weight pin; 9 - brush; 10 - spring; 11 - carrier; 12 - locking ring; 13 - case; 14 - weight; 15 - weight holder; 16 - capacitor holder; 17 - capacitor; 18 - terminal

Fig. 11. Installing the carrier onto TIM302A automatic spark timer:
1 - spring; 2 - carrier; 3 - weight pin
body 3 clockwise if the ignition is late, or counterclockwise if the ignition is early, until the test lamp comes on.

Fix the breaker body in this position and secure it with screws and lock. Without disconnecting the test lamp, check again the ignition timing for proper adjustment. If the ignition point is set correctly, disconnect the test lamp and reinstall the breaker cover.

The value of ignition advance angle is to be found in Section "Specifications" (refer to "Basic Data for Adjustment and Check-up"). At the same time check and, if required, adjust the gap between the dischargers and ignition coil terminals, which must be 9 mm.

The springs of the automatic spark timer must not be bent or extended since they are specially calibrated. When removing and reinstalling automatic spark timer (IM30A), take care to note the position of carrier 2 (Fig. 11). To set the latter properly, match the slots of the carrier with weight pins 3 so that the openings through which springs 1 can be seen are rectangular in shape (refer to Fig. 11).

Breaker Point Gap Adjustment

In order to adjust the breaker point gap, turn over the crankshaft so that the breaker cam is set to the position ensuring the maximum opening of the contacts. Slacken stop screw 1 (Fig. 10) and, turning eccentric 6 with a screwdriver in one direction or the other, set the breaker point gap equal to 0.4-0.6 mm.

The gap is to be measured with a flat feeler gauge to be found in the motorcycle set of spare parts, tools and accessories.

After setting the required gap, tighten up screw 1.

To facilitate fulfillment of this operation undo the screw fastening the automatic spark timer and remove carrier 11.

In this case the cam with the automatic spark timer will freely turn over on the camshaft shank. Turning a cam to one or other side ensures access to the breaker contacts, stop screw 1 and eccentric 6 when checking and adjusting clearance in the breaker.

LUBRICATION SYSTEM

The engine lubrication system is combined-type (forced-feed and by splash). A lubrication diagram is presented in Fig. 12.

Oil is to be poured into the crankcase through the filling hole and it flows with plug 2 with an oil level dipstick. From there, the oil is sucked through a gauge filter 3 by the gear pump installed in the body of the front bearing which is actuated from the gear that is in mesh with the timing gear driving pinion. The oil pump has two gears mounted in the body, these gears feed oil to main oil line 7. To prevent the oil pressure in the system from rising above permissible level, reducing valve 5 is fitted in the oil pump body.

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During normal operation of the oil system, the excessive oil pressure forces out the reducing valve and excess oil is by-passed back into the oil pump suction duct.

The reducing valve does not require any adjustment in the process of usage.

From the oil line, the oil is supplied to the annular groove in the front bearing body and then further oil via the duct to the centrifuge body. The oil purified in the centrifuge is fed through crankshaft oil drain duct E and oil supply duct B in the crankshaft web to traps F provided in the crankpins and, from there, passes via holes B to the connecting rod bushings.
The fast moving parts of the crank gear promote intensive oil splashing and formation in the crankcase of oil mist used to lubricate the working surfaces of cylinders, piston pins, connecting rod small ends, tappet guides, main rolling bearings, valve timing gears, camshaft cams and ball bearings, tappets and other friction parts.

![Diagram](image)

Fig. 13. Crankcase and front main ball bearing:
1 = centrifuge fastening bolt; 2 = lock washer; 3 = centrifuge washer; 4, 7 = sealing ring; 5 = gasket; 6 = centrifuge cover; 8 = centrifuge body; 9 = screen; 10 = timing gear gasket; 11 = driving timing gear; 12 = front bearing housing; 13 = front main ball bearing; 14 = plug; 15 = crankshaft; 16 = screw; A = front oil pump

After getting into tappet slots O, the atomized oil enters the rod casings, settles in them and flows down into the cylinder heads. Here the oil is splashed by the valves and springs and lubricates the valves and rockers. Excess oil flows down drain pipe 6 back into the crankcase. If the mushroom tappet 20 (Fig. 3) are installed on the engine, the atomized oil gets into the rod casings through the hole in the crankcase near the tappet guide bushings.

To discharge accumulating oil baffled by the flywheel gland, oil drain duct A is provided in the crankcase.

To prevent oil seepage from the crankcase to the clutch, a rubber gland is
fitted on the flywheel hub, and a rubber gland on the camshaft excludes ingress of oil to the breaker.

The centrifuge is basically a fine oil filter. Before reaching the centrifuge, the oil is cleaned by the oil header gauge only. Centrifuge aluminium body 8 (Fig. 12) and cover 6 installed on the camshaft front journal are locked with a key and secured with bolt 7 through the use of special washer 3 fitted in the centrifuge cover. To prevent spontaneous unscrewing of bolt 7, lock washer 2 is provided. Mounted between the centrifuge body and cover is screen 9 with one oblong hole for oil passage from the body space into the centrifuge cover space and further on via the ducts to the connecting rod bearings. The correct position of the hole in the screen with respect to the ducts is ensured by a rib entering the centrifuge body.

The centrifuge body and cover are sealed by special rubber ring 7. To reduce oil leakage, sealing ring 4 is fitted between the camshaft end face and washer.

Care of Lubrication System

In operating the motorcycle, keep the oil level in the crankcase at the upper mark of an oil dipstick. If the oil level drops to the lower mark on the dipstick, engine operation is inadmissible. Oil should be added from clean containers and through a funnel with a gauge (using the latter is a must), taking care to prevent ingress of dust, dirt and moisture into the crankcase.

Before checking the oil level, wipe the oil dipstick clean and insert it into the filling hole of the crankcase up to the stop, without screwing up the plug. Change oil when the engine is hot.

Prior to changing oil in the crankcase, thoroughly clean the plugs of the filling and drain holes of the crankcase and screw them out. Then drain the used oil, screw in the drain hole plug and fill in fresh oil. After every 10,000 km run, wash the engine lubrication system. For this purpose, screw out a drain hole plug, discharge the used oil, screw in the drain hole plug and pour 1.2-1.5 l of oil into the crankcase; for washing, start the engine, allow it to operate for 2-3 min and discharge the oil again. Remove and wash the crankcase sump. Following that, pour fresh oil into the crankcase.

In winter time, heat oil before priming up to a temperature of 70-80 °C. It should be remembered that even a short-time disturbance of lubrication system operation may lead to an engine breakdown.

Excessive overheating of cylinders and heads, power drop and knocks in the engine are an indication of insufficient lubrication.

Operation of the lubrication system is checked by diaphragm-type emergency oil pressure transmitter 8 (Fig. 12) which operates when the pressure in the system drops to 0.13-0.18 MPa (1.3-1.8 kgf/cm²). A pressure drop is signalled by the dashboard-mounted indicator lamp of the emergency oil pressure transmitter. When the ignition is switched on, the indicator lamp will light up, after starting the engine, the lamp will go out. If
the indicator lamp is alight with the engine operating, this means that the oil pressure transmitter or engine is out of order. In this case engine operation is impracticable until faults are detected and eliminated.

In case the indicator lamp of the emergency oil pressure transmitter comes on instantaneously at the engine average speed, which may occur as a result of metal particles getting under reducing valve ball 44 (Fig. 6), it is necessary to clean the valve seat. For this purpose, drain oil from the crankcase, remove the sump, disassemble the reducing valve (withdraw cotter pin 41, plug 42, spring 43 and ball 44) and clean the seat.

It is advisable to perform cleaning of the seat with the help of a 10 mm dia drill sharpened at angle of 90° by turning it manually and applying slight pressure to it. It is permissible to seal the valve seat with a 10 mm dia ball by gently tapping it (two or three times) with a hammer weighing 0.1-0.2 kg through a drill (use may be made of a tommy bar to be found in a tool bag). Following that, turn over the crankshaft two or three times and re-assemble all the parts in reverse order.

When the engine is overheated or operates at a low idling speed (with engine speed of 800 min⁻¹), the indicator lamp may light up with the lubrication system in good working order. It is advisable to periodically screw out the oil pressure transmitter and check oil pressure with the help of a test pressure gauge. The oil pressure at the average rotational speed of a warmed-up engine must be not lower than 0.3 and not higher than 0.6 MPa (3 and 6 kgf/cm², respectively).

In the process of engine operation, under the action of centrifugal forces, dirt is separated from the oil and settles on the centrifuge body and cover. For this reason, the centrifuge must be cleaned after every 10,000 km run.

**FUEL-FEED SYSTEM**

The fuel-feed system includes the following: a petrol tank, three-way cock with a filter and settler, two carburettors, air cleaner, air ducts and fuel lines.

Fuel Cock with Settler The cock is screwed into the petrol tank threaded bushes. Arranged in the cock lower portion is settler 5 (Fig. 14) with filter gauge 6. Petrol is fed through one of the two fuel line pipes 10 and 11 of different height.

Slide valve 3 mounted in the cock body has one axial and two radial holes. One of them (a through hole) is coincident with a hole in high fuel pipe 11 (main fuel), the other being in line with the duct of the low fuel pipe 10 (reserve fuel).

Provided on the other side of the body are two unions for connection of fuel rubber hoses extending to the carburettors.

The cock handle has three positions: C (ON) – cock turned on; 3 (OFF) – cock turned off; P (R) – cock turned on for fuel reserve consumption.
The reserve contains close to 2 l of fuel.

To wash the setler and gasket filter of the fuel cock, unscrew the lower nut, separate the setler and cup with the filter from the cock, clean them of dirt and wash in pure petrol.

When re-installing the setler, make sure the sealing gasket is intact and properly fitted.

The engine is supplied from two carburettors K63T installed on the cylinder heads.

Fig. 14. Fuel cock:
1 - body; 2 - handle; 3 - side valve; 4 - side valve sealing gasket; 5 - setler; 6 - filter gauze; 7 - setler sealing gasket; 8 - fuel cock sealing gasket; 9 - threaded bushing; 10 - reserve fuel (pump) pipe; 11 - main fuel pipe

The carburettor design is shown in Fig. 15.

Carburettors K63T. Carburettors of this type are interchangeable and identical in design.

Carburettor adjustment. Before starting to adjust the carburettors, check the gap between the electrodes of spark plugs, breaker point gap and the clearance between the valve stems and rocker ends.

Fueling speed adjustment. Prior to adjustment, make sure there is a clearance between the cable sheath end piece and union. this clearance must be within 2-3 mm. If there is no clearance or the clearance is greater than 24

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required, slacken the lock nut of union 1 (Fig. 15) and rotating the latter clockwise or counterclockwise, adjust the clearance and secure the union with the lock nut. This clearance must be the same on both carburetors.

Carburetor adjustment for low idling speed of the engine is to be carried out on a warmed up operating engine. If a warmed up engine stops at the minimum idling speed, the idling system should be adjusted.

Adjust each of the carburetors separately, proceeding as follows: using screw 36, set the minimum steady speed of the engine, then gradually turn back screw 24 until the engine begins to miss, following that, slowly turn the screw forward until the engine starts to operate steadily; next, using screw 38, again
reduce the extent to which the throttle is opened until the minimum steady engine speed is achieved, at the same time the mixture composition is to be regulated with screw 24. The operations described above should be performed until the minimum steady engine speed is achieved.

Follow the same procedure to adjust the carburettor of the other cylinder.

After the idling speed adjustment, the engine speed must be the same during operation of the left- and right-hand cylinders. This is to be checked by alternately disconnecting the right- and left-hand cylinders by removing the caps from the spark plugs.

Check by listening if there is any change in the engine speed during operation of each of the cylinders. If the engine speed is different at the right- and left-hand cylinders, the carburettors should be adjusted by screwing in or unscrewing throttle screws 38 until the same speed is achieved.

To make sure the idling speed is steady, sharply open and close the throttles (by turning the throttle control handle).

If the engine operates steadily at a slow rotational speed, but stops when the throttle in sharply opened, screw in screw 24 by \( \frac{1}{4} \) turn, \( \frac{1}{2} \) turn (the mixture will become richer); if the engine stops when the throttle is sharply closed, and screw 24 by \( \frac{1}{4} \) to \( \frac{1}{2} \) turn (the mixture will become poorer).

Air-fuel mixture adjustment under engine operating conditions. Engine running under operating conditions (at average loads) is dependent on the needle position in the throttle, therefore, carburettor adjustment consists in the selection of the proper position of the needle.

The need for such adjustment arises as a result of changes in climatic conditions, for instance, when passing from a summer to winter in-service period; during a running-in period or for increasing the engine power at the expense of its economical operation. Adjustment is to be performed by moving dosing needle 34 along the thread with respect to clear by rotating it after first slackening lock nut 3. When the needle is screwed into the clear, the former rises with respect to the atomizer hole and the mixture becomes richer; with the needle screwed out, the mixture will become poorer. Turning the needle by one revolution causes it to move for 0.5 mm.

On completing the adjustment, tighten lock nut 3.

Correct adjustment of carburettors for the middle load conditions is to be checked by sharply increasing the engine speed.

When, in this case the knocking is heard in the carburettor, the mixture must be enriched by raising the needle.

Setting the fuel level in the float chamber. If the fuel level in the float chamber is too high, fuel consumption is increased or engine pick-up is insufficient, and also after replacement of the fuel valve or float, it is necessary to set the normal fuel level in the carburettor float chamber.

In order to set the fuel level in the float chamber, remove the float chamber cover and install the carburettor in a vertical position — with the float chamber up. In this position, the band on the float lateralsurface (in its middle position) must
be parallel to the carburettor body plane adjacent to the float chamber cover and the distance between the float band and this plane must be equal to (13.5±1) mm. If required, change the position of the float by bending fuel valve stop 16.

Care of carburettors. After every 5000 km, it is advisable to wash and blow off the carburettors. Wash carburettor parts with clear petrol. After washing, blow over the carburettors and their parts with air or dry them. It is impermissible to wipe parts with a cleaning cloth or some other similar materials. For cleaning the jets, avoid using a steel wire so as not to change the cross-section of the jet holes since this may disturb the normal operation of the carburettors.

In case the motorcycle is to be operated for a long time under hot climate conditions (at temperatures of 35 to 40 °C and higher) and also at an altitude of 2000 m and higher above the sea level, it is advisable to lower the dosing needle and, if the motorcycle is to be used under cold climate conditions (at air temperatures from minus 15 °C and lower), the dosing needle should be raised.

Fuel leakage through carburettor drain hole 31 indicates that the float chamber fuel valve is leaky. In this case it is necessary to wash the fuel valve or replace its elastic washer, eliminate scratch marks and nicks on the valve seat.

Air Cleaner (Fig. 16) – is mounted on the gearcase and attached to the carburettors with the rubber branch pipes.

Fig. 16: Air cleaner:
1 – preliminary filter; 2 – filter; 3 – gasket; 4 – cover; 5 – special nut

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Dry filter elements of the air blower consist of filter 2—coarse paper filter 2 or a prefilter made from glass fiber. The filter is made of materials resistant to the environment. The preliminary filter serves as a coarse filter element to remove large particles of dust, drops of water coming in together with air and water with the filter. From the filter intake, air is withdrawn in the filter cavity. Inside the filter cavity, the air is cleaned of dust and water droplets.
Therefore, running the motorcycle in rain, remove the preliminary filter from the filter. After riding, the filter element should be dried and re-installed.

TRANSMISSION

The motorcycle transmission consists of interconnected units designed to transmit the torque from the engine crankshaft to the rear wheel and sideward wheel, and also to change the reactive force at the driving wheel.

The transmission includes the clutch, gearbox, main drive with a differential gear and reduction gear.

Clutch

The dry double-disk clutch is designed to transmit the torque from the engine to the gearbox, to disconnect the engine from the gearbox when changing the gears, and to ensure smooth engagement during getaway of the motorcycle.

The clutch consists of driven and driving parts and clutch release mechanism. The clutch driving parts include flywheel (enter to Fig. 22) and pressure (8), intermediate (9) and bearing (11) disks mounted on the flywheel pins.

At the centre of the pressure disk is a square hole into which clutch release rod 12 enters.

The bearing disk is fastened to the pin ends with screws which are locked by prick punching the bearing disk into the slot of screw head.

The clutch driven parts comprise two driven disks 10 having, on either side, moulded-in linings made from friction material; the disks move into mesh with the splined portion of the gearbox primary shaft.

The correct size of the clutch will considerably increase its service life.

Avoid riding with the clutch slippage. When starting off and changing the gears, smoothly engage the clutch. Sudden engagement of the clutch with the engine operating at a high rotational speed leads not only to rapid wear of the disk friction linings, but also overloads transmission parts and increases tyre wear.

The clutch has two control linkages: from the clutch operating lever arranged on the handlebar (hand drive), and from the shift pedal (foot drive).

When using the hand drive, throw out the clutch before the gear is engaged (or changed over) and smoothly release the clutch operating lever after engaging (changing over) the gear.

When the foot drive is used, the clutch is disengaged automatically in the process of engagement (changing over) of the next gear, without acting on the manual clutch operating lever.

In this case, after engaging the gear, hold the pedal with the toe and heel of your foot, gradually returning the pedal to the initial position and at the same time increasing the engine speed.
The clutch release drive is to be adjusted as required with the aid of adjusting bolt 6 (Fig. 22) and adjusting screw 20 of clutch cable 19. First adjust the foot drive. If the latter is properly adjusted, there must be a small clearance between the adjusting bolt end and intermediate rod 3. The presence of a clearance is indicated by the rocking of shift pedal 1.

The free travel of the shift pedal front arm must be within 10-15 mm. The amount of slide block 16 travel, with the clutch disengaged manually, must not be greater than the value of the slide block travel during clutch disengagement with the shift pedal. To check the hand drive for correct adjustment, proceed as follows: by depressing the shift pedal up to the stop with your foot, perform full engagement of the required gear. Withdraw the clutch operating lever manually towards the handle on the handlebar. Perception of cable tensioning is bound to appear only at the end of lever travel in a disassembled 1-3 mm from the handle. If this distance is found to be greater or less than specified, then turn back or forward the adjusting screw, ensure the required value.

After adjusting the clutch drive, secure the adjusting bolt and adjusting screw with lock nuts.

**Gearbox**

The double-shaft four-speed gearbox incorporates a reverse gear and automatic clutch release mechanism actuated during gear shifting. The gearbox design is shown in Fig. 17-23.

Shafts: Primary shaft 9 (Fig. 17) is mounted on two ball bearings. The shaft is made integral with two rings of the lst, 2nd speed and reverse gears. The 3rd and 4th speed gears are press-fitted. The 4th speed gear is kept from turning on the shaft by a Woodruff key. The 3rd speed gear is linked with the 4th speed gear by means of end face projections.

Secondary shaft 10 is also mounted on two ball bearings and has a toothed rim for reverse shifting gear 20. Press-fitted on the shaft are two splined sleeves 11 which are prevented from turning by keys. The 1st, 2nd and 3rd speed gears are free to rotate on metal ceramic bushings, and the 4th speed gear, on a bronze bushing. The gears are linked to the shaft with the aid of gearshift movable sleeves 13. No special supply of lubricant to the freewheel surfaces is provided.

Starting mechanism. This includes starting 13b and intermediate 3 shafts with gears. Freely rotating on the intermediate shaft are two gears with 12 teeth each on the end faces. The shaft front end is gear-fitted into the casing.

Toothed quadrant 30 is press-fitted on the splines of the starting shaft. The quadrant is pressed with the aid of a torsion spring against rubber buffer 5 (Fig. 19).

The spring is wound up by turning bushing 1 (Fig. 17) mounted in the casing front wall by one-half revolution counterclockwise.

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The bushing is sealed by rubber ring 2, and the shaft, by a double-edge carcass-type gland. The starting lever is deposed with the foot, the quadrant is thrown into mesh with the intermediate shaft small gear which becomes linked, with the aid of the end face ratchet, to the large gear, the latter being in constant mesh with the 2nd speed gear of the gearbox primary shaft. After starting the engine, remove your foot from the starting lever which, together...
Fig. 18. Crankpin (cross-section):
1 = starting mechanism shaft; 2 = intermediate shaft; 3 = pin gear stop; 4 = idle gear installation piece; 5 = primary shaft; 6 = secondary shaft; 7 = gearshift fork; 8 = gland; 9 = buffer shaft; 10 = crank-case; 11 = crank pin; 12 = gearshift mechanism shaft; 13 = gearshift disk pin

Fig. 19. Starting mechanism:
1 = intermediate shaft; 2 = starting mechanism lever; 3 = wedge slot; 4 = starting mechanism shaft; 5 = buffer of starting mechanism quadrant; 6 = buffer strap; 7 = locked quadrant; 8 = primary shaft
The housing is sealed by rubber ring 2, and the shaft, by a double-edge carcass-type gland. The starting lever is attached to the starting shaft by means of a wedge bolt. When the starting lever is depressed with the foot, the quadrant is thrown into mesh with the intermediate shaft small gear which becomes linked, with the aid of the end face ratchet, to the large gear, the latter being in constant mesh with the 2nd speed gear of the gearbox primary shaft. After starting the engine, remove your foot from the starting lever which, together
Fig. 18. Crankcase (cross-section):
1 - starting mechanism shaft; 2 - intermediate shaft; 3 - idle gear drive; 4 - idle gear intermediate plate; 5 - primary shaft; 6 - secondary shaft; 7 - gearshift fork; 8 - gland; 9 - follower shaft; 10 - crank-case; 11 - crank pin; 12 - gearshift mechanism pawl; 13 - gearshift disk pin

Fig. 19. Starting mechanism:
1 - intermediate shaft; 2 - starting mechanism lever; 3 - weigh bolt; 4 - starting mechanism shaft; 5 - rubber buffer of starting mechanism quadrant; 6 - buffer stop; 7 - threaded quadrant; 8 - primary shaft
Fig. 30. Gearshift mechanism
(crestal position):
1 - pawl spindle; 2 - gearshift
mechanism pair; 3 - gearshift
disk with shaped cut-outs (con
cave); 4 - gearshift disk pin; 5 -
screwed pinion transmission
contact; 6 - fork shaft; 7 - inter-
catcher; 8 - neutral position
transmission spring

Fig. 31. Reverse shift mechanism:
1 - 1st reverse gear; 2 - primary shaft reverse
ring gear; 3 - reverse shift fork; 4 - secondary shaft reverse
ring gear; 5 - reverse shift handle; 6 - sealed rubber ring; 7 - reverse
shift fork lever; 8 - pin; 9 - cover; 11 - collar; 14 - gear engaged (front position); 21 - pin disengaged
clear positions

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with the quadrant, will return to the initial position under the action of the return spring. In this case the quadrant linkage will be taken up by the rubber buffer with a steel lining.

Gearshift mechanism: Four forward gears are engaged by splined sleeves 13 or the secondary shaft, which are set in motion along the shift by the shift forks. These latter have special protrusions entering the shaped cut-outs of gearshift disk 3 (Fig. 20). When the disk is turned, the forks move along shaft 6 mounted in the casing. Fitted on the gearshift disk are three pins 4 and neutral position transmitter spring 8.

In the neutral position, the transmitter spring closes through an insulated contact the electric circuit of the indicator lamp located on the dashboard. When
Fig. 23. Main drive and differential gear:
1 - differential cover; 2 - wedge bolts; 3 - differential casing; 4 - lock ring; 5 - hub; 6 - main drive casing; 7 - driving gear assembled with bearings; 8 - left-hand hub; 9 - drive shaft gear; 10 - angular gear; 11 - angular plate; 12 - distance bearing; 17 - idle gear; 14 - right-hand hub; 15 - differential half; 16 - half bearing; 17 - needle bearing; 18 - output gear; 19 - output shaft; 20 - lock ring; 21 - elastic coupling; 22 - cardan shaft; 23 - differential cover.
depressing one of the arms of the foot shift pedal with the foot, shifter shaft 9 (Fig. 18), linked to the crankcase turns through a certain angle. Fixed in the crank is a pin entering the slot of pawl 2 (Fig. 20) sliding along spindle 1. The pawl acting on one of the pins of the gearshift disk turns the latter. The disk is located with the aid of a lever catch. The reverse speed is put in with the help of handle 5 (Fig. 21) positioned at the right-hand side of the gearbox. Owing to its elasticity, the handle is locked in position on the bovets of the gearcase and cover by screw 6 having a spherical head. If the lever handle is shifted forward, the reverse shift fork and secondary shaft sliding gear move forward. As this takes place, the sliding gear comes into mesh with the idler gear installed on the gearbox cover. The idler gear is in constant mesh with the main shaft reverse gear.

The reverse gear may be engaged only on the spot and with the gearshift mechanism in the main neutral position (between 1st and 2nd gear).

When any of the gears is put in, it is impossible to engage the reverse gear. This is prevented by a special protrusion on the reverse shift fork, this protrusion enters the slot of the gearshift disk during engagement of the reverse gear.

The reverse shift handle is fastened on the knurled conic of the lever spindle and must be set to the required position before tightening the nut.

Clutch release mechanism adjusted in gear shifting. When changing the gears, crank-cast 2 (Fig. 22) turning forward or backward from its middle position, raises the long arm with the roller of inner 4 arranged in the gearcase space.

The short arm of this lever acts on compound intermediate rod 5 which, with its external end, presses adjusting bolt 6 of inner clutch release lever 17. The outer lever swinging on the pin, acts on clutch release rod 12 via slideblock 16, bearing 15 and end piece 13.

**Directions for Use**

Servicing the gearbox consists in timely changing oil in the gearcase and adjusting, as required, the clutch release mechanism.

Change oil at the time intervals prescribed by the Manual. The oil level in the gearcase is to be checked with a dipstick as directed in Section "Preparing for Departure".

The dipstick has a red-coloured polyethylene head used as a breather. Should it be necessary to clean the breather, the head may be removed.

It is good practice to change oil in the gearbox shortly after a return from a trip. Before discharging the used oil from the gearbox and priming it with fresh one, thoroughly clean off dust and dirt from the filling and drain holes with plugs. Following that, screw out the plugs of the filling and drain holes, discharge the used oil and pour fresh oil into the gearcase through a funnel with a gauge. The oil level in the gearcase must reach the upper mark on the dipstick inserted up to the stop in the filling hole with an unscrewed plug.

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When changing oil of one grade for that of another grade, wash the gearcase after draining the used oil. For this purpose pour 1.4 l of oil into the gearcase to wash the latter, screw in the filling hole plug, start the engine and allow it to operate for 2-3 min at the crankshaft average rotational speed, engaging in turn the 1st, 2nd, 3rd and 4th speeds (the motorcycle must stand on a support with the rear wheel slightly raised). Then discharge the flushing oil and pour fresh oil into the gearcase through a funnel with a gauge.

Long-time coaster or engine operation with the clutch disengaged is inadmissible as this will lead to thrust bearing overheating and its failure. To avoid difficulties, it is advisable to put in the neutral position or the gear close to the neutral position (1st or 2nd gear) during slowing-down before the motorcycle is brought to a full stop. In case of failure to engage any of the gears on the spot, release the clutch operating lever (after this is done, the primary shaft starts to rotate), following which press again the clutch operating lever and engage the required gear.

To engage the first or reverse speed without impact during get-away, after disengaging the clutch, wait a few seconds before putting in the required gear till the primary shaft rotational speed decreases.

The reverse gear can be engaged only with the main neutral position corresponding to the position of the gearshift mechanism between the 1st and 2nd gears. This position is shown by the lighting up of the neutral position indicator lamp. Applying too much force to put in the reverse gear with the gearshift disk in the other positions may lead to a breakdown. A breakdown may also be caused by an attempt to engage any of the gears by applying excessive force when the reverse gear is engaged. It is forbidden to engage and disengage the reverse gear with the foot.

The gearbox has one more fixed neutral position between the 3rd and 4th speed gears. This neutral position should be used in coasting. The neutral position should be found when the clutch is disengaged with the manual lever. To engage the 3rd and 4th gears without impacts after coasting, it is necessary to increase the engine speed and only then put in the required gear.

During operation in a cold season when the gearbox is not heated, there may appear noise (crackle) produced by the starting mechanism ratchet. In this case avoid considerably increasing the engine speed. The noise will vanish as the gearbox becomes heated.

To ensure more reliable sealing of the joint between the speedometer flexible shaft and the gearbox cover, a rubber ring may be fitted. To prevent dirtying, the recess in which the ring is fitted must be filled with lubricating grease.

Dismantling and Assembling Procedure

Dismantling. To be carried out proceeding as follows:

1. Remove the starting mechanism lever, clutch release lever, slide block, thrust bearing and clutch release rod end piece. Take off the elastic coupling disk.
2. Undo the two screws securing the starting mechanism shaft bushing to

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the gearcase front wall, relieve the winding-up tension of the starting mechanism shaft spring.

3. UnscREW the nine bolts securing the cover.
4. Set the clutch release lever pin and turn a soft cord through it. Holding the cover by the cord, drive out the primary and secondary shafts by slightly tapping there. Remove the cover. In doing so, take care to ensure that the gasket is intact.

Remove the idle reverse gear. Remove the reverse gear with the fork from the secondary shaft.

5. Remove the starting mechanism shaft assembly, take off the spring, gear and washers from the intermediate shaft.
6. Extract the fork shaft from the opening in the gearcase (without pulling the shaft out of the forks).
7. Withdraw the forks with the shaft from the gearshift disk slots.
8. Fit the classic coupling disk on the secondary shaft and secure it with the nut.
9. By gently tapping the primary shaft front end and elastic coupling disk, drive the shafts with the beams from the gearcase.
10. Stiffly pull back the catch, remove the gearshift disk from the pin.
11. Extract the pawl, pin and spring.
12. Unfasten and unscrew the nut fastening the crank-cam, remove the crank-cam from the shifter shaft, replace, withdraw the shifter shaft.
13. Take off the reverse gear engaging handle, extract the pin and lever from the gearcase.

Assembling. To be carried out proceeding as follows:

1. Install the gearshift mechanisms.
2. Install the primary shaft assembly into the gearcase so that the shaft front bearing is recessed a half of its length into the gearcase seat.
3. Insert the shift forks into the slots of the secondary shaft gearshift sleeves, pass the fork shaft through the forks and install the secondary shaft into the gearcase. By slightly tapping it with a soft-metal hammer, drive the shaft into the gearcase so that the gear rums on the primary and secondary shafts are brought into coincidence, fully press-fit the shafts into the gearcase. Insert the forks into the gearshift disk slots, and the fork shaft, into the gearcase.

Further assembly does not involve any difficulties and must be performed in reverse order to dismantling.

Main Drive and Differential Gear

The main drive and differential gear are mounted in a common split housing made of three parts: differential lower 1 (Fig. 23), differential casing and main drive casing 6.

The main drive consists of a pair of spiral bevel gears 7 and 9. The motorcycle spur differential consists of the following parts: two hubs 8 and 14, two satellites 10, two idle gears 13 and differential half 15.
Hub 8 is mounted in the main drive casing on two needle bearings. Hub 14 in the differential half. The satellites and side gears are installed on axles 11 whose tenons, on one side, enter differential half 15, and on the other side, large bevel gear 9. The differential half and gear are centered by means of two rollers and tightened together by two bolts which are secured by a special lock washer.

The assembled differential is supported by two bearings: ball bearing 16 mounted in the differential casing, and roller (compound) bearing in the main drive casing. The force from the differential is transmitted to the side car wheel through the pair of gears 18 and 19. Gear 18 is mounted on the splines of hub 14 and fixed with lock ring 20. Nuts 5 have a left-hand thread at both ends.

Oil is to be poured into the main drive casing through the filling hole, and into the differential gear, through the side port in the cover. If the oil level drops below the lower mark on the dipstick, it is forbidden to use the motorcycle.

Reduction Gear

The force from the differential gear is transmitted via the transverse torsion cardan shaft to reduction gear small gear 16 (Fig. 26) which is in mesh with gear 11.
The transverse carbon shaft is designed in such a manner that owing to its flexibility it cushions impact loads arising in the power transmission of the sidecar driven drive.

Gear 19 is interchangeable with differential gear 19 (Fig. 23).

Gear 11 (Fig. 24) is mounted on two ball bearings 10 and 13. Covers 3 and 6 are fastened to the casing with the aid of bolts.

Reduction gear air-tightness is ensured by use of gaskets 4, collar gland 7 and two rubber glands press-fitted in nut 2.

Oil is to be poured into the reduction gear casing through the filling hole. If the oil level drops below the lower mark on the dipstick, it is forbidden to use the motorcycle.

When mounting the reduction gear carbon shaft, take care to ensure the proper position of the joint forks. The forks press-fitted on the carbon shaft spindles must be arranged in the same plane.

Servicing the differential and reduction gear comes to checking the oil level and changing oil in due time at the time intervals specified in Section "Maintenance".

It is good practice to change oil in the differential and reduction gear just after a return from a trip when the oil is warm and can be easily drained. If the same oil is used in the differential and reduction gear during all seasons, the castings need not be washed during changing oil. In case oil of another grade is to be poured into the castings (when changing oil), the differential and reduction gear castings must be washed with oil used for washing the gearbox, following the same sequence of operations. The needle bearings of the universal joints are to be coated with lubricant Lithol-24 via the pressure lubricators screwed into the universal joint center-crosses.

To lubricate the universal joint, shift off the rubber seal and unscrew the protective cap with the aid of a radius wrench. Differential case 23 (Fig. 22) have a left-hand thread and reduction gear cowl 17 (Fig. 24), a right-hand thread.

WHEELS

The motorcycle wheels (Fig. 23) have a steel rim, and cast aluminium body reinforced with a steel brake drum. Mounted in the wheel body are adjustable tapered roller bearings. The labyrinth packing in the brake-to-wheel joint protects brake parts against direct ingress of dirt.

Care of Wheels

During the running-in period, the tensioning of wheel spokes may get weaker. An indication of loose spoked is a lower-pitch sound produced during a tap test. For this reason, during the running-in period it is necessary to periodically check spoke tensioning and tighten up the spokes as required.

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Subsequently, as the distance run by the motorcycle increases, the number of spokes that last tensioning will considerably diminish.

The spokes must be tensioned uniformly and tightly. Check the tensioning by tapping the spokes with a wrench or some other metal object, and the uniformity of their tensioning is to be determined by a monotonous sound produced during a tap test.

Simultaneously with checking spoke tensioning during the motorcycle running-in period it is necessary to verify the clearance in wheel bearings and, if required, adjust it.

To adjust the bearings, proceed as follows:
raise the wheel above the ground;
remove the axle;
take off the sand collar;
insert and tighten up the axle (without the collar);
holding the wheel, smoothly screw in the nut till eliminating the clearance (to be determined by the wheel rocking);
unscrew nut by 10°-15°;
holding a nut, tighten the lock nut;
take out the axle and fit the sand washer,
insert and tighten the axle;
make sure there is clearance in the bearing assembly unit and wheel is free to rotate. There should be no perceptible clearance. The overtightening of bearings is inadmissible.

After adjusting the bearings, check them for heating during motorcycle movement. Heating is to be checked by touching with the hand the parts of the wheel body that are closer to its centre, shortly after completing a 3-4 km run without stoppage and braking. If the bearings are overtightened, the wheel body will get much heated (to be checked by feel) and adjustment has to be repeated.

Checking the wheel bearings for proper tightening, their adjustment and lubrication should be carried out at the time intervals specified in Section "Maintenance".

To lubricate the wheel bearings, proceed as follows: remove the wheel, screw off lock nut 2 (Fig. 23) and nut 1; insert the wheel axle into the bearings from the end of the hub splined rim and by gently tapping the axle thickened end, press off the bearings (the bearing outer race installed

Fig. 23. Wheel:
1 - bearing adjusting nut; 2 - lock nut; 3 - inserted roller bearing
at the side of sprockets to be pressed off; remove the old lubricant from the bearings and hub, wash them in kerosene and dry; coat the bearings with fresh lubricant and re-assemble the wheel in reverse order.

Re-mount the wheel and adjust the bearings for proper tightening.

TYRES

The service life of tyres largely depends on the air pressure in them and on the load applied to them. Riding with tyres having a reduced air pressure will cause damage to the protector and cord on the sides of a tyre.

In case of prolonged usage of the motorcycle with a partial load (a driver and one passenger in the sidecar body), it is advisable to reduce the air pressure in the rear wheel tyre by 0.05 MPa (0.5 kgf/cm²).

The rear wheel tyre operates under more arduous conditions. To ensure even wear of all the tyres, it is necessary to interchange the wheels after every 5000 km, i.e., fit the rear wheel in place of the front one, the front wheel instead of the sidecar wheel, the sidecar wheel instead of the spare wheel, and the latter in place of the rear wheel. Parking the motorcycle on tyres for a long time (more than 30 days) is inadmissible. In case of preservation and putting in storage, the motorcycle must be installed on supports to ensure full relief of the tyres.

When the motorcycle is in use, there may arise the need to repair inner tubes (eliminating a puncture) or replace them, which involves dismounting and mounting of tyres.

Dismounting. To remove the tyre, do the following:

- fully deflate the tube;
- push the valve inside the tyre;
- place the wheel on the floor, stand with your both feet on the tyre and press the tyre bead into the rim recess;
- lever up the tyre bead with tyre mounting tools at the point spaced at about 1/4 of the rim circumference from the valve and bring the bead over the rim edge. In this case the opposite part of the bead must remain inserted in the rim recess;
- re-positioning both tyre tools around the rim edge, gradually take out the entire tyre bead and then pull out the inner tube.

If necessary, take out the other bead, proceeding in the same manner.

Repairing a damaged inner tube. A damaged point on a tube can be detected by the noise of leaking air. If a puncture is too small, immerse the tube in water and then escaping air bubbles will indicate a point of puncture. A damaged spot should be filled by vulcanization.

Under road conditions, repair must be carried out with the aid of a tyre patch kit following the instructions to be found in it.

A faulty valve must be replaced. If the air leaks between the valve and tube, tighten the nut securing the valve, using two wrenches.

Mounting. To mount the tyre and tube, proceed as follows:

- powder the tyre inside surface with talcum; fit the rim band on the rim and

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mate the valve hole in the band with the hole in the rim. Take care to ensure that the rim band completely covers all the nipple heads and the spokes do not protrude from the nipple heads;

insert part of the tree bead into the rim recess and, using tyre mounting tools, fit the entire bead on the wheel rim;

insert the tube valve into the hole in the rim, screw the control valve into the tube valve, slightly inflate the tube and enclose it into the tyre. In doing so, see that no folds are formed;

fit the other tyre bead, starting from the side opposite to the valve. See that the fitted part of the tyre bead enters the rim recess. As a rule, about 1/3 of the bead is to be inserted by hand and the remaining portion, with the aid of tyre mounting tools. When using these latter, take care not to damage the tube. Do not apply excessive force in mounting the tyre bead so as not to cause damage to the bead cable;

after mounting the tyre, push the valve slightly inwards, infill the tube to a greater extent and tap the tyre around its circumference with a mallet so that the tyre seats uniformly in the rim recess;

inflate the tube to the required pressure and screw on the cap;

make sure the tyre is properly arranged on the rim (the chock strips on the tyre must be concentric with the rim).

Note: No lock nut is fitted on the valve on tubes of tyres with rubber-metal valves.

FRONT FORK

The front fork consists of two tubes, end pieces, springs, parts of hydraulic shock absorbers, traverse and bridge with a steering column bar. Mounted on the fork is a handlebar shock absorber.

Tubes 30 (Fig. 26) inserted into the slotted holes of bridge 18 and clamped in it by coupling bolts 47 are load bearing parts of the fork. The tubes terminate in cones on which traverse 3 is fitted. Screwed into the upper portion of the tube cones are nuts 8 which link the tubes with the traverse. Casings 27 with headlamps mounting brackets are installed on the fork tubes between the traverse and bridge. Fitted on the lower portion of the tubes are bushings 32 which are prevented from displacement by lock rings 33. Radial bores in the tubes over the bushings are used for the passage of oil. Provided inside the tubes are shock absorber rods 45. At the top the rods are screwed into nuts 8 and secured with lock nuts 7.

Attached to the lower parts of the rods are guides 42. Pistons 43 are freely fitted on the rods over the guides. The circular clearance between the hole in the piston and the rod is a flow section for shock absorber fluid of the hydraulic shock absorber. Spiral springs 46 are fitted on the shock absorber rods and secured, at the top, on the spiral slots of upper end pieces 4, and below, with the aid of nuts 31 screwed on the shock absorber bodies.

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Fig. 26. Front fork:
1 = headlamp bracket; 2 = washer; 3 = 12-
traverse; 4 = spring upper end piece; 5 = sealing
ring; 6 = red nut; 7 = lock nut; 8 = coupling nut;
9 = handiller shock absorber wing nut; 10 = 26,
27 = special nut; 11 = shock washer; 13 = bearing
nut; 14 = gland; 15 = protective washer; 16 =
ball bearing; 17 = spring column bar; 18 =
ball bearing; 19 = gland; 20 = protective washer; 21 =
friction washer; 22 = oil washer; 23 = inner
washer; 25 = spring washer; 27 = fork blade
casing; 28 = gland with nut; 29 = upper
bearing; 30 = fork blade tube; 31 = shock
absorber rod; 32 = lower bearing; 33 = lock
ring; 34 = fork blade end piece; 35, 47 =
coupling bolt; 36 = shock absorber rod fixing
bolt; 38 = pin; 39 = cone; 40 = shock absorber;
41 = nut; 42 = roll guide; 43 = piston; 44 = pin;
45 = rod; 46 = spring; 48 = guide coupling

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The fork tubes with the rods secured inside are a stationary portion of the front fork, and fork blade end pieces 34 with the bases for fastening the front wheel axle and pieces of hydraulic shock absorbers 40 are a moveable portion of the fork.

The wheel axle is passed through the hole of the right-hand end piece base, screwed into the thread of the left-hand end piece and then locked with bolt 35. Provided in the lower portion of both piece bases is a threaded hole for bolts 36 securing shock absorber cones 29. During jolting on a rough road, the end pieces together with upper bushings 29 move along the fork blade tubes, sliding on lower bushings 32.

Glands 28 screwed on the end piece tubes hold the upper bushings, preventing outflow of oil from the fork inner space and protecting the tube surface against ingress of sand and dust. The glands consist of three edge caps, pressure springs, felt rings and washers are held in place by nuts screwed on the gland housings.

Dismantling. It is not advisable to dismantle the front fork unless absolutely necessary.

Before dismantling, place the motorcycle on a support, raise its front wheel and put a rest under the motorcycle front portion.

Screw off the nut of left-hand end piece bolt 35, screw out the front wheel axle (left-hand thread) and, having withdrawn the front wheel from the brake disk, move the wheel (after first disconnecting the front wheel brake cable).

Screw off nut 26 and take off wing nut 9. Unscrew nuts 8 and 10, remove nuts 8 from the rods and take off reverse 3. Release the nuts of bolts 47 and remove fork blade end pieces 34 with guide tubes 30. Screw out the housings of glands 28 and withdraw tubes 30 from end pieces 34. Remove lock rings 33, bushings 32 and 29 and gland 28 from tubes 30.

To dismantle the fork shock absorber, unscrew shock absorber fixing bolt 36 and outside shock absorber 40 assembly. Then screw off the nut in the rod upper portion, remove the upper end piece and fork spring. Screw out the spring lower end piece and remove the rod-and-piston assembly (take care to protect the shock absorber tube against damage). To disassemble gland 28, screw off the gland nut, take out the felt ring, withdraw the gland cap spring and remove the cup.

To remove casing 27, detach the headlamp, screw off the nuts and withdraw bolts 47 securing the guard to the casing. Unscrew the nuts securing the front guard to the bridge and remove the guard. Extract the bolts and remove the casings.

Assembling. Prior to assembling, all the fork parts must be thoroughly cleaned of dirt and washed in kerosene.

To assemble the fork, proceed as follows: assemble shock absorber 40, fit the spring, insert the shock absorber with the spring into fork end pieces 34 and tighten with bolt 36. Fit the body of gland 28 in assembly, guide bush 29 and 32 lock ring 33 on tube 30. Insert tube 30 into end piece 34 and screw the
Install the frame. Before installing the front fork on the frame, check the number of balls in the steering column bearings. There must be 22 pcs in each of them. Fit the balls into the races of bearings pre-dished into the frame head, applying a coat of lubricant Lithium 2. Insert the fork into the frame head and secure with nut 13, then mount traverse 3 on the cones of tubes 20. Screw up the ends of the shock absorber rods into nut 8 having secured with lock nuts 7. Ensure that the clearance between the lock nut end faces and spring upper end piece 4 is within 0.2–0.4 mm. Slightly screw in nuts 8. Insert balls 47, screw home nuts 8 on traverse 3 and tighten bolts 41, screw up nut 10 and shock absorber wing nut 9 and corner-pin the latter.

Connect the front wheel brake cable to the lever on the brake disk and insert the disk together with the wheel between the fork blades. Pass the front wheel axle through the hub and brake disk and screw the axle right home (left-hand thread).

Secure the axle in the left-hand end piece of the fork blade with bolt 35.

Checking and adjusting the clearance between the lock nut and spring upper end piece. The clearance between lock nut 7 and spring upper end piece 4 must always be within 0.2–0.4 mm. To check and adjust the clearance, remove the boss wheel, screw out nut 8 securing the tube to the traverse and, after raising end piece 34 upwards, withdraw the rod together with the nut and spring end piece from the tube. If, as a result of checking, the clearance is found to be out of the specified limits and has to be adjusted, it is necessary to tighten lock nut 7 and slightly screw nut 8 off the rod. By screwing the lock nut out or off the rod, set the required clearance between the lock nut and end piece. Holding the lock nut with a wrench, screw on nut 8 until it rests against the lock nut and tighten them up reliably. Lower end piece 34 and screw in bolt 3 into the fork tube.

After adjusting the clearance in one fork tube, follow the same procedure to adjust the clearance in the other tube.

Adjusting the steering column bearings. While the motorcycle is in use, it is necessary to adjust the steering column bearings. They should be tightened so as to eliminate the clearance at the same time ensuring free turning of the handlebar.

Adjust the bearings for proper tightening, proceeding as follows: raise the motorcycle front portion so that the front wheel does not touch the ground; screw out handlebar shock absorber wing nut 9 and remove washers 21–24. By rocking the fork up and down by the handlebar, or fork blade end pieces 34, check the clearance.

If there is clearance in the bearings, screw out the nuts of the handlebar- to-traverse attaching brackets and, without disconnecting the cables and

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electric wires, remove the handlebar from the traverse and place it on the petrol tank. Unscrew nut 13 and coupling nuts 8, take off nuts 8 from the rods and remove traverse 12. If the traverse is hard to remove from the fork tubes, knock the traverse off the tubes by gently tapping it with a mallet through the way of a wooden extension. Tighten up bearing nut 13 fully and then slacken it by 1/4 turn. Check again the bearing clearance for the presence. The front fork must turn without seizure and without applying too great force.

On completing the adjustment, re-install the traverse, handlebar and re-assemble the handle stock absorber.

Changing oil in shock absorber. To change oil in the front fork shock absorber, raise the motorcycle front portion, remove the front wheel and slacken the nuts of bolts 47.

Screw out coupling nuts 8, take off them the rods, remove the right- and left-hand blades of the fork. Turn over the blades so that end pieces 34 are directed upwards and discharge the used oil. Pour 150 to 200 cm³ of kerosene into tubes 30 of each blade; by shaking up, raise the inner spaces of fork blade shock absorbers and tubes, drain the kerosene and pour fresh oil into the tubes. In order to completely discharge the flushing kerosene, the fork blades must be kept with the end pieces upwards within 10 and 15 min.

BEAR WHEEL SUSPENSION

The rear wheel levered suspension using spring-hydraulic double-acting shock absorbers ensures riding comfort.

The vertical forces arising due to road roughness are taken up by the wheel and transmitted through the suspension lever and shock absorber to the frame. The spring-hydraulic shock absorbers dampen impacts and suppress suspension vibrations. The lateral forces are transmitted from the wheel to the frame via the suspension lever installed on rubber bushings. The articulated joints of the spring-hydraulic shock absorbers with the suspension lever and lever-to-frame connection are also made with the use of rubber bushings. Such joints ensure silent operation and practically do not wear, therefore care is servicing the joints consists in checking the fasteners for reliable tightening.

Spring-hydraulic shock absorbers. These are basically easily removable and interchangeable units.

Bearings spring 4 (Fig. 27) is an elastic element of the shock absorber. The vibrations are damped by double-acting hydraulic shock absorbers arranged in body 7. The shock absorber is essentially an air-tight vessel closed at the top by nut 6 and gland 33 through which rod 9 passes. Positioned inside the body is cylinder 8 in which piston 27 secured to the rod by nut 13 reciprocates.

Compression valve 26 is mounted in the lower portion of the shock absorber cylinder and the by-pass valve consisting of retainers 22, 24 and spring 23 is arranged on the piston upper end face. Insulted in the cylinder upper portion are rod guide 28, gland housing 31 with gland 33. Spring-hydraulic shock absorbers are provided with a cam-type regulating device 41 — movable cam.
Fig. 27. Shock absorber design:

1 - upper end piece; 2 - block; 3 - upper housing; 4 - spring; 5 - buffer; 6 - reservoir nut; 7 - shock absorber body; 8 - working cylinder; 9 - mo; 10 - bearing ring; 11 - movable case; 12 - fixed case; 13 - lower end piece; 14 - compression valve body; 15 - rebound valve nut; 16 - rebound valve adjusting washer; 17 - rebound valve spring; 18 - rebound valve washer; 19 - rebound valve retainer; 20 - rebound valve disk; 21 - rebound valve throttle disk; 22 - valve valve retainer; 23 - by-pass valve spring; 24 - by-pass valve limiting retainer; 25 - compression valve assembly; 26 - compression valve assembly; 27 - piston; 28 - rod guide; 29 - gland spring; 30 - reservoir nut; 31 - gland housing; 32 - gland washer; 33 - rod rather gland; 34 - end felt gland; 35 - packing washer.
12 - fixed cam) to change the degree of precompression of bearing springs depending on the load and road conditions.

Spring precompression is adjusted for two positions. The first position: springs are not contracted (corresponding to the load comprising a driver and a passenger in the sidecar); the second position: springs are contracted (corresponding to the maximum load and movement over poor roads).

Adjustment is to be carried out by turning movable cam 11 counterclockwise with a special wrench until the cam is locked in the upper position.

Dismantling. To disassemble the shock absorber, remove the latter from the motorcycle after first placing the motorcycle on a support. Then install the shock absorber in a vertical position and clamp its lower end piece in a vice. To dismantle the shock absorber, proceed as follows:

1. By pressing housing 1, lower it by 3 to 10 mm and remove released blocks 2.

2. Remove housing 3, spring 4, bearing ring 10 and movable cam 11.

3. Move end piece 1 with rod 1 upward and unscrew nut 6 with a special wrench. Take the rod upper end piece with the hand and raise it up in jacks.

This must cause the rod assembled with piston 21, housing 31 and working cylinder 8 to come outside.

4. Immerse the rod assembled with the cylinder and lower valve body into kerosene and, holding the cylinder with the left hand, move the rod several times up and down with the right hand. Take the cylinder together with the rod out of the kerosene and, holding the cylinder with one hand, remove from it the rod together with the gland’s housing, guide 31 and piston assembly. Pour oil out of the cylinder and shock absorber body.

5. Secure the rod by the upper end piece in a vice and screw off rebound valve nut 12.

6. Remove the piston with all the valve parts, rod guide, spring 39 and gland housing 31 assembly.

7. Carefully take out felt gland 34 from the housing, remove the reservoir nut gland and, using a wooden rod, push out rubber gland 33 from the upper side of the housing.

8. Press out the compression valve assembly from the working cylinder by gently tapping a wooden drift with a mallet.

Reassemble the shock absorber in reverse order. To avoid damage to the rubber gland when fitting the gland housing on the rod, use should be made of a tapered end piece.

Oil should be poured in with the working cylinder inserted and with the compression valve in the shock absorber body. Fill the working cylinder with oil up to the rim, the remaining oil is to be poured into the shock absorber body.

After priming with oil, insert the rod with the piston into the working cylinder, close the cylinder with the rod guide and, having carefully moved the gland housing up to the guide, screw up the reservoir nut. Following that,
BRAKES

The brakes of all the motorcycle wheels have a mechanical linkage. The front-wheel brake is equipped with a separate linkage from the lever on the handlebar. The brake of the rear wheel and sidecar wheel is operated from the common hot pedal.

Front-wheel brake. Brake shoes 1 (Fig. 28) rest with their spherical seats on the heads of tappets 5, and with their pressure pads, on cams 3 installed in disk 4. Attached to the cams by means of slots are driving (7) and driven (8) levers arranged on the face side of the brake disk. The levers are interconnected by tie rod 2 adjustable as to a length. The driving lever is linked through a cable to the front-wheel brake control lever arranged on the motorcycle handlebar. When depressing the front-wheel brake control lever, the cable acts on the brake driving lever and both levers turn the cams simultaneously, as a result, the shoes move apart, being pressed against the wheel brake drum. The shoes return to the initial position under the action of two springs 6. To compensate for wear of the brake linings, the brake design provides for the use of special devices.

Compensation for wear is first achieved by tightening the cable sheath, for which purpose, it is necessary to screw out adjusting union 11. Subsequently, when adjustment with the union is impossible, screw the union right home, remove both driving and driven levers from the cams and set them to a new position, after turning them by 10° counterclockwise with respect to the cams (by one tooth). After this is done, perform brake adjustment to screwing out the union.

When in the process of operation and further wear of the linings, the length of the union is found again to be insufficient for adjustment, disassemble the brake and turn the cams through 180° about their axis. In this case, owing to the cam being symmetrical with respect to the axis at its stem, the brake shoes are set to a position whereas wear of the linings is compensated by 3 mm across diameter.
Fig. 28. Front-wheel brake:
1 - brake shoe; 2 - tee nut with hub; 3 - cap; 4 - disk; 5 - upper; 6 - spring; 7 - driving lever;
8 - driven lever; 9 - return spring; 10 - pin; 11 - adjusting union; 1 - washer conventionally not shown; A - A - resolved

Fig. 29. Rear-wheel brake:
1 - adjusting cone; 2 - upper; 3 - lever pin; 4 - lever; 5 - cam; 6 - equalizer; 7 - lever screw;
8 - brake shoe; 9 - brake shoe spring
If the wear is less than specified, turning of the cam will be premature and will make it impossible for the assembled brake to enter the wheel brake drum. The possibility is not ruled out that in certain cases the cam can be turned through 180° without preliminary re-positioning of the levers. If necessary, wear of the liners can be further compensated by placing adjusting washers of the same thickness between the tappets and their supports in the brake disk (the motorcycle is not stocked with spare washers).

Dismantling the brake is a simple procedure and does not require any special explanation.

Re-assemble the brake, proceeding as follows:

1. Install the cams into the disk holes;
2. Fit return spring 9 by hooking it directly to the disk hole;
3. Install the shoes with springs on the spherical ends of the tappets and cam bearing surfaces;
4. Mount the driving and driven levers and secure them to the cam slots, maintaining angles of 82° ± 3° as shown in Fig. 28. Error in parallelism of the levers must not be greater than 5°.

After mounting the brake on the motorcycle, link the tie rod with the driving lever.

Turn each lever clockwise until the shoes are pressed against the wheel brake drum.

Screwing in or out the tie rod into the forks, adjust the distance between the centres of holes in the forks so that the pin linking the fork with the driven lever can freely enter the holes of the lever and fork. The tie rod must be screwed into the fork for a distance of not less than 5 mm.

Lock the tie rod in the fork, link the tie rod to the driven lever and cotter-pin it. Insert the return spring. Adhering to the abovementioned assembly rules will ensure the required conditions for reliable operation of the brake owing to both shoes being simultaneously pressed against the wheel brake drum. When re-assembling the brake, install the shoes in their original places, otherwise wear will be disturbed and braking efficiency will deteriorate for some time.

Also, pay attention to the cam surfaces on which the shoes rested since the cam surfaces are asymmetrical with respect to the cam axis of rotation. Both shoes must rest on the cam surfaces that are equally displaced with respect to the stem.

In operation, the brakes are to be adjusted as required by screwing out the adjusting union as directed above. On completing the adjustment, lock the union.

The brake must be so adjusted that the wheel raised above the ground is free to rotate without rubbing against the shoes and the required efficiency and convenience in grasping the lever with the hand is ensured during braking.

The wheel brake. Brake shoes 8 (Fig. 29) rest with their seats on the heads of tappets 2, and with the pressure pads on cam 3. The cam has a slot in which equalizer 6 is mounted. Turning the cam with the equalizer causes the shoes to be pressed against the brake drum.

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Fig. 30. Rear-wheel and door axles brake linkage:
1 - bumper; 2 - prop.; 3 - suspension; 4 - suspension spring; 5 - outer wheel spring; 6 - adjusting union; 7 - adjuster wheel brake cable; 8 - shield, 9 - rear pin; 10 - brake shoe lever; 11 - var seer; 12 - interlock lever; 13 - rear seer; 14 - equalizer adjusting bolt; 15 - coupling; 16 - rear wheel fork; 17 - outer hinge pin; 18 - prop.

Fig. 31. Adjustment of rear-wheel brake

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As the brake linings become worn, the clearance between the brake shoes and wheel brake drum increases. To maintain the clearance within the specified limits, the brake is provided with a slack adjuster in the form of cone 1. The latter is to be operated in as required (see the outside of the brake drum) so as to move apart tappets 2 which bring the brake shoes nearer to the drum and cam.

To clamp the cone in position, its surface has longitudinal grooving into which the tappets enter under the action of springs 9 tightening the brake shoes together.

The need for brake adjustment is to be determined by the value of free travel of outside hinge lever 19 (Fig. 30). The free travel can be considered normal if tides not exceed 33 mm. If the free travel is greater than the specified value, raise the rear wheel and, using a wrench with a 8 mm mouth, turn the protruding square of the adjusting cone (as shown in Fig. 31) clockwise until the shoes start to touch the brake drum during turning the wheel. Following that, turn the adjusting cone back by one fixed interval so that the wheel can rotate without touching the brake shoe.

The brake of the rear wheel anti-sidecar wheel is operated from the foot pedal through equalizer 3 (Fig. 30). The equalizer upper arm is connected with the rear wheel brake linkage, the lower arm being connected with the sidecar wheel brake. The availability of the equalizer ensures the correct distribution of braking moments and synchronous operation of the brakes.

The length of front tie-rod 13 of the rear wheel brake linkage must be such as to ensure the distance of 3 to 9 mm from the equalizer symmetry plane to the axis of oscillation of the rear wheel suspension lever. The equalizer symmetry plane must coincide with the symmetry plane of the upper arm of brake pedal 2.

The brake pedal must be pressed against footstop rubber ridge 1, the footstep is to be installed according to Fig. 31 (3°-13°).

The length of rear tie-rod 11 is to be adjusted when mounting the latter or when requiring the brakes.

Adjustment is to be carried out with the wheel removed, the brake assembled and the brake pedal pressed against the motorcycle footstep, proceeding as follows:

press lever 10 forward (clockwise) and bring nut 8 out of the lever;
screeching off or on the nut, bringing end face to pin 9 without clearance.
Displacement of the cam lever lower head is permissible up to 3 mm forward (in the direction of braking). The tie-rod threaded part must not be disconnected in the nut.

Sidecar wheel brake. This brake is similar in design to the rear wheel brake.

The brake is operated by means of cable 7 (Fig. 30). Fitted at both ends of the cable are adjusting unions 5 with a protective rubber pipe slipped over them. To keep dirt away from the cable, see that the pipe is pulled over the unions and rubber sleeve 17 seals the cable front end.

Checking the brake and its linkage for proper adjustment is to be done with the wheel raised.

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At first you are to check the adjustment of the clearance between the brake shoe and drum with the aid of the adjusting cone (following the same procedure as that recommended for the rear wheel brake). Adjusting unions 6 must be turned to such a position as to prevent the cable action on the brake cam lever.

Next, adjust the cable for proper tensioning with the help of unions 6. First, by unscrewing the unions or one of them, set the position at which wheel braking begins. Following that, by screwing in one of the unions, release the brake applied to the wheel.

The absence of cable skewness is a mandatory condition for satisfactory operation of the sidecar wheel brake linkage. Here, attention should be given to the position of step 30. If required, the latter must be screwed in or out and locked.

To reduce friction of the cable on the sheath during adjustment, slightly shake the cable up.

Excessive tensioning of the cable may cause - through the equalizer - braking of not only the sidecar wheel, but also the rear wheel. After completing the adjustment of the brake system, check its efficiency when braking at a slow speed and make sure there is no heating of the wheel bodies during movement. The wheel bodies should not be heated during movement without braking. If, in braking, the wheel bodies excessively run hot, increase the clearance between the shoes and brake drums.

Pinned on the bracket of pedal 2 is adjusting bolt 14 limiting the turning of equalizer 3. When the position of bolt 14 is properly adjusted, on depressing the pedal with a 40 to 50 kgf force, the clearance between the equalizer and bolt 14 end must be within 2 and 3 mm.

Pressing the equalizer against bolt 14 weakens the action of the sidecar wheel brake or puts the latter out of operation at all. The above bolt serves as a stop for the equalizer lower arm in case the cable gets broken.

Brake parts should be lubricated at the time intervals specified in Section "Maintenance". Excess lubricant must be removed to prevent greasing of the linings.

The maximum wear of the brake lining is subject to the rivet head seat depth, which should make at least 0.3 mm.

SADDLES

Depending on the mass of a driver or a passenger the stiffness of the saddles is adjusted by shifting of the springs along supports; in this case you are reduced to slacken fastening bolts. The shifting of the spring towards the front hings ensures the more soft cushioning of the saddle, the shifting of the spring in the opposite side ensures the more stiff cushioning of the saddle. The adjustment over, reliably tighten the bolts.

Check the tightening of the saddle fasteners after every 2500 km of the run.
The motorcycle is intended for use only with a sidecar. The motorcycle sidecar is single-seat, with a levered wheel suspension using a spring-hydraulic shock absorber.

The sidecar metal body is passenger-type, welded. It is equipped with an upholstered seat consisting of two cushions (seat and back). The costly removable folding back opens access to the luggage boot. To open the luggage boot, depress the button of the lock fitted on the back. The boot can be locked with the aid of a special key. Provided on the left-hand inside lateral wall of the boot are brackets for fastening a pump, a holder for a fuel can and a gadget for fastening a shovel.

The sidecar body is attached to the frame front tube by use of two clamps with rubber pads. The rear portion of the body is secured to two rubber springs fastened to the brackets of the frame rear tube.

To reduce body vibrations, a stop bar with a rubber buffer is fitted to the frame rear portion.

To protect the shock absorber against very strong impacts during movement with a full load over poor roads, a shock absorber travel limiter with a rubber buffer taking up impact during extreme downward deviation of the wheel carrier lever is mounted on the right-hand longitudinal tube of the sidecar frame.

The sidecar is attached to the motorcycle at four points (Fig. 32). The two
lower attaching points are essentially roller hinges embracing the bolt brackets of the motorcycle frame. The rear coil hinge is mounted in bracket 5 secured to the sidecar frame by two coupling bolts. When the bolts are slackened, the bracket can be turned or moved out of the sidecar frame tube.

The upper attaching consists of two tie-rods adjustable as to length. The tie-rods are articulately connected to the sidecar frame ears and motorcycle frame brackets.

The sidecar wheel is mounted as a cantilever on the axle of the reduction gear hinged to the frame. The vertical forces exerted on the wheel are suppressed by the spring-hydraulic shock absorber installed on the frame arc and in the reduction gear bracket with the use of rubber hinges-bushings. The wheel suspension lever is linked to the frame with the aid of rubber hinges-bushings similar to bushings used in the motorcycle rear wheel suspension.

The motorcycle with a properly mounted sidecar is easily steerable and does not deviate from the selected travel direction. Since the motorcycle has two driving wheels (sidecar and rear wheels), when installing the sidecar with respect to the motorcycle, try to ensure such a position at which the sidecar wheel is parallel to the motorcycle wheels and all the wheels are perpendicular to the horizontal plane of a road. Checking for correct positioning of the sidecar with respect to the motorcycle is to be carried out in the process of operation when moving at a slow speed over an even horizontal road section, with the handbrake released. The motorcycle must not wobble aside.

It should be necessary to adjust the wheels for parallelism, loosen the coupling bolts clamping bracket 5 and move the latter in or out of the rear tube until the correct relative position of the wheels is achieved. This position can be checked with the aid of two straight bars to be applied to the wheels at 90 to 100 mm above the ground.

Perpendicularly to the wheels with respect to the road is attained by increasing or reducing the length of adjustable tie-rods 1 and 2.

When performing adjustment, coat all the hinges with lubricant Lithol-24.

**ELECTRICAL EQUIPMENT**

The motorcycle electrical equipment comprises electric power sources and using equipment, auxiliary devices and electric circuit. The electrical equipment ensures ignition of air-fuel mixture in the engine cylinders, lighting, audible and light signalling.

A circuit diagram of the motorcycle electrical equipment is shown in Fig. 33.

The electric circuit consisting of low-tension wires is made up according to a single-wire system, i.e., with one wire extending from electric power sources to the using devices (from the positive terminals of storage batteries and generator), the frame and other metal parts of the motorcycle and the devices proper ("earth") are used as the other wire.

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The negative terminals of the storage batteries and generator are connected to the frame ("earths"). To check operation of the generator and current-and-voltage regulator, an indicator (red) lamp P220E is provided. Extinction of the lamp with the engine operating indicates that the generator and current-and-voltage regulator are in good working order.

To check the oil pressure in the engine system, emergency oil pressure transmitter M11206 is fitted, with indicator (red) lamp P220E serving as an emergency oil pressure warning light.

The neutral position of the gearshift mechanism and switching on of the turn indicator is signalled by indicator (green) lamps P220D, switching on of the high beam being signalled by indicator (blue) lamp P220M.

When mounting or dismounting the electrical equipment devices, it is necessary to break the circuit with the aid of battery switch 46.3710.

**Electric Power Sources**

**Storage Batteries**

Installed on the motorcycle is a storage battery type 6MTC9. The rated voltage of one battery is 12 V, the capacity is 5 A·h.

The storage batteries supply power to all using devices of the motorcycle with the engine not operating or running at a slow rotational speed. When the engine speed is higher than 1800 min⁻¹, the load is switched over from the storage batteries to the generator from which the batteries are charged.

When using and servicing the storage batteries, adhere to their operating instructions.

**Generator**

Mounted on the motorcycle is generator F424 designed for the rated voltage of 14 V and having the rated power of 150 W.

The maximum power at short-time loads is 200 W. The mass of the generator is 3.7 kg.

Design. The generator is basically a three-phase synchronous electrical machine with electromagnetic excitation, having the following structural elements and characteristic design features: cover 1 (Fig. 34) has, at the drive end, a cylindrical boss that is eccentric to the rotor axis, for adjusting the centre-to-centre distance of the drive gearing, and flange for securing the generator to the frame of the car.

At the drive end the generator has rubber gland 2 to seal off the inner space from the corrosive medium of the crankcase. Rotating in bearings 11 (with make-up lubrication and double-end packing) is rotor 3 with an excitation winding and slip rings.

Three-phase stator winding 4 is star-connected with the insulated neutral. The phase leads are soldered to the heads of the bolts securing rectifier unit 8.

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Two covers 1 and 6 and also the starter are drawn together by three screws M6. The brushes with current carrying plates are secured to brush holder 7 and cover 6 by means of captive screws.

Semiconductor rectifier unit 8 built into the generator makes it possible to obtain direct current at the generator terminals.

The rectifier unit consists of three monoblocks cast from aluminium alloy, with finning for convective heat transfer. Built into each monoblock are two semiconductor elements of opposite polarity, the electrical connection of which is made with the aid of two busbars: an "earth" and an insulated busbar. The insulated busbar has a contact screw.

It is forbidden to disassemble the rectifier unit.

Terminals for connecting the generator to the motorcycle electric circuit are fitted on common terminal block 2. They have limiting washers preventing the possibility of wire misconnection during assembly and spontaneous disconnection of wires in operation.

Operating principle. Generator G424 is classified among three-phase synchronous electrical machines with electromagnetic excitation. The characteristic features of the generator are as follows: at the slow rotational speed of the rotor the generator excitation winding must be fed from an external 4-c. source (spunge battery) and only after excitation from a storage battery at a

Fig. 34 Generator F-424
1. cover; 2 - gland; 3. - types; 4- starter winding; 5- terminal block; 6 - rear cover; 7 - brush holder; 8 - rectifier unit; 9 - 10- protective caging; 11 - bearing.
Generator operation with fully discharged storage batteries is impossible since the generator fails to build up.

It is forbidden to operate the generator under no load.

In case the generator operates without load (with the wires extending to using devices broken or disconnected) at a high rotational speed, the interphase a-c voltage will reach the values at which it may break down the semiconductor elements of the unit, thus causing damage to the generator.

Mounting on the motorcycle. Insert the mounting boss of the cover (at the drive end) into the engine crankcase mounting hole. At the same time ensure that the gears move into mesh and the studs enter the elongated holes of the generator flange. A gasket must be fitted between the crankcase and generator end face planes.

Fit flat and spring washers on the studs and screw on the nuts until the generator is slightly pressed against the crankcase. Connect the wires to the terminal bolts and mount the safety caps.

Start the engine and, slowly turning over the generator counter- and clockwise (at engine slow speed), find the optimum position of gear meshing, at which the gears operate with the least noise. Without changing the generator position, tighten up the nuts. If the drive gear meshing is improperly adjusted, this may lead to a breakdown of the generator shaft.

Care of the generator. The design of generator T424 makes it possible to reduce its maintenance in operation to minimum. The use of bearings with make-up lubrication eliminates the need for periodic lubrication of the bearings. The factory-stuffed lubricant in the bearings is sufficient for the entire operating life of the generator. The generator slip rings do not form carbon deposits in operation, practically wear very little, are not fouled with brush dust and, therefore, do not require frequent grinding and periodic polishing.

The electric brushes fitted on generator are sufficient for the entire service life.

While the generator is in use, check for reliable tightening of the nuts of the terminal bolts with cable lugs, generator coupling screws, fan fastening screw and generator fastening screws.

After the expiry of the generator operating time (20,000 km run of the motorcycle) clean off brush dust from the cover inner space at the slip ring end.

To facilitate the cleaning procedure, it is advisable to remove the generator from the motorcycle, take off the casing and brush holder with brushes.

Total disassembly of the generator before the expiry of the guarantee period is not allowable.
Voltage Regulator

Generator F414 operates together with contactless voltage regulator 33.3702. The voltage regulator is intended for automatic maintaining the voltage of the generator terminals and controlling the pilot lamp of storage battery charging. After starting the engine the pilot lamp goes out, indicating the serviceability of the generator and of the voltage regulator (pilot lamp may blink when the motorcycle moved with 30 km/h speed and at the instant the additional load is connected to the circuits).

When installing the voltage regulator on the motorcycle, see that the regulator body would be reliably connected to the motorcycle frame with the aid of a fastening bolt.

Electric Power Using Equipment

To produce high-tension current, the motorcycle engine is fitted with an ignition coil E204 and breaker D13502A with an automatic spark timer.

The position of the ignition coil and breaker is shown in Fig. 35.

Ignition Coil

Ignition coil E204 has two leads each of which feeds current to one of the cylinder spark plugs and operates in conjunction with the breaker having an automatic spark timer.

The clearance between the discharge and high-tension terminals is set to 9 mm. As increase or reduction of the clearance in operation, loosening of fastening of the current-carrying wires to the terminals, fouling of the wires and terminals are inadmissible.

Breaker with Automatic Spark Timer

Keep the breaker clean, ignite the fastenings in due time, replenish the lubricant for the oil wick and friction surfaces of the automatic spark timer. Wipe the breaker with a clean cloth moistened with parol.

After 500 km (at the beginning of the running-in period) and subsequently after every 3000 km, check the contacts for good condition, dress them, if necessary, and adjust the gap. Dressing the contacts should be carried out with a needle file or some other tool having no abrasive dust. When dressing, remove
a small knob on one of the contacts, but a recess on the other contact should not be eliminated. After dressing, wash the contacts with clean petrol and set a gap of 0.4 to 0.6 mm.

After every 5000 km, the breaker lever pin and weight-pin clearance should be lubricated with one drop of oil T22. The cam-pushing clearances and oil wick are to be lubricated with 2–3 drops of oil T22.

Operation of Ignition System

On switching on the ignition, the circuit of the ignition coil primary winding becomes energized. When the breaker contact points are opened, a high-tension current (10 000 to 15 000 V) necessary to ignite the air-fuel mixture arises in the secondary winding, at the same time sparks are formed between the spark-plug electrodes of the left- and right-hand cylinders: one spark is formed when the compression stroke comes to an end in one of the cylinders, the other strikes during the exhaust stroke period.

Headlamp, Dashboard, Motorcycle and Sidecar Lamps, Horn and Stop Light Switch

The motorcycle is provided with a headlamp type ΦΓ137-5. Mounted in the headlamp are a high and lower beam bulb and clearance (parking) light bulb. Indicators (pilot) lamps of the generator operation, emergency oil pressure, gearshift mechanism neutral position, switching-on of turn indicators and high beam, as well as the speedometer with a lighting bulb, and the ignition lock are all arranged on the dashboard.

To set the headlamp to the correct position, proceed as follows:

- Install the motorcycle (with a load) on a level ground in front of a white wall or screen at a 10 m distance from the headlamp glass to the wall (Fig. 36);
slacken the bolts securing the headlamp and set the latter to such a position whereby the axis of the light beam from the high beam filament is horizontal, i.e., the centre of a light spot on the screen and the headlamp centre are equidistant from the ground; check the lower beam. The upper boundary of the light spot on the screen, with the lower beam filament switched on, must be not less than 10 cm below the headlamp centre; secure the headlamp fastening bolts. The motorcycle is fitted with horn indicators with orange lenses and bulbs A12-21-3. Red lamp 17.3716 with bulbs A12-21-3 and A12-5 is fitted on the motorcycle rear wheel guard; mounted in the lamp lower portion is a clear lens for license plate illumination. Fitted on the sidemount guard front portion is a two-section lamp ID0225I with both A12-8 in the clear lens section, and bulb A12-21-3 in the orange section. Mounted on the sidemount guard rear portion is a two-section lamp ID1219I with bulb A12-21-3 in the orange lens section, and bulb A12-21-6 in the red lens section. The motorcycle is provided with horn C205I. The latter operates with the ignition switched on, upon depression of the horn button located on the left-hand side of the handlebar. Switches BB54 and 3.3720 are used on the motorcycle as stop light switches.

Wiring

Electric power sources and using equipment as well as auxiliary devices are interconnected by wires. For ease of wiring, the wires (except the high-tension wires) are assembled in bundles. The wires are connected to one another and to using devices through metal connections protected by rubber tubes to prevent a contact-to-frame fault, the wires being protected by rubber caps. Bundled conductors are fastened to the motorcycle and sidemount frame by tapes and tightened together with clips.

All the light signalling devices are protected by fuses. Fuse unit TIP 11M with four 13 A fuses fitted in it is installed on the bracket under the dashboard. Upper fuse No. 1 is intended to protect the "day - night" switch circuit against short circuits. Fuse No. 2 is designed to protect the clearance light circuit against short circuits. Fuse No. 3 ensures short-circuit protection for the horn circuit, hand and foot brake stop switches and neutral position and oil pressure indicator lamp circuit. Fuse No. 4 protects the turn indicator relay circuit against short circuits. A 10 A fuse may be inserted in this circuit instead of a 15 A fuse.

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Troubleshooting the Motorcycle Electric Circuits and Units

Failure of electric power sources and using equipment (generator, voltage regulator, instrumentation, lighting devices, etc.) may be indicative of a faulty electric circuit.

In this case, malfunction may be caused by the following faults:
- broken or disturbed contact in the wires connecting a using device to the power source;
- faulty fuses or switching devices (ignition lock, switches, pickups, etc.);
- a short circuit or overload in a circuit, causing fires to operate.

Before checking the electric circuit, make sure the fuse is in good condition.

The latter can be verified with the aid of a test lamp by connecting end of the wire to the "+" of the storage battery, and other, to one of the ends of the fuse under check. The other (free) end of the fuse should be connected through the test lamp to the "−" of the storage battery or to the motorcycle frame (Earth).

If the fuse is serviceable, the lamp will be bright.

To check the electric circuit, proceed as follows:
- switch on the ignition lock;
- switch on the checked circuit with using devices.

If any of the using devices is inoperative and the fuse is in good condition, then circuit or using device is faulty. Checking for the presence of voltage should be started with the terminals of using devices. In this case the following versions may be possible:

- no voltage at the device terminals (the test lamp will not light up) – check the circuit running from the using devices to the source;
- a wire may be broken or there is no contact in connections. In this case, depending on the nature of fault, tighten up the contacts in connections or replace the wire. The terminals are energized (test lamp comes on) – check the using device for serviceability (replace burnt lamps).

If the fuse blows, there is a short in the circuit. It is necessary to locate and eliminate the fault before switching on the ignition lock or a circuit section under test. The checking is to be done as in previous case.

When checking the voltage in the high-voltage coil primary winding, the breaker points should be closed.

Trouble Shooting in Generator and Voltage Regulator

When the test lamp of operation of the generator and voltage regulator fails to light up upon switching on the ignition, check connection of terminals on the voltage regulator and storage battery as well as connection of the voltage regulator body to the "frame" for reliability, voltage on the positive "+" terminal of the voltage regulator for presence.

If this test was incorrect and check the serviceability of the test lamp circuit from the dashboard to the terminal "Bk" of the voltage regulator. For this
purpose disconnect the wire from the terminal "J"K" on the voltage regulator, switch on the ignition and touch the positive terminal of the voltage regulator with the disconnected wire. If in this case the lamp fails to light up, with the voltage available at positive terminal, check the wires, the reliability of contacts and the test lamp. If upon closing the circuit the lamp lights up, the cause of a trouble is in the voltage regulator which must be replaced.

When the test lamp of operation of the generator and voltage regulator fails to go out after starting the engine, with the operating engine, you are to switch on the distance light, then switch off the storage battery with battery switch.

When the generator and its exciting circuit are sound, the engine continues to operate and the lighting of the lamp in the headlight varies negligibly. In this case the lighting of the test lamp is indicative of a loose contact on the storage battery terminals or malfunction of the voltage regulator which must be replaced. Never attempt to check the serviceability of the generator by closing to the frame the terminal designated with the positive sign since in this case the rectifier unit in the generator can fail.

The erroneous connection of the positive terminal of the storage battery to the motorcycle "frame" can result in the same consequences.

When at a medium speed of crankshaft rotation the engine stalls upon disconnecting the positive terminal of the storage battery, first of all you are to make sure that the generator exciting circuit is energized. For this purpose, when the engine is not operating and the ignition is switched off, you are to disconnect the wire from the "III" terminal of the voltage regulator and contact it for a short time to the positive terminal of the voltage regulator. When in this case a small spark appears, the generator excitation circuit is serviceable.

The absence of sparking on the positive terminal is indicative of (if the wire from the "III" terminal of the generator to the voltage regulator is not damaged) a trouble in the generator. After checking the intact condition of wires and the reliability of connections (on the storage battery, generator and voltage regulator) you are to check the generator for serviceability.

The generator and its semiconductor rectifier can be also checked with the aid of a test lamp with the engine inoperative.

To check the semiconductor rectifier, disconnect the generator from the circuit and then perform the following operations:

1. Connect the storage battery positive terminal to generator terminal "I" and the storage battery negative terminal through the test lamp to the generator body. The test lamp must not light up in this case. Then connect the storage battery positive terminal to the generator body, and the negative terminal to generator terminal "III" through the test lamp. The latter must come on. If in the first case the lamp has lighted up, this means that the semiconductor rectifier (the lower semiconductor element) is faulty. If the lamp is not alight in the second case, this indicates that the "II" — generator frame circuit is broken.

2. Connect the storage battery positive terminal to the generator positive terminal, and the negative terminal through the test lamp to generator terminal
The test lamp must not light up. Next, connect the storage battery positive terminal to generator terminal "+", and the negative terminal to the generator positive terminal through the test lamp, the latter must light up. If the lamp comes on in the first case, the semiconductor rectifier (upper semiconductor element) is faulty. If the lamp is not alight in the second case, this means that the "−" generator circuit is broken.

In addition, check the generator excitation circuit for serviceability, which can also be done with the aid of a test lamp. For this purpose, the storage battery positive terminal should be connected through the test lamp to terminal "III" (generator armature first exciting terminal "IV" from the current-and-voltage regulator, and the storage battery negative terminal, to the generator body.

Turning over the generator also with thread of a ranging lever, watch the glow of the test lamp. If the latter glows without flickering, this indicates that the excitation circuit contains no in good condition. Insufficient light of the lamp points to poor contact between the brush and ring, or between the ring and generator excitation winding leads.

Care of Electrical Equipment

During daily maintenance, check the headlights, horn, lamps, storage batteries, generator and ignition for proper operation. In case of failure of headlamp electric bulbs, replace them.

To replace the clearance (parking) light bulbs, remove the holder with the bulb and separate the bulb from the holder.

To replace a burnt out indicator (signal) bulb in the lamps, remove the lamp from the case and separate the bulb from the holder.

If horn sounding deteriorates, adjust the horn by turning the adjusting screw in one direction or the other.

After every 2000 km run, check the following:

- The gap between the sparking plug electrodes; if necessary, clean the spark plugs of carbon deposit;
- The wires for reliable connection;
- Fastening and serviceability of bulbs in the headlamps and lamps, if required, remove dust from the reflectors, wipe the lens glass,
- Before replacing a blown fuse, locate and eliminate a fault in the electric circuit.

During operation of the motorcycle it is necessary to periodically check the reliability of the speedometer fastening on the dashboard panel and its connection with a flexible shaft.

When a spark appears, it is necessary to add lubricant to the union end or to the instrument lubricator.

For this purpose, remove the speedometer and clear a hole in the plug. Then, arrange the speedometer so that the lubricating hole and union end (for the hole in agent) were from above and turning the axle manually, pour some five-six drops of iso-paraffinic H10M-1 of other equivalent instrument oil.
<table>
<thead>
<tr>
<th>Trouble</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine fails to start</td>
<td>No spark at spark plug electrodes; spark plug(s) improper; incorrect gap or breaker points burned; battery-cold ignition coil; point(s) and cap corroded; no contact in wire connection or in ignition switch; no clearance in valves; No petrol fed to carburettor; clogged bowl-injected pump; clogged choke in meter; clogged carburettor (fuel, air); fuel filter; carburettor adjustment went loose; low-quality petrol</td>
<td>Clean spark plugs, set the gap, replace, if necessary, set at gap, dress contact points; replace coil; replace capacitor; remove carbon; adjust clearance; clean out hole; clean and wash choke or meter; clean and wash carburettor; draw in gas; change petrol</td>
</tr>
<tr>
<td>Engine overheats</td>
<td>Ignition timing misaligned, air synchronization in operation of carburettor; rich or poor mixture; dirty air cleaner; no mixing in connections; poor cooling because of dirt restrictions between head and cylinder fins</td>
<td>Adjust timing according to instructions; adjust carburettor; wash air cleaner; clean engine of dirt</td>
</tr>
<tr>
<td>Engine misfires, with one cylinder functioning</td>
<td>Breaker point gap misadjusted; mixture gap in ignition coil disconnected; high-tension wire insulation broken (cool to contact in wire connections); valve clearances out of adjustment; carburettor(s) misadjusted</td>
<td>Set the gap; replace spark plug with a new one; check wires and their connections for good condition; replace, if necessary; adjust clearances; adjust carburettor</td>
</tr>
</tbody>
</table>
| Engine plugs | Misfired ignition timing (tchey ignition); valve clearances out of adjustment | Adjust timing according to instructions; adjust clearances;
<table>
<thead>
<tr>
<th>Trouble</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine fails to develop full power</td>
<td>Valves loosely seated; intake air cleaner dirty; engine overloaded</td>
<td>Adjust ignition timing according to instructions; replace worn parts</td>
</tr>
<tr>
<td>Engine consumes too much petrol</td>
<td>Intake manifold gaskets worn or out of adjustment; air cleaner dirty; engine overloaded</td>
<td>Replace intake manifold gaskets; replace worn parts</td>
</tr>
<tr>
<td>Clutch slipping</td>
<td>Clutch release mechanism not adjusted; gear shifting; clutch release mechanism not adjusted</td>
<td>Adjust clutch release linkage; replace worn parts</td>
</tr>
<tr>
<td>Clutch fails to be fully disengaged</td>
<td>Primary shaft/gear coupling has come off bearing; excess amount of oil in case</td>
<td>Replace primary shaft/gear coupling; replace oil</td>
</tr>
<tr>
<td>Oil leakage along primary shaft splines</td>
<td>Oil leakage from gas/air breather</td>
<td>Drain engine oil and replace breather</td>
</tr>
<tr>
<td>Noise and jerks during gear shifting</td>
<td>Primary shaft/gear coupling has come off bearing; excess amount of oil in case</td>
<td>Replace primary shaft/gear coupling; replace oil</td>
</tr>
</tbody>
</table>

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Adjust carburetors for synchronous operation of cylinders; change plugs; clean parts to remove carbon deposit; replace worn parts.

Adjust ignition timing according to instructions; adjust carburetors for synchronous operation and proper air-fuel ratio; clean and wash them; clean valves to remove carbon deposit and grind them; wash filter element of air cleaner; allow engine to cool.

Adjust ignition timing according to instructions; adjust carburetors; make sure tires are not required; adjust brakes according to instructions; replace worn parts.
<table>
<thead>
<tr>
<th>Troubleshooting</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise in general during motorcycle movement</td>
<td>Worn gears; insufficient oil level in sump; gearwheel bush worn; gearwheel loosely held in position; clutch release mechanism not adjusted</td>
<td>Replace gears; top up; Replace worn clutch; replace catch spring; adjust mechanism</td>
</tr>
<tr>
<td>Disengagement of gears</td>
<td>Main Drive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oil leakage from casing drain hole or from labyrinth packing between wheel and main drive</td>
<td>Drain oil to required level; replace gland; tighten up nut</td>
</tr>
<tr>
<td></td>
<td>Main drive casing overheated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oil leakage from wheel side</td>
<td>Drain oil and pour 200 cm³ of fresh oil; replace seal</td>
</tr>
<tr>
<td></td>
<td>Great cardan shaft play as viewed from differential end</td>
<td>Tighten wedge</td>
</tr>
<tr>
<td></td>
<td>Front Fork</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clearance in steering column bearings; clearance if fork blade tube worn in traverse due to screwing off of casing nut; no oil or insufficient amount of it in fork shock absorber; two great clearances between lock nut and spring upper end piece; fork brake tube bearing much worn</td>
<td>Eliminate clearance by tightening bearings; eliminate clearance by tightening mast; investigate cause of oil leakage; Eliminate leaks. Front shock absorbers with oil; on clearance according to instructions; replace bearings</td>
</tr>
<tr>
<td></td>
<td>Shock Absorbers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rod gland worn out; washing ring damaged; worn rod</td>
<td>Replace gland; replace ring; replace rod</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Trouble</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear suspension badly worn</td>
<td>Insufficient amount of oil in shock absorbers.</td>
<td>Overheat, wash suspension shock absorbers with required amount of oil; overheat and wash shock absorbers if necessary, clean valve and piston end face, replace worn parts.</td>
</tr>
<tr>
<td>Hard operation of rear suspension</td>
<td>Valve seat valve heavily worn or shock absorber lower valve does not sit properly in its seat when piston inside</td>
<td>Drain dust of piston w on shock absorber lower valve and oil (checked)</td>
</tr>
</tbody>
</table>

**Electrical Equipment**

- Ignition key inserted up to stop and turned as position 1 (Fig. 31). Ignition operation knob, lamp, generator warning lamp, pointer indicator lamp and emergency oil pressure lamp will work but engine operation is not smooth, repair is imperative.
- When engine revn. speed is changed from low to high, and voltage regulator and generating operation indicator lamp will not go out (glows steadily).
- With headlamp bulb switched on the operating light switches, only high of lower beams on.
- Stop lamp a continually bright.
- On closing turn indicator switch, turn indicator bulb will not light up.

- Fuse blown; no connection in the circuit of listed devices.
- Generator fails to provide required voltage, voltage regulator is defective, some contact of storage battery terminals.
- One of bulb filaments burns out; broken contact in light switch.
- Stop light switch spring overloaded.
- Rod dust and dirty
- Burn-out bulbs or broken contact connections.
- Factory intermittent relay of turn indicator, fuse is burnt.

- Replace fuse; restore contact; connect plug.
- Check generator and voltage regulator wires for reliable connections; make sure generator and voltmeter regulators are in good condition, and voltage terminals.
- Replace bulb; restore contact.
- Adjust spring for proper operation by adjusting length; close cutout.
- Replace bulb, restore contact; replace relay.
- Replace fuse.
RUNNING-IN A NEW MOTORCYCLE

Correct running-in of a new motorcycle will increase its service life. Running-in of the motorcycle is subdivided into two stages: up to 1000 km run and from 1000 to 2500 km run (see Table 1).

Fitting on the motorcycle carburettors are throttle lift limiters. After 2500 km run they should be removed.

Running-in should be carried out on hard-surface roads or on improved cart roads with a load on the motorcycle not exceeding 50 per cent of the maximum value.

To avoid engine overheating, it is not advisable to move at speeds higher than permissible.

For a run-in motorcycle, it is not allowable to exceed the following maximum permissible speeds in the 1st gear - 20 km/h, in the 2nd gear - 40 km/h, in the 3rd gear - 70 km/h, in the 4th gear - 95 km/h. Riding at these speeds must be short-time (not longer than 2-3 min).

The recommended speed for a run-in motorcycle should be 50-70 km/h when moving on an improved-surface highway.

Table 1

<table>
<thead>
<tr>
<th>Gear</th>
<th>Run, km up to 1000</th>
<th>Run, km from 1000 to 2500</th>
<th>Run, km up to 1000</th>
<th>Run, km from 1000 to 2500</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>20</td>
<td>30</td>
<td>45</td>
<td>55</td>
</tr>
<tr>
<td>II</td>
<td>35</td>
<td>40</td>
<td>60</td>
<td>70</td>
</tr>
</tbody>
</table>

OPERATION PECULIARITIES

GENERAL

Before operating a new motorcycle, carefully read these instructions and carry out the following operations:

- remove the protective (antirust) coating from chromized parts using a soft cleaning cloth moistened with white spirit or clear petrol, and then wipe the surface with a dry clean cloth.

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check the level of oil in the engine crankcases, gearcase, main drive casing, and differential gear and reduction gear; add oil, if necessary; check and, if required, regulate the tire pressure; make sure the wheel spokes are uniformly tightened; pour petrol into the fuel tank; render the storage batteries serviceable as directed in the relevant instructions and install them in their intended places; fit the following: spark plug tips on the high-tension wires; orange cat's eyes at the side of the sidecar body, and on the front fork, a red cat's eye on the sidecar's rear guard; rear-view mirror; license plate bracket and mudguards; linkings of brake pedal and shift pedal; mount an anti-theft device on the frame; check the controls, clutches and brakes for proper operation; check the fastenings, especially of the wheel axles, the sidecar, handlebar, front fork and tighten up, if necessary; check the motorcycle lighting equipment for proper operation; after starting the engine, check and, if necessary, adjust the carburetors for minimum steady-rotational speed and synchronous operation of the cylinders. When servicing the motorcycle, use oils and lubricants recommended by the Manufacturer. The use of oils and lubricants other than specified may cause damage to the motorcycle's parts and assemblies.

PREPARING FOR DEPARTURE

Thorough checking of the motorcycle before departure is a guarantee of trouble-free operation. Prior to departure, pay attention to the fastening of the wheel axles and handlebars; check the brakes, turn indicators and stop-light switches for good condition; make sure the headlamp and lamps give light.

It is necessary to check the level of oil in the cases with a dipstick mounted into the plug of the filler of each unit and having two check marks: the upper mark to indicate full priming, and the lower one showing the lowest permissible level. The dipsticks of the gearbox and main drive are identical in design, differing only by the length and arrangement of marks. The shorter dipstick is screwed into the gearcase. When checking the oil level, the plug with a dipstick should not be screwed in, but rather inserted into the hole until it is pressed against the thread.
Check the tire pressure with the aid of a pressure gauge and, if necessary, inflate the tire to the required pressure.

On completing the examination and priming of the motorcycle, proceed to starting the engine.

**ENGINE STARTING**

To start the engine, do the following:

1. Close the battery switch by setting it to the BK2 (ON) position. Check the emergency ignition switch for proper position. The key must be set to the lowermost position.
2. Check and, if required, set the reverse-shift handle to the rear position.
3. Set the main neutral position (between the 1st and 2nd gears) of the gearshift mechanism.
4. After this is done, the neutral position indicator lamp located on the dashboard must light up, with the ignition switched on.
5. Open the fuel cock (refer to Fig. 14) by setting its handle to the O (OPEN) position.

When starting the cold engine (at ambient temperature up to −15 °C) it is necessary to use the carburetors starting device. For this purpose turn up starting device lever 23 (Fig. 15) and then the throttle control handle turn a little back.

After the engine is warmed up, return the starting device lever to the initial position (down).

At an ambient temperature from −15 °C and below it is recommended to depress additionally on the float depressor. Then depress the starting mechanism lever several times;

- Insert the ignition key up to the stop and turn it clockwise to the first fixed position.
- After this is done, the battery charge and generator operation indicator lamp, emergency oil pressure transmitter indicator lamp and neutral position indicator lamp will light up.

By gradually depressing the starting mechanism lever with your foot, bring the toothed quadrant of the starting mechanism shaft into mesh with intermediate shaft small gear, following which start the engine with a sharp jerk of your foot. If the quadrant fails to come into mesh still resistance is left, move the motorcycle forward or backward. If, during starting, an excessive force is applied to overcome the resistance, this may cause breakdowns. Do not remove your foot from the lever during repeated jerks.

After starting, warm up the engine. Warming up a cold engine in a must since in this case the friction surfaces will operate with insufficient lubrication due to thick oil and this will lead to their increased wear.

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It should be borne in mind that after starting a cold engine at ambient temperatures below 0 °C the latter must not be allowed to develop a high rotational speed. Otherwise the centrifugal gasket may be pressed out and no oil will be fed to the connecting-rod bearings, as a result, the latter will be damaged.

After starting the engine, the generator operation indicator lamp and emergency oil pressure lamps will go out. Engaging any of the forward gears will cause the neutral position indicator lamp to go out. The lamp is on when the reverse gear is engaged.

A properly adjusted engine must run steadily at a low rotational speed with the throttle control handle fully turned forward.

Start riding only after the engine is warmed up and operates steadily at a low rotational speed. At subfreezing ambient temperatures and after the motorcycle has been standing idle for a long time, it is advisable not to operate the engine, after first 3 to 5 km of travel, at a high rotational speed and move at 30 to 40 km/h speed so that the oil in the gearbox and main drive becomes heated and acquires the viscosity necessary for normal lubrication of the gears and bearings.

**MOTORCYCLE DRIVING**

Start riding only in the first gear. When taking off, be careful not to release sharply the clutch operating lever as this may lead to a jerk or motorcycle breakdown. The engine rotational speed must be such that the engine will not stall when the clutch is smoothly engaged.

After bringing the motorcycle up to 15-20 km/h speed, put in the second gear. When the speed reaches 25-35 km/h, put in the third gear, and at 45-50 km/h speed, the fourth gear. After that, the speed should be governed with the throttle control handle.

After starting out, be sure to check the brakes for good condition by applying them several times to the motorcycle wheels.

Avoid moving for a long time in the first and second gears unless this is necessitated by road conditions since in this case the engine will develop a high rotational speed and, being poorly cooled, will wear rapidly. Besides, movement in the lower gears will lead to excessive consumption of fuel. To quickly reduce the travelling speed, apply the brakes to the motorcycle wheels.

There are three methods of braking with the aid of brakes, by means of the engine, using the engine and brakes simultaneously.

The first braking method can be resorted to whenever it is necessary to quickly stop the motorcycle provided the road grip of tyres is good. For this purpose, throw out the clutch and at the same time decrease the engine speed
(throttle down) and gradually depress the pedal of the rear-wheel and sidecar wheel brake and the front-wheel brake lever. With the brakes applied to all the wheels simultaneously, the motorcycle riding stability is higher than with only one brake applied.

To brake the motorcycle with the aid of the engine, decrease the engine speed without disengaging the clutch. When the engine speed is considerably reduced in the process of braking, throw out the clutch to prevent engine stalling and, if necessary, stop the motorcycle by applying the brakes to its wheels. Engine braking may be resorted to on long downgrades or on road straightens, and also whenever it is necessary to reduce the travelling speed on a slippery road.

Slowing down the motorcycle simultaneously with the engine and brakes should be effected on steep descents and when riding on a slippery road in order to avoid skidding. Apply the brakes gradually. Hard braking may cause skidding and overturn of the motorcycle. Especially dangerous is hard braking in winter time and on a wet road. During emergency braking the motorcycle may turn somewhat aside, especially when braking is effected without applying the brake to the front wheel.

For this reason, before operating the motorcycle, test it for proper handling at a low speed under the following braking conditions: separately with the front-wheel brake, the rear-wheel and sidecar wheel brakes and using all the brakes simultaneously at different loads.

A friction-type handlebar shock absorber is provided to absorb lateral jolts acting on the front wheel during movement on a rough road.

The degree of shock absorber tightening should depend on road conditions and travelling speed. In case of riding at a high speed, especially on a rough road (on cobbles), the handlebar shock absorber wing nut must be tightened to a greater extent; when moving slowly, with frequent turns, the handlebar shock absorber wing nut should be slackened so as not to impede the turning of the motorcycle.

Motorcycle stability at right- and left-hand turns is not the same. When turning to the right, i.e., towards the sidecar, the motorcycle is less stable and more liable to overturn than when turning to the left.

It should be remembered that a certain minimum permissible radius of turn must correspond to a definite travelling speed of the motorcycle. The permissible radius of turn must be increased as the travelling speed rises. The motorcycle handlebar should be turned smoothly, without jerks, especially when turning to the right.

In operating the motorcycle, keep a close watch on the thermal conditions of operation of the engine, power transmission units and running gear mechanisms.
Normal operation of the engine is indicated by good acceleration characteristics of the motorcycle, absence of knocks in the crank gear. Signs of engine overheating are as follows: engine operation at hot-spot ignition, loss of power as a result of which the motorcycle is slow to gather speed and harsh metallic knocks in the crank gear.

It must be remembered that a long-time riding with an overheated engine may lead to a breakdown and accident. To avoid overheating, try to use the most appropriate gears and choose such sections of a road where engine overload can be excluded.

To cool an overheated engine, stop the movement and shut down the engine.

In case of engine stoppage turn off the fuel cock.

It is forbidden to cool the engine with water since this may cause damage to cylinders and their heads.

To stop an overheated engine, reduce the engine rotational speed to a minimum, switch off the ignition and sharply open carburettor throttles to the stop with a throttle control handle.

MAINTENANCE

The motorcycle service life is to a great extent depends on the quality of maintenance and service materials used. Servicing the motorcycle consists in regular cleaning and washing, checking its assemblies and units for technical condition, adjustment and lubrication.

Motorcycle maintenance includes the following:
- check inspection and daily maintenance; maintenance after 500 km run (running-in);
- maintenance after 2500 km run (running-in);
- maintenance No. 1 (M-1) after 500 km run;
- maintenance No. 2 (M-2) after 10,000 km run;
- seasonal maintenance (in autumn and spring time);
- maintenance during the prolonged storage.

The above-menioned maintenance intervals are recommended for motorcycle operation on roads with low dust content. When riding over dusty or dirty roads, maintenance intervals must be reduced. During each maintenance procedure, all detected faults must be eliminated in addition to the obligatory list of maintenance operations.

The list of motorcycle maintenance operations depending on a travelled distance and lubrication intervals of lubricating operations are presented in Table 2, and oils and lubricants to be used are listed in Table 3.
| Operations | Refer- ence
in
manual
diagram
(Fig.
379) | Num- ber of
lubricat-
on points | Kind of maintenance | Tools, instrument used for performing operations |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tighten nuts of cylinder head securing studs</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Head 12, wrench with squares</td>
</tr>
<tr>
<td>Check and, if necessary, adjust valve seat-to-rockers and expansion clearance</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Head 12, wrench with squares, carborator gauge</td>
</tr>
<tr>
<td>Wash under and fuel filter of fuel tank, remove and wash carburetors, blow compressed air through jets and ducts</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Wrench 12x13</td>
</tr>
<tr>
<td>Check and, if required, adjust carburetors for minimum steady idling speed of crankshaft and for synchronous operation of cylinders</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Wrench 8x10, screwdriver</td>
</tr>
<tr>
<td>Remove carbon deposit from the surfaces of cylinder head combustion chambers, piston, piston rings and valves</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Wrenches 12x13, 14x17, heads 12, 13, wrench with squares</td>
</tr>
<tr>
<td>Check valves for air-tightness and, if required, gasket then</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Wrenches 8x10, 14x17, head 12, wrench with squares</td>
</tr>
<tr>
<td>Remove cements, dismantle and clean loft dirt</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Check oil level in engine crankcase and top up, if necessary.</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>During daily maintenance</td>
</tr>
<tr>
<td>Change oil in engine case and top up, if necessary.</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

www.ClassicCycles.org
<table>
<thead>
<tr>
<th>Task</th>
<th>Frequency</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tighten carburetor fastening nuts and screws</td>
<td>x</td>
<td>Wrench 12x13, screwdriver</td>
</tr>
<tr>
<td>Blow through air filter elements with dry compressed air</td>
<td>x</td>
<td>Wrench 12x13</td>
</tr>
<tr>
<td>Replace air filter element</td>
<td>x</td>
<td>Wrench 12x13</td>
</tr>
</tbody>
</table>

**Power Transmission and Running Gear**

<table>
<thead>
<tr>
<th>Task</th>
<th>Frequency</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check engine, gearbox, main drive, differential gear, reduction gear, front fork, handbrake, shock absorbers, pivot pins, silencers, generator, etc. for reliable fastening; also make sure sidestand is properly attached to motorcycle and sidestand body to frame. Tighten up fastenings. If necessary</td>
<td>x</td>
<td>Wrenches 12x13, 14x17, 19x22, 16x41, box spanner 19x21 and round wrench</td>
</tr>
<tr>
<td>Check oil level in gear box crankcase, if necessary</td>
<td>x</td>
<td>Grease gun</td>
</tr>
<tr>
<td>Change oil</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Lubricate bearings of cardan shaft joints</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Lubricate splines of reduction gear cardan shaft</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Check oil level in reduction gear case and pour fresh oil, if necessary</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Change oil</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Check oil level in main drive casing, top-up, if required</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Change oil</td>
<td>x</td>
<td>Wrench 14x17</td>
</tr>
<tr>
<td>Check and, if necessary, adjust clutch release mechanism and brake linkages</td>
<td>x</td>
<td>Pliers, wrenches 8x10, 12x13, 14x17</td>
</tr>
<tr>
<td>Remove wheel, disassemble brake, wash command hole, apply fresh lubricant to:</td>
<td>x</td>
<td>Wrenches 8x10, 14x17, 19x22, cone bar, hammer</td>
</tr>
<tr>
<td>arbor of cam</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>cost thread</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>bearing surfaces of wheels and fitted to them</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>cam and appena</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Remove oil from clutch and apply lubricant</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Operations</td>
<td>Reference</td>
<td>Number of label points</td>
</tr>
<tr>
<td>------------</td>
<td>-----------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Lubricate rear wheel brake linkage hinge</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Lubricate the thread of exhaust pipes/braking rods</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>Apply two-three drops of oil into the front wheel to silence and clutch operating lever pins and control cables</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Pour 2–3 cm³ of oil into sheaths of clutch and brake control cables</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Lubricate slide block and cable, throttle control handle and links</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Check if wheel spokes tensioning and tightening, if required</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check and if required, adjust the wheel bearings tightening</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remove wheel, take out bearings of wheel hub, clean and used grease from hub, wash bearings in solvent and lubricate</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Disassemble the steering column, wish radial bearings, fill with fresh lubricant, assemble</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Check and, if necessary, adjust the tensioning of the steering column bearings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change oil in the front fork shock absorbers</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
<td>Check</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>-------</td>
</tr>
</tbody>
</table>
| 1    | Change oil in the shock absorbers of the rear wheel and
      |              |       |        | Free Download |
| 2    | Linear wheel suspension* |       | 1      |        |
| 3    | Lubricate the threads of the slider-to-axle holes
      |              |       |        | Wrench 14x17 |
| 4    | Replace the clutch cable
      |              |       |        | Wrench 14x17 |
| 5    | Check and, if necessary, tighten body water fl ow
      |              |       |        | Wrenches 14x17, 19x23 |
| 6    | bar and hammering of slider rubber
      |              |       |        | Wrenches 12x13, 19x22, 27 |
| 7    | Check and adjust tire balance and rubber angle
      |              |       |        |          |
| 8    | of motorcycle
      |              |       |        |          |
| 9    | and linear wheels* |       |        | Free Download |
| 10   | Interchange wheels |

**Electrical Equipment**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Check</th>
<th>Action</th>
<th>Notes</th>
</tr>
</thead>
</table>
| 11   | Check all electric devices for proper operation and
      |        |        | Free Download |
| 12   | Installation in electric circuits for proper condition. |
| 13   | Eliminate detected faults |
| 14   | Check the ignition advance angle and adjust, if necessary, |
| 15   | |
| 16   | |
| 17   | Remove breaker from the camshaft and front ring of
      |        |        | Free Download |
| 18   | camshaft, check all dwell parts, lubricate internal
      |        |        |          |
| 19   | surfaces and apply new two drops of oil at
      |        |        |          |
| 20   | lower point |
| 21   | weight pole |
| 22   | felt wick |
| 23   | case bush |

*When difficulties appear in performing the operation, address to the service section or to a specialized shop.
<table>
<thead>
<tr>
<th>Operations</th>
<th>Reference or location diagram (Fig. 317)</th>
<th>Number of hours</th>
<th>Kind of maintenance</th>
<th>Tools, instrument used for performing operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check contacts for good condition, dress them, if necessary, adjust gap and ignition advance angle</td>
<td>x</td>
<td>200 running-in period</td>
<td>x</td>
<td>Screwdriver, feeler gauge</td>
</tr>
<tr>
<td>Clear spark plugs to remove carbon deposits, check and, if necessary, adjust electrode gap</td>
<td>x</td>
<td>2500 running-in period</td>
<td>x</td>
<td>Wrench, feeler gauge</td>
</tr>
<tr>
<td>Remove generator, disassemble it partially, clean off brush and copper dust from generator inner space</td>
<td>x</td>
<td>M-1</td>
<td>x</td>
<td>Wrench 8 x 10, wrench with square, heads 12 and 13</td>
</tr>
</tbody>
</table>

**Notes:** 1. The sign "x" indicates that required maintenance operations have to be carried out after the specified distance run by the motorcycle. A deviation of not more than 300 km is allowable. 2. In the process of usage, for various reasons, the need may arise to perform any of the operations specified in Table 2 irrespective of the distance run by the motorcycle. Carrying out such operation should not be postponed until the next maintenance procedure. 3. The storage batteries should be serviced according to the relevant operating instructions. 4. When using all TAP-3B or TCS-138, the periodicity of oil change intervals makes 10,000 km.
<table>
<thead>
<tr>
<th>Ref. No. in Fig. 27</th>
<th>Unit or mechanism</th>
<th>Oils and lubricants</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Crankcase</td>
<td>Oil M-BB for compression ratio 7-0; M-65/100° for compression ratio 8.5</td>
</tr>
<tr>
<td>6</td>
<td>Gearcase</td>
<td>Oil M-BB, YAIL-15H or YC=15K</td>
</tr>
<tr>
<td>12</td>
<td>Main drive casing with differential gear</td>
<td>Oil YAIL-12H or YC=15K</td>
</tr>
<tr>
<td>15</td>
<td>Reduction gear sheave</td>
<td>Oil YAIL-12H or YC=15K</td>
</tr>
<tr>
<td>1</td>
<td>Sealing groove bearings</td>
<td>Lithol 23 lubricant</td>
</tr>
<tr>
<td>4</td>
<td>Wheel hub bearings</td>
<td>Same</td>
</tr>
<tr>
<td>17</td>
<td>Cardan shaft joint bearing</td>
<td>Same</td>
</tr>
<tr>
<td>18, 19</td>
<td>Joint, brake shoes, adjusting cone, stopper and shoes (bearing surface)</td>
<td>Same</td>
</tr>
<tr>
<td>10</td>
<td>Rear wheel brake linkage hinge</td>
<td>Same</td>
</tr>
<tr>
<td>11</td>
<td>Sidecar-bracketing collet hinge</td>
<td>Same</td>
</tr>
<tr>
<td>7</td>
<td>Throttle-cable handle and cables</td>
<td>Oil T 2</td>
</tr>
<tr>
<td>3</td>
<td>Breaker: lever pin, weight pin, bushing, felt wick</td>
<td>Oil T 2</td>
</tr>
<tr>
<td>9</td>
<td>Brake and clutch operating lever pins, brake and clutch control cables</td>
<td>Oil M-BB or M-65/100°</td>
</tr>
<tr>
<td>8</td>
<td>Front fork shock absorbers</td>
<td>Same</td>
</tr>
<tr>
<td>2</td>
<td>Shock absorbers of sidecar wheel and rear wheel suspension</td>
<td>Oil MITI-10 or AK-17T or AVY</td>
</tr>
<tr>
<td>13, 16</td>
<td>Cardan shaft hanger bearings</td>
<td>Grease Lithol-154</td>
</tr>
<tr>
<td>14</td>
<td>Sphere of reduction gear cardan shaft</td>
<td>Same</td>
</tr>
<tr>
<td>20</td>
<td>Plenum pipe fastening nut</td>
<td>Graphite lubricant BRIH-1</td>
</tr>
</tbody>
</table>

**Check Inspection**

Check inspection should be carried out before departure in order to check the motorcycle whose technical condition must comply with the rules of road and the requirements of this Manual. During check inspection, verify the following: presence of petrol in the tank and the level of oil in the units; proper operation of the brakes and control mechanisms; absence of oil in the crankpin; operation of the headlight, stop light, horn, turn indicator of the motorcycle. Eliminate all detected faults.

**DAILY MAINTENANCE**

Daily maintenance includes the following: cleaning the motorcycle of dust and dirt and, if necessary, washing it; checking the fastenings for good condition. In the latter case particular care must be taken to check the fastenings.
of the handlebar, front fork to the steering column, sidewalk to the motorcycle; tightening of the wheel axles; inspection of the wheels and tires for good condition; checking the brakes, light and audible signalling devices, headlamp, instrumentation and motorcycle controls for serviceability; priming the motorcycle with petrol and oil.

Brake operation is to be checked on the move. Detected faults must be eliminated. The engine, gearbox and main drive are best cleaned with a kerosene-moistened hair brush. Synthetic detergents may be used.

An engine that has just cooled off may be washed with the aid of a hose. When washing the motorcycle, avoid using water under high pressure, do not aim a jet of water directly at the generator, voltage regulator, storage batteries, breather plugs of the gearbox, main drive and reduction gear. Moisture that has penetrated inside some of the units may cause corrosion and give rise to defects that will be hard to eliminate.

SEASONAL MAINTENANCE

In autumn, wash the tank with clean petrol after first removing any sediment and thoroughly check the ignition system in order to avoid difficulties when starting a cold engine in winter.

In autumn and spring, change the density of electrolyte in the storage batteries if this is required by climatic conditions under which the motorcycle is to be operated.

MAINTENANCE DURING PROLONGED STORAGE

When preparing the motorcycle for prolonged storage, do the following:

- thoroughly clean the motorcycle of dust and dirt and wash it;
- after washing, wipe it dry, remove traces of corrosion and paint up places where the paint coating is damaged;
- fully prime with petrol and turn off the cock;
- start the engine and allow the petrol in the carburettor float chambers to be fully burned out;
- screw out the spark plugs and pour 25...30 cm³ of motor oil heated to 70...80 °C, into the cylinders;
- on depressing the starting mechanism lever pedal, turn over the crankshaft by 10...15 revolutions and screw the spark plugs back into the cylinders;
- coat all the chromed surfaces with corrosion-preventive compound;
- remove the silencers, close the inlet and outlet holes with rags or a plug;
- pour 1.5...2.0 l of motor oil (use may be made of waste oil) through the adapter branch pipe;
- close the hole in the branch pipe and turn over the silencer several times about its axis. Following that, discharge oil from the silencer, re-install the latter and close the outlet holes tightly with oiled rags or a plug.
Coat the chromized parts with warmed up petrolatum or microwax ЗВБД or ГИБ-74 or preservative compound: resin – 20 %, lacquer No. 19-30 %, white spirit – 50 %.

Install the motorcycle on supports (blocks) and reduce the tyre pressure down to 0.05...0.1 MPa (0.5...1.0 kgf/cm²).

Lubricate the set of tools with corrosion-preventive compound and wrap them in oiled paper.

Servicing the motorcycle during storage consists in the following:

- once every two months inspect the motorcycle, if any traces of corrosion are detected, scrape bright corrosion-affected places and paint them;
- screw out the spark plugs, put in the first gear, turn over the crankshaft by 10...15 revolutions with the aid of a cranking gear and screw in the spark plugs again;
- depress the pedal and levers of the brake and clutch three to five times, turn over the throttle control handle.

STORAGE RULES

The motorcycle can be best stored in dry, well ventilated room with relative humidity of 50...70 %.

The motorcycle can be stored in unheated room or under a shed that decreases the intensity of solar radiation and excludes the effect of atmospheric precipitation.

Never store the motorcycle in the room with acids, alkalis, fertilizers and other aggressive substances.

The storage battery should be stored separately as recommended by the Operating Instructions for the storage battery.

When preparing the motorcycle for long-term storage it is necessary to thoroughly clean it of dust and dirt, wash it, wipe dry, remove the traces of corrosion, to paint damaged places, if necessary, to prime with petrol, to close the cock and install the motorcycle in the place of storage.

After storage it is necessary to move the motorcycle from supports (blocks) and preserve it, for this purpose remove preservative compound from the chromized surfaces using soft waste moistened with white spirit or clear petrol, with subsequent wiping the surfaces with dry clean waste.

87
<table>
<thead>
<tr>
<th>Sketch</th>
<th>Bearing no. and type</th>
<th>Place of installation</th>
<th>Q'ty per motorcycle, pc</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.jpg" alt="Sketch 1" /></td>
<td>110</td>
<td>Differential cup</td>
<td>1</td>
</tr>
<tr>
<td><img src="image2.jpg" alt="Sketch 2" /></td>
<td>204</td>
<td>Camshaft rear bearing</td>
<td>1</td>
</tr>
<tr>
<td><img src="image3.jpg" alt="Sketch 3" /></td>
<td>20C</td>
<td>Camshaft front bearing</td>
<td>1</td>
</tr>
<tr>
<td><img src="image4.jpg" alt="Sketch 4" /></td>
<td>206</td>
<td>Left-hand cover of reduction gear</td>
<td>1</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Sketch</th>
<th>Bearing No. and type</th>
<th>Piece of installation</th>
<th>$/yr per motorcycle</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image.png" alt="Sketch" /></td>
<td>209 Single-row radial ball bearing</td>
<td>Crankshaft front bearing</td>
<td>1</td>
</tr>
<tr>
<td><img src="image.png" alt="Sketch" /></td>
<td>42209 Radial roller bearing with short cylindrical rollers</td>
<td>Crankshaft rear bearing</td>
<td>1</td>
</tr>
<tr>
<td><img src="image.png" alt="Sketch" /></td>
<td>303 Single-row radial ball bearing</td>
<td>Gearbox primary shaft</td>
<td>1</td>
</tr>
<tr>
<td><img src="image.png" alt="Sketch" /></td>
<td>304 Single-row radial ball bearing</td>
<td>Gearbox secondary shaft</td>
<td>2</td>
</tr>
<tr>
<td><img src="image.png" alt="Sketch" /></td>
<td>6-7204 Single-row tapered roller bearing</td>
<td>Wheel hub</td>
<td>8</td>
</tr>
<tr>
<td><img src="image.png" alt="Sketch" /></td>
<td>874901 Needle bearing</td>
<td>Rear drive driving gear</td>
<td>1</td>
</tr>
<tr>
<td>Sketch</td>
<td>Bearing No. and type</td>
<td>Place of installation</td>
<td>Q’ty per motorcycle, pc</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------</td>
<td>-----------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td><img src="image1" alt="Sketch1" /></td>
<td>30863045 Double-row radial thrust ball bearing</td>
<td>Main drive driving gear</td>
<td>1</td>
</tr>
<tr>
<td><img src="image2" alt="Sketch2" /></td>
<td>715707 Radial thrust ball bearing</td>
<td>Left-hand cover of reduction gear</td>
<td>1</td>
</tr>
<tr>
<td><img src="image3" alt="Sketch3" /></td>
<td>904700 Needle bearing</td>
<td>Steering column of motorcycle frame</td>
<td>2</td>
</tr>
<tr>
<td><img src="image4" alt="Sketch4" /></td>
<td>948066 Thrust ball bearing without cage</td>
<td>Universal joint cover cross</td>
<td>12</td>
</tr>
<tr>
<td><img src="image5" alt="Sketch5" /></td>
<td>7006100 Needle roller 3x15.8</td>
<td>Gearbox clutch release mechanism</td>
<td>1</td>
</tr>
<tr>
<td><img src="image6" alt="Sketch6" /></td>
<td>7006105 Radial ball bearing</td>
<td>Differential left-hand hub</td>
<td>1</td>
</tr>
<tr>
<td><img src="image7" alt="Sketch7" /></td>
<td>Roller DV 6.25x1.35</td>
<td>Main drive casing</td>
<td>90</td>
</tr>
<tr>
<td><img src="image8" alt="Sketch8" /></td>
<td>Ball V 10 H</td>
<td>Main drive casing</td>
<td>29</td>
</tr>
<tr>
<td><img src="image9" alt="Sketch9" /></td>
<td>Oil pump body</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
### APPENDIX 2

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Part or assembly note packed</th>
<th>Qty per assembly cycle, pc</th>
<th>Dimensions, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>7201124-6</td>
<td>Camshaft</td>
<td>1</td>
<td>35</td>
</tr>
<tr>
<td>17000190</td>
<td>Crankshaft</td>
<td>1</td>
<td>85</td>
</tr>
<tr>
<td>15004122</td>
<td>Starting mechanism shaft</td>
<td>1</td>
<td>44</td>
</tr>
<tr>
<td>7204151</td>
<td>Primary shaft</td>
<td>1</td>
<td>45</td>
</tr>
<tr>
<td>85-6111504156</td>
<td>Secondary shaft</td>
<td>1</td>
<td>46</td>
</tr>
<tr>
<td>1325112-5</td>
<td>Main drive casing</td>
<td>2</td>
<td>72</td>
</tr>
<tr>
<td>7205033</td>
<td>Universal joint fork</td>
<td>6</td>
<td>49.3</td>
</tr>
<tr>
<td>7200655-5A</td>
<td>Wheel hub, differential</td>
<td>6</td>
<td>36</td>
</tr>
<tr>
<td>17006-50</td>
<td>Gearbox crank shaft</td>
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<td>Front fork</td>
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<td>72008119</td>
<td>Steering column</td>
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<td>59.6</td>
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<td>13-24155</td>
<td>Shock absorber cup</td>
<td>3</td>
<td>24</td>
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<td>MT85642</td>
<td>Clutch-release rod</td>
<td>1</td>
<td>10.1</td>
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### APPENDIX 3

**TIGHTENING TORQUE VALUES**

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<tr>
<th>Part name</th>
<th>Tightening torque value, kgf-m</th>
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<tr>
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<td>25-28</td>
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<td>Crankshaft attaching bolt</td>
<td>2.5-3.2</td>
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<tr>
<td>Cylinder head attaching nut</td>
<td>4.2-4.6</td>
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<td>Manually operated sequence in two steps</td>
<td>2.8-3.6</td>
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<tr>
<td>Torque attaching stud</td>
<td>0.6-0.8</td>
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<tr>
<td>Solid attaching gear to engine</td>
<td>0.8-0.8</td>
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<tr>
<td>Generator attaching mount</td>
<td>1.1-1.6</td>
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<tr>
<td>Engine bolts, attaching mount</td>
<td>1.1-1.6</td>
</tr>
<tr>
<td>Part Name</td>
<td>Tightening Torque Value, kg·m</td>
</tr>
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<td>-----------------------------------------------</td>
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<tr>
<td>Generator fastening nut</td>
<td>2.2-2.8</td>
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<tr>
<td>Nut of connecting rod bolts</td>
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<td>Shift pedal inserting nut</td>
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<tr>
<td>Fastening nut of reverse handles</td>
<td>1.4-1.8</td>
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<td>Main Drive</td>
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<tr>
<td>Crankcase cover fastening nut</td>
<td>1.4-1.8</td>
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<tr>
<td>Running Gear</td>
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<td>4.4-6.2</td>
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<tr>
<td>Nut of fastening bolt of rear wheel axle</td>
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<tr>
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<tr>
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<td>Dust shock absorber reservoir</td>
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<td>Dust shock absorber rod reservoir</td>
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<td>1.6-1.3</td>
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<tr>
<td>Nut of fastening main drive casing to differenental gear cover and case</td>
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<td>Nut of fastening main drive gear to tandem joint fork</td>
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<td>Bolt fastening main drive casing to propeller</td>
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<tr>
<td>Reduction Gear</td>
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<tr>
<td>Nut of fastening wheel axle to reduction gear</td>
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<td>Tightening bolt for reduction gear covers</td>
<td>1.6-1.9</td>
</tr>
<tr>
<td>Nut of universal joint cover cross tapered bolt</td>
<td>1.6-1.8</td>
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Mounting of Anti-theft Device Lock

Take out an anti-theft device lock with keys, a cover, a rivet and spring from a tool and spare parts bag.

To assemble the anti-theft device lock fit spring 3 (Fig. 1) on bar 1 of the anti-theft device lock and mount it into body 4 arranged on the steering column of the motorcycle frame having chosen the required position of the lock by rotating the key. Take the key out, attach cover 2 to body 4 with rivet 5.

Fig. 1. Anti-theft device lock:
1 - anti-theft device lock bar; 2 - cover; 3 - spring; 4 - body; 5 - rivet

Fig. 2. Rear-view mirror:
1 - nut; 2 - washer; 3 - post; 4 - hole; 5 - screw; 6 - mirror; 7 - left-hand bracket

Installation of Rear-View Mirror

To install the rear-view mirror on the motorcycle proceed as follows:

1. Insert post 1 (Fig. 2) and remove washer 2 from post 3 of the mirror;
2. Insert post 3 into hole 4 of left-hand bracket 7;
3. Mount the washer and the nut and tighten the latter;
4. By turning post 3 and mirror 6 having preliminary slackened screws 5, set the mirror to such a position as to enable the driver to see the vehicles following the motorcycle without moving his body;
5. Draw up post nut 1 and screws 3 of the mirror-ball joint tight.
Installation of Mudguards

To install the left-hand mudguard (or the right-hand one) on the motorcycle, proceed as follows:

- Take the left-hand mudguard (or the right-hand one) in assembly out of the boot;
- Unscrew one bolt 1 (Fig. 3) intended for fastening of clamp 2 and slacken the other one;
- Install mudguard 3 on front sidepipe 4 of the motorcycle frame; in doing so put the clamp on the sidepipe and mount the previously unscrewed fastening bolt, then position the mudguard in such a manner so that it would not touch gasoline tank 5 and engine 6; draw up nuts of the clamp fastening bolts tight.

Installation of Storage Battery

In case the motorcycle is supplied together with the 6MTCH storage battery placed in the boot, install the storage battery on the motorcycle, so do as follows.

Put liner 1 (Fig. 4) on the storage battery platform, install the storage battery as it and fasten the battery with strap 2, in so doing hook one of the strap ends over the projections of bracket 3 and pass the other one through a
hole in the storage battery platform allowing which secure the strap ends by nuts 4 and 5 preliminary putting washer 6.

Connect lugs 7 to wires 11 and 12 with the help of bolts 8, nuts 9 and washers 10 (Ref. Nos. 7, 8, 9, 10 are to be found in the boot together with the SPTA bag).

Connect the wire lugs to the storage battery terminals (wire 11 running from the main cable — to the "+" terminal and wire 12 running from the "frame" switch — to the "−" terminal). Tighten up bolts 8.

Installation of Licence Plate Bracket

Take the licence plate bracket from the sidcar boot.

Fix bracket 2 (Fig. 5) in the bottom part of the motorcycle rear guard with nuts 3 and washers.

Washers and nuts are to be fitted from the inner side of the mudguard.

Mounting of Cat's Eyes

Take three cat's eyes (two orange and one red) from the tool and spare parts bag. Take nut and washer (3 pcs each) from the tool kit.

Mount red cat's eye on the sidcar guard from behind and orange cat's eyes on the sidcar body at the front from the right-hand side or on the headlamp left-hand bracket.

Spherical-head screw on the cat's eye should enter the mounting hole. Fit a washer, a nut and tighten it.

Fitting of Plug Cap

Take plug caps from tool and spare parts bag.

Screw the cap into the copper core of the high-voltage wire and fully fit it on the electrode of the plug. Fit another cap in a similar way.
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