
# WORKSHOP MANUAL FOR MODELS
# TOMOS AUTOMATIC SILVER BULLET A3 SP
# TOMOS AUTOMATIC SILVER BULLET A3 GM
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EDITION 1980
TOVARNA MOTORNIH VOZIL TOMOS KOPER YUGOSLAVIA

**FOREWORD**

This manual is not supposed to be a text-book for beginners but a book of reference for service workshops and the experienced rider of AUTOMATIC SILVER BULLET and BULLET.

We have, therefore, omitted all those explanations which are obvious to the expert.

In the first place we want to show how to go about repairs in a professional way. This will save your time and money.

TOVARNA MOTORNIH VOZIL
TOMOS KOPER

**CONTENTS**

**NOTE:**

The differences between AUTOMATIC A3 SP and A3 GM are as follows:

| Type | A3 SP | A3 GM |
|---|---|---|
| Length of piston | 50 (2 in) | 52,5 (2.06 in) |
| Exhaust pipe | Ø 26 (1 in) | Ø 22 (0.86 in) |
| Chain sprocket on the wheel | Z = 22 | Z = 24 |

## REMOVING THE ENGINE FROM THE FRAME

For most repairs, gearbox need not be removed from the frame. Engine is removed only when crankshaft or main driving gear on pedal shaft must be dismantled.

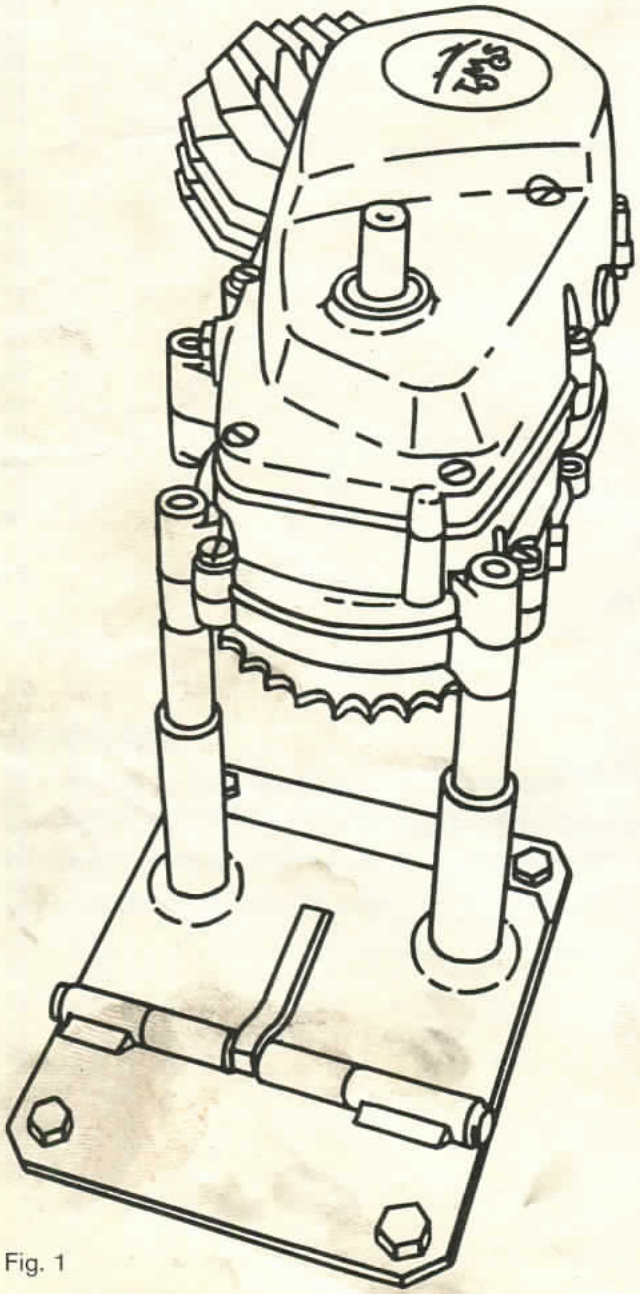


Fig. 1

### Removing the Engine

Unscrew oil drain plug on bottom side of RH engine cover with a screwdriver and let oil drain from the gearbox. With spanner 11 unscrew two pin nuts on both pedal cranks. Remove both washers and drive out both pedal crank pins with copper or plastic hammer. Remove LH and RH pedal cranks and cup, spring and washer on the right hand side of engine.

Unscrew three screws of LH and RH shields each and detach the shields from the frame with a screwdriver.

Unscrew three screws of magneto cover and detach cover. Remove plastic shield from the mainshaft on left hand side.

By rotating the rear wheel, locate chain link, extract chain master link spring, press out chain master link and extract chain. Disconnect all electrical leads. Unscrew bottom screw on control cables cover under the fuel tank and release spark plug control cable.

Unscrew both nuts on exhaust pipe with spanner 10, release and unscrew screw on exhaust bracket with two spanners 10, detach exhaust pipe and cylinder gasket.

Remove fuel supply line, with spanner 10 unscrew two carburettor screws, detach carburettor, gasket and rubber sleeve. Carburettor may remain on engine while crown nut must be detached and unscrewed. Extract control cable along with throttle piston. Unscrew all three engine screws with two spanners 13. Remove centre stand spring, extract two rear screws and detach spring carrier. Hold engine by hand, extract top screw and remove the engine out of the frame. Take intake silencer out of frame.

## DISMANTLING THE ENGINE

Place the engine on special device 714.011 so that the flywheel magneto is turned downward. Unscrew seven screws on the RH engine cover with a screwdriver and separate cover and cover gasket. Remove adjusting washers on mainshaft and countershaft.

Release clutch nut. Lock clutch with special tool No. 732.202 and unscrew nut with spanner 19. Remove both clutches and sintered bush. Extract complete countershaft and mainshaft. Remove chain and detach shaft.

Rotate engine placed on stand so that flywheel magneto is on top.

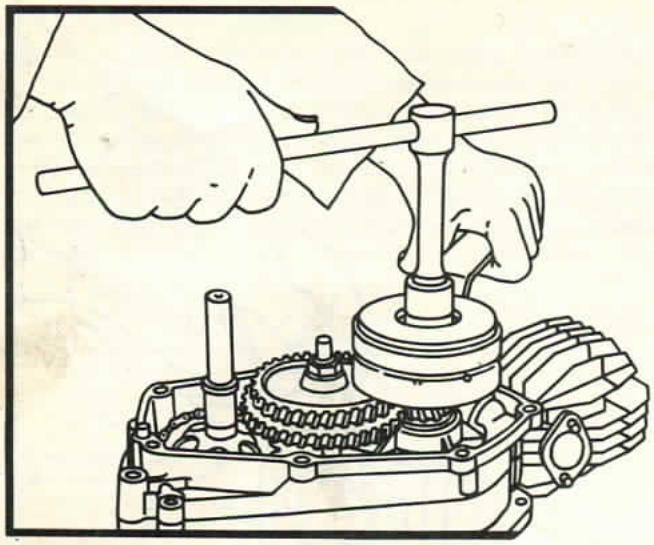


Fig. 2

Unscrew flywheel magneto nut with socket box spanner 15; with this operation the magneto flywheel is fixed in the special tool 732.202. By no means should the flywheel magneto be locked with a screwdriver between magneto flywheel poles and ignition or lighting coil cores. The flywheel is removed with tool 700.334 by using spanners 19 and 32.

Unscrew three screws of the base plate with screwdriver and remove the plate. When removing the base plate, first release rubber insert piece in the crankcase to avoid damaging the electric leads.

Unfold protective washer on chain sprocket nut and lock the sprocket with special tool 732.202. Use spanner 32 to unscrew chain sprocket nut and remove the sprocket.

Turn the engine for 90° on the rotary stand so that cylinder is on top. By using socket box spanner 11, unscrew four nuts, remove cylinder head and cylinder.

With pointed nose pliers remove gudgeon pin spring circlips, Fig. 4. Press out gudgeon pin and remove piston. Remove cylinder gasket.

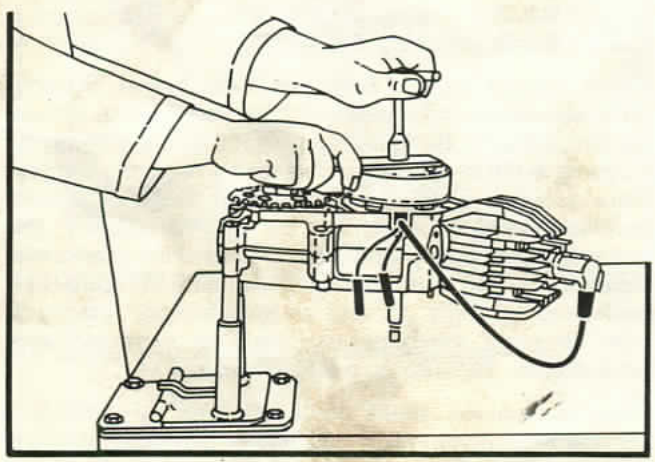


Fig. 3

Turn the engine on the rotary stand so that gearbox is on top. Unscrew eight screws connecting the crankcase halves with a screwdriver. By light blows of wooden or plastic hammer detach LH and RH halves of the crankcase. Detach crankshaft from LH half of the crankcase. Take LH half of the crankcase from the stand and by light blows of wooden or plastic mallet knock out the mainshaft with gear on which occasion also distance bush in the sealing ring is released. Remove metal bush.

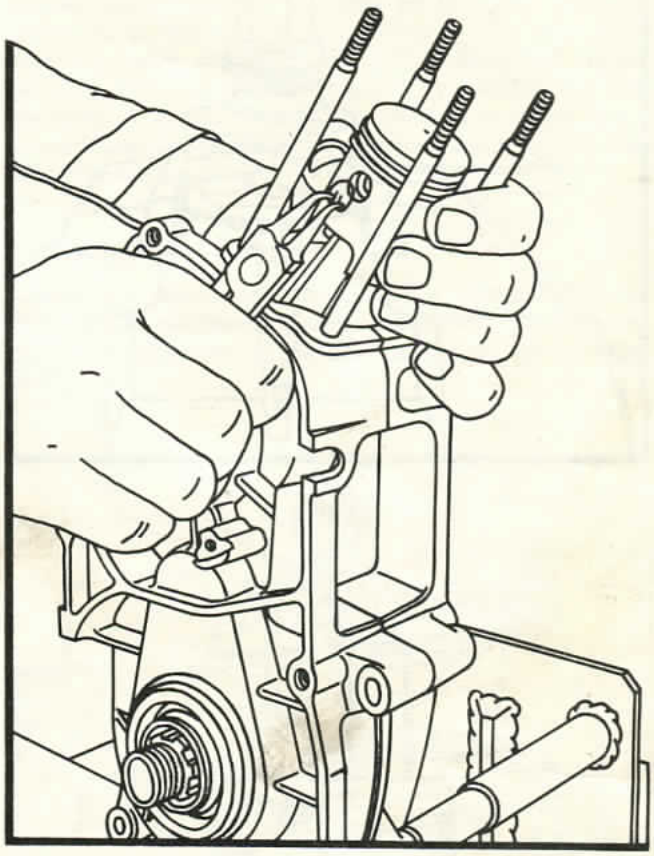


Fig. 4

Remove bearing inner races from LH and RH halves of the crankcase with special tool No. 704.467. By no means should races be removed without using special tools lest the crankshaft should be distorted or damaged. For dismantling with dismantling tool, use spanners 20 and 14 (Fig. 5).

Extract the two remaining centering pins from both halves of crankcase. By using special tool No. 702.856, press out outer races of crankshaft bearing from RH half of the crankcase. Sealing ring is pressed against exterior side while outer races of crankshaft bearing are pressed against interior side.

Crankshaft bearing sealing ring is pressed out from the LH half of the crankcase following the same sequence as for RH one. Mainshaft bearing and sealing ring are also pressed out by using a suitable socket (Fig. 6).

Countershaft bearing is dismounted by heating the crankcase and light shaking on a level base or by using special tool No. 706.485 on a suitable stand, as shown in the Fig. 7.

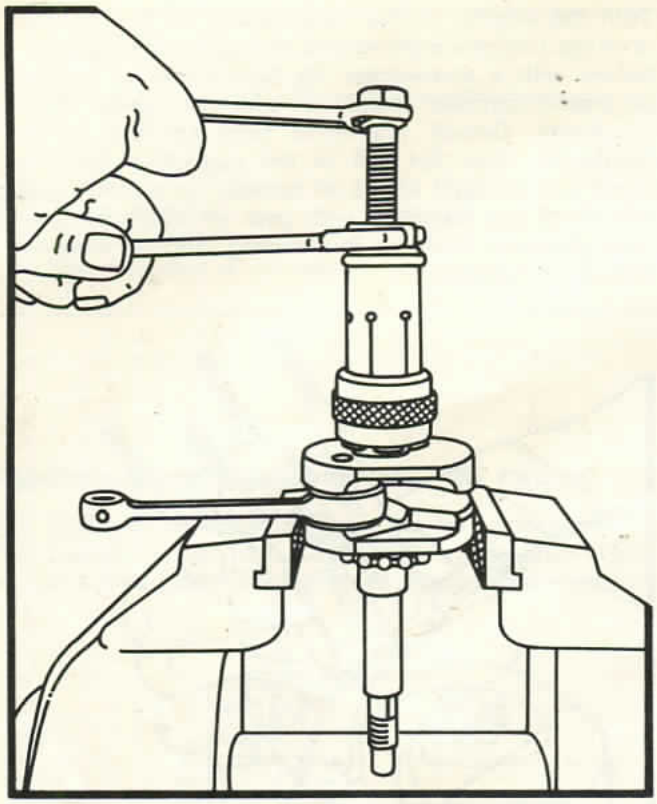


Fig. 5

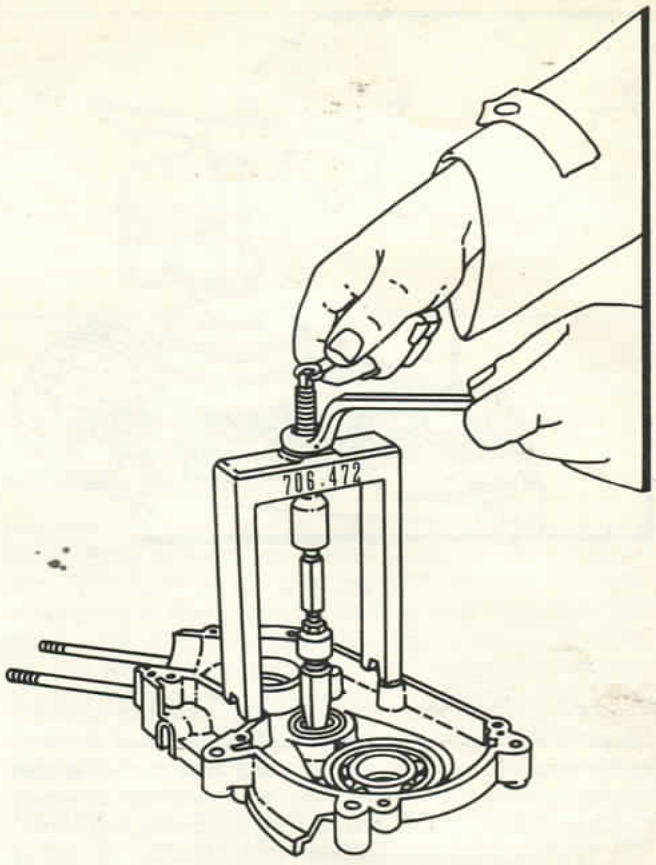



Fig. 7

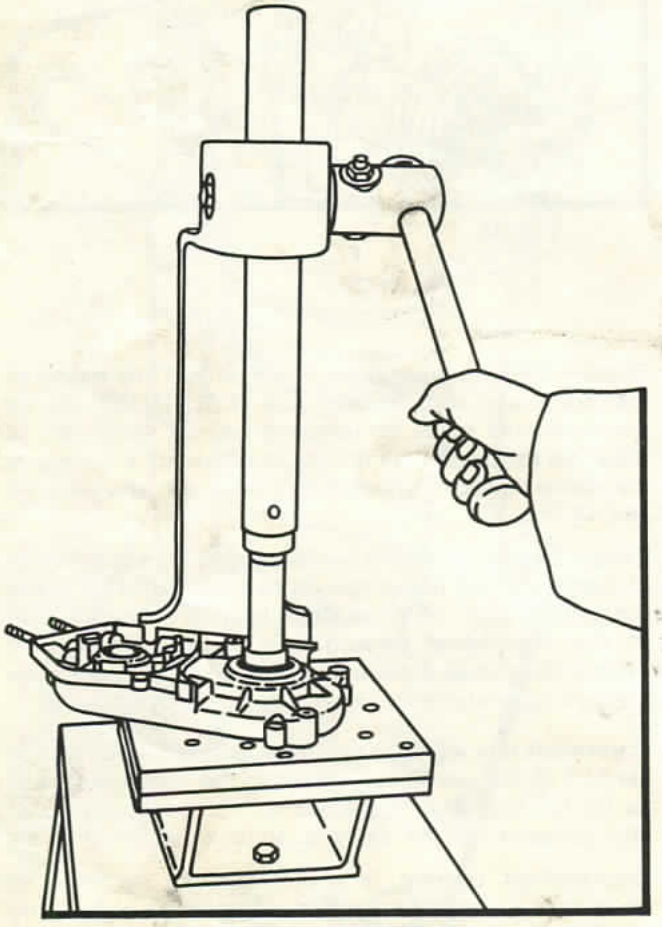


Fig. 6

## CHECKING ENGINE PARTS AND ASSEMBLIES

### Checking LH and RH Halves of Crankcase

First, check crankcase halves for possible distortions. Check crankcase joining surfaces on levelling plate and level them, if necessary. Severely damaged crankcases must be replaced. Filing or grinding of crankcase is not allowed.

Dial indicator placed in LH and RH halves of crankcase is used to check the bores of outer races of the crankshaft ball bearing (Fig. 8) which should read

$$\varnothing\ 40 - \begin{matrix}0.025\\0.050\end{matrix} \qquad (1.575 - \begin{matrix}0.0018\\0.0019\end{matrix}\ \text{in})$$

Check tapped holes in both crankcase halves. Suitable bolts should normally screw into the bore holes. Check the stud bolts for fixing the cylinder if they are sufficiently screwed in the crankcase and if threads are not damaged. More accurate check for right-angled fitting of screws is effected when mounting the cylinder. Check the remaining bearing bore holes in LH half of the crankcase. Carefully heat (to avoid damaging the paint) RH crankcase cover and by slight shaking on level surface, dismount both bearings. Bearings can also be extracted with extractor No. 706.485 on a suitable stand.

Effect a common check of both halves of crankcase, LH and RH engine cover and joining surfaces of these parts to avoid later leaking of oil from gearbox or water into flywheel magneto.

### Checking the Bearings

Check all shaft bearings. First, thoroughly wash them in petrol, blow them with jet of compressed air. Then, by holding the outer races of bearings, somewhat shake them and check for bearing clearance. If clearance is noticed, the bearing must be replaced. Likewise, check the bearing bush of pedal shaft in RH cover. Shaft is inserted into the bush, pushed in and bush checked for wear.

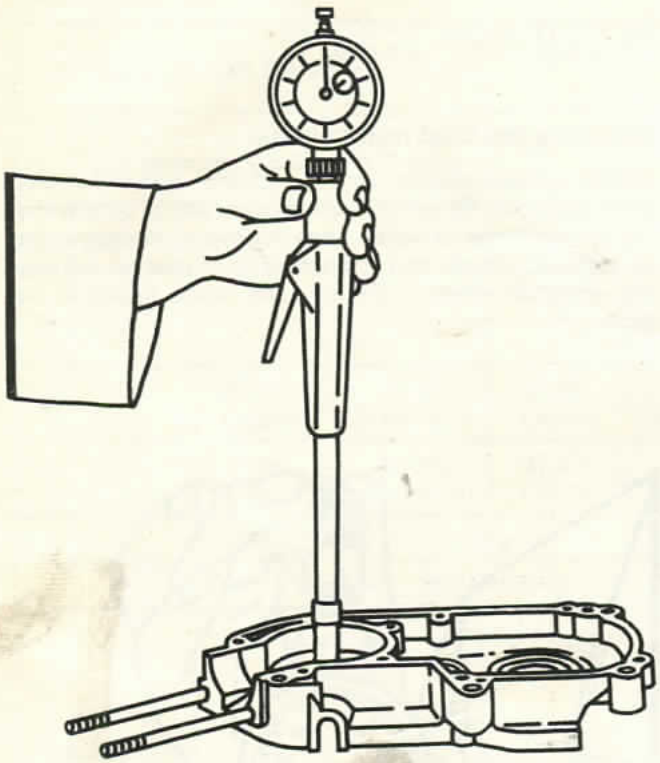


Fig. 8

If clearance is obvious, the bush should be replaced. Following the same sequence, check the sintered bush on crankshaft.

Pedal shaft needle races are dismounted only when they are to be replaced since they might get distorted and are not suitable for use any more. They are dismounted by pressing or knocking them out. Check of bearings is effected in the sprocket by rotating the pedal shaft. First, only examine crankshaft bearings. If necessary, use a magnifying glass, to ascertain how much the bearing surfaces on the outer races are damaged and if surface

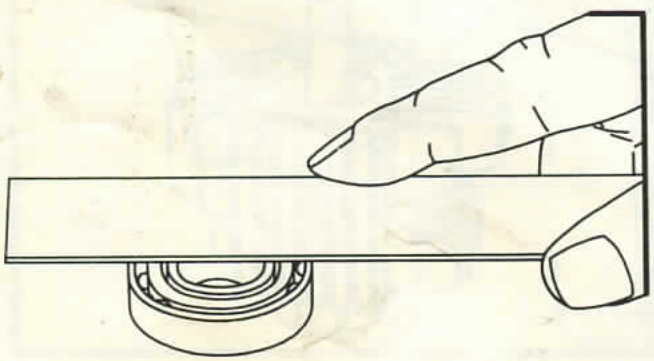


Fig. 9

of balls has started to peel off. Bearings are washed and blown with jet of compressed air, fitted into the sleeve and then into the inner race.

With a precision gauge, preferably metallic, and in sufficient light, check if the bearing inner and outer races are level (checking of crankshaft bearing).

### Checking the Gaskets and Seals

Check gaskets and seals for damage. The damaged rubber seals must be replaced. Fit the other seals on their respective shafts and check if the seal when under suitable pressure, is tight on its entire sealing surface. This can be established by rotating the seal by hand on the corresponding shaft. Bore holes where the seals are pressed into the crankcase under a determined pressure are also checked.

### Checking the Crankshaft

Check the crankshaft for possible damage. Fix the crankshaft between gauge measuring points and measure deflection of the shaft at the points indicated in Fig. 10.

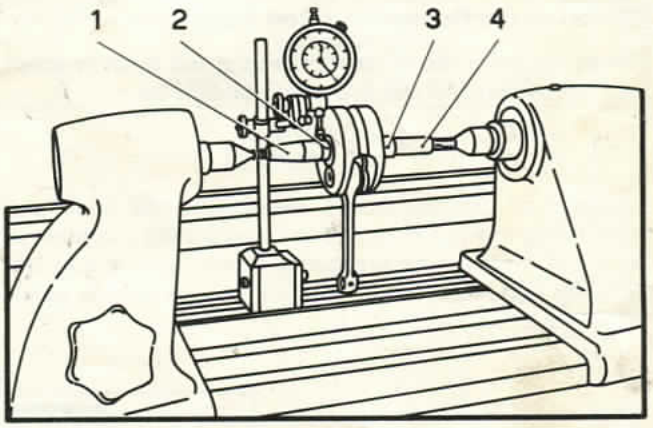



Fig. 10

Deflection allowed: (and play)
0.02 mm at check points 1 and 4 (0.0008 in)
0.03 mm at check points 2 and 3 (0.0012 in)

Take measurements on the above points on the same level.

Check free turning of the connecting rod which should be free of radial clearance.

Axial play of the connecting rod should be between 0,2 mm and 0.5 mm (0.008 in and 0.02 in).

The keyway in the crankshaft conical part lies under the angle of 36° 30′ ± 20′ in relation to the centre line of connecting rod pin of the crankshaft semiaxes.

Check the crankshaft conical part for damage and inspect the thread on both semiaxes and the keyway. Crankshaft taper 1 : 5. Special attention should be paid to end of thread and surface where needles of the roller clutch fit.

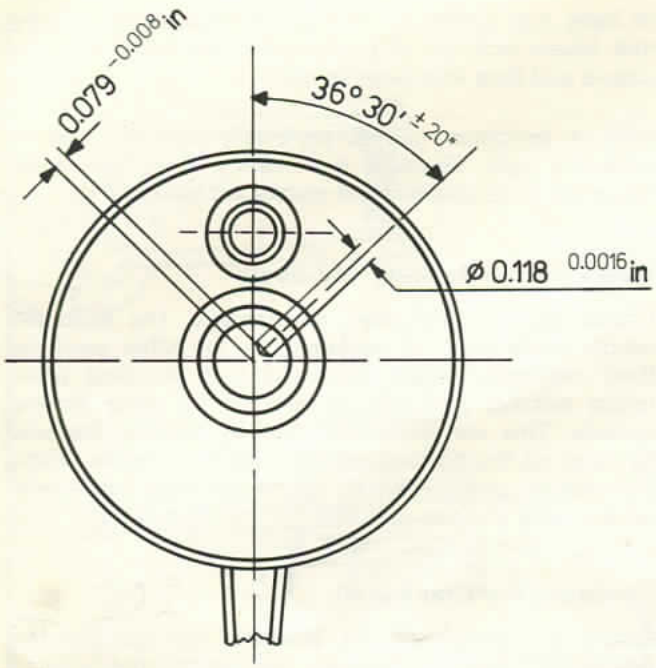



Fig. 11

The bush must have the following dimensions:

outer dia 12 $^{+\ 0.045}_{+\ 0.060}$ (0.472 $^{+\ 0.0018}_{+\ 0.0024}$ in)

inner dia 9.65 (0.38 in)

length of the connecting rod bush 13 – 0.110

Upon having pressed the bush into the connecting rod, first bore two new lubrication holes according to bore holes in the connecting rod. Bush must then be rebored to increase the inner dia to

10 $^{+\ 0.02}_{+\ 0.01}$ (0.472 $^{+\ 0.0018}_{+\ 0.0024}$ in)

### Checking the Cast Iron Cylinder

Check cylinder sliding surface and appearance for possible damages. By using dial indicator, check bore within the sliding range of piston rings in several directions and on different levels and according to marks on cylinder top establish whether dia is within range stated in the table.

### Checking the Connecting Rod Bush

Check the inner dia of the connecting rod bush pressed into the connecting rod eye which should be

ø 10 $^{+\ 0.02}_{+\ 0.01}$ (0.394 $^{+\ 0.0078}_{+\ 0.00039}$ in)

Check if oil grooves in the connecting rod bush and connecting rod eye match. If the connecting rod bush is worn out it should be pressed out with special tool No. 708.253 (Fig. 12) and replaced with a new one by using the same tool.

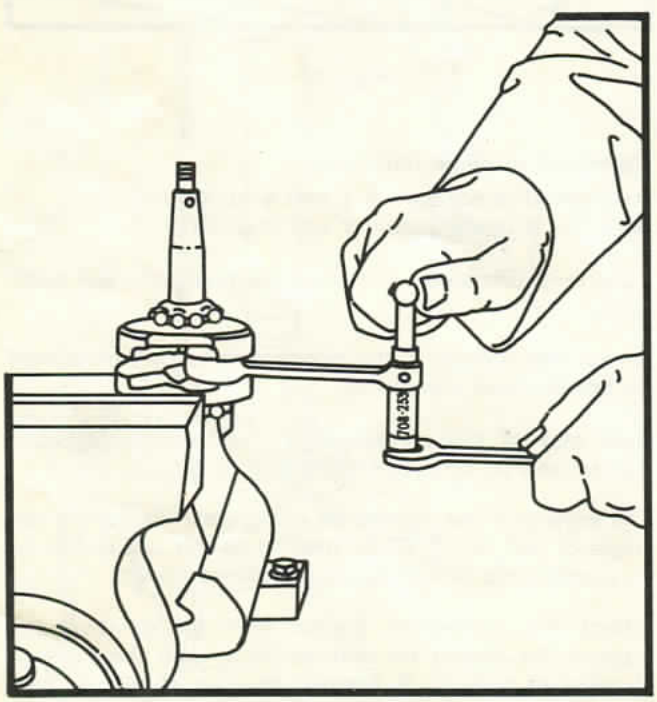



Fig. 12

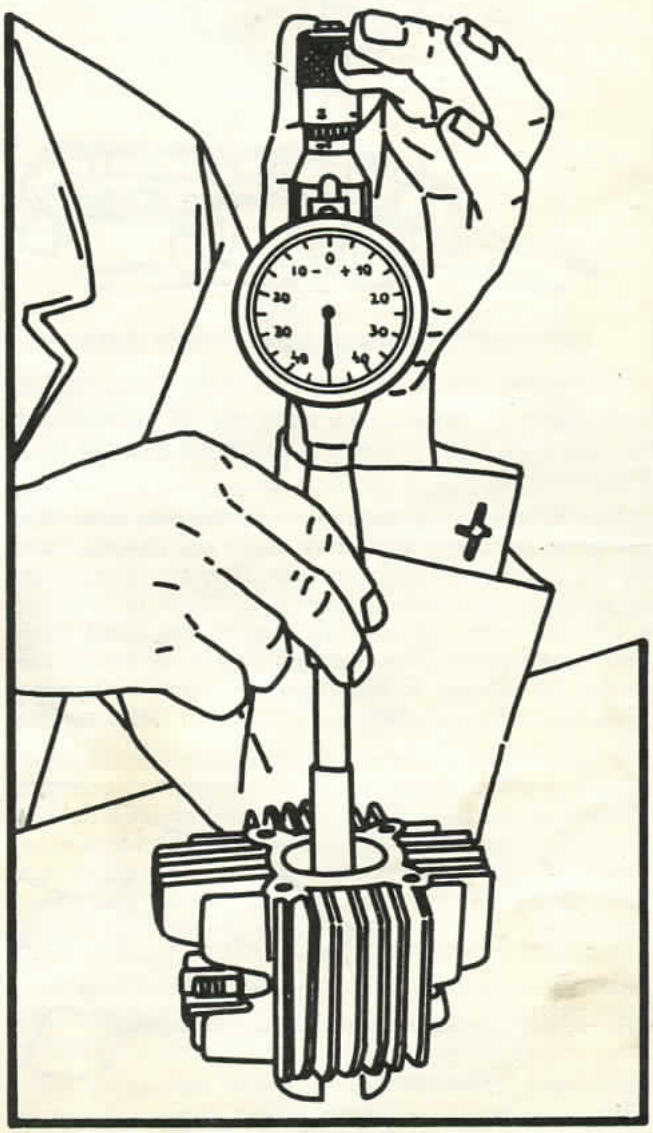


Fig. 13

Allowable maximum ovalness and taper of cylinder bore is 0.006 mm, larger dia at the bottom.

Hardness of cylinder material should be within 195–250 kg. p. sq. mm HB 5/750/30, measured on cylinder top.

Check the parts if they are free of moulding sand or other rests of edges.

**Checking the Piston**

Check piston surfaces for possible damages. With micrometer check piston dia on points D1, D2, D4 at right angles to gudgeon pin and compare the reading with the corresponding group on piston and in the table.

Table of Cast Iron Cylinders

| | |
|---|---|
| Standard ∅38 (1.496 in) | a from 38.010 (1.4964 in) to 38.020 (1.4968 in) |
| | b from 38.020 (1.4968 in) to 38.030 (1.4972 in) |
| 1 st oversize ∅38.5 (1.515 in) | a from 38.510 (1.5161 in) to 38.520 (1.5165 in) |
| | b from 38.520 (1.5165 in) to 38.530 (1.5169 in) |

Table of Pistons

| Group | Piston dia at points | | | |
|---|---|---|---|---|
| | D1 | D2 | D3 | D4 |
| A | 37.95 (1.4940 to 37.96 1.4944 in) | 37.91 (1.4925 to 37.92 1.4929 in) | 37.87 (1.4909 to 37.88 1.4913 in) | 37.85 (1.4901 to 37.86 1.4905 in) |
| B | 37.96 (1.4944 to 37.97 1.4948 in) | 37.92 (1.4929 to 37.93 1.4933 in) | 37.88 (1.4913 to 37.89 1.4917 in) | 37.86 (1.4905 to 37.87 1.4909 in) |
| Piston rings | Dia | | Tangential stress | |
| | 38 (1.496 in) | | 0.63 kg ± 10% (1.39 lb ± 10%) | |

CONICAL OVAL

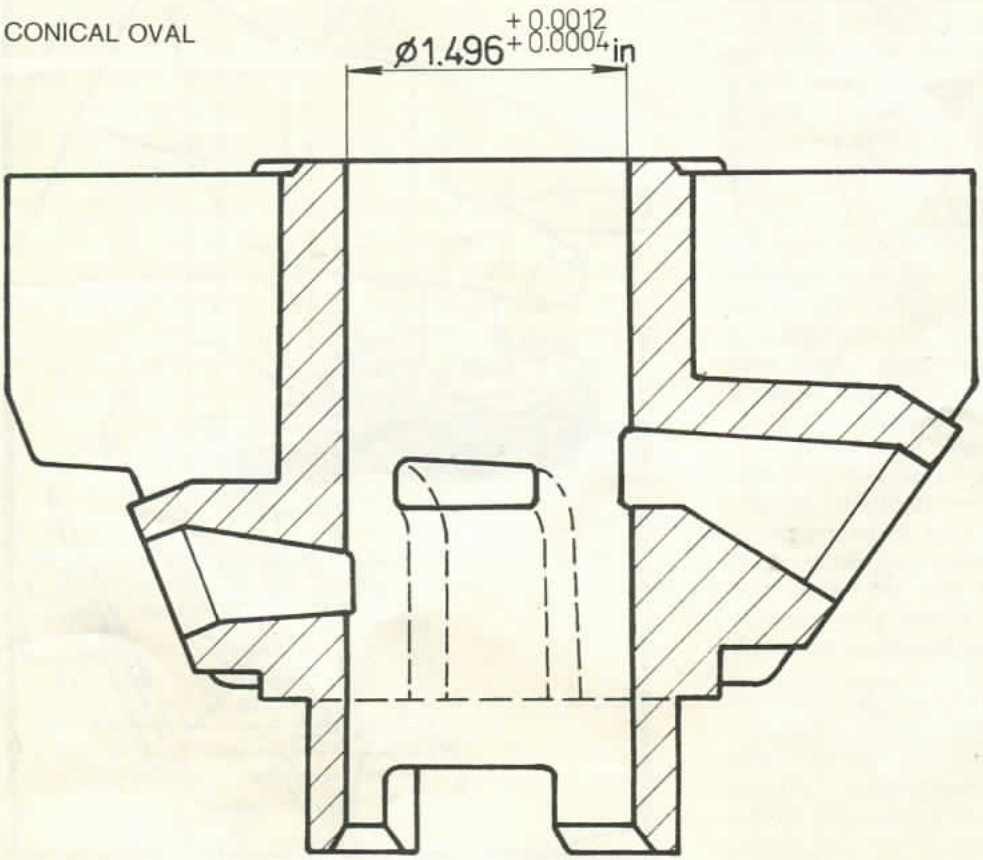



Fig. 14

OVAL CONVEXO-OVAL

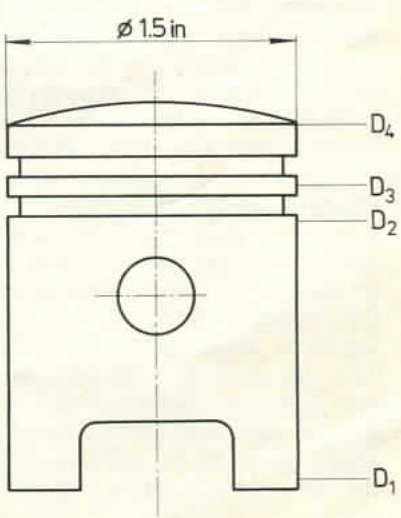



Fig. 15

Check width of grooves for piston rings in the piston which should be within

$$2\ ^{+\ 0.05}_{+\ 0.03}\ (0.078\ ^{+\ 0.0019\ \text{in})}_{+\ 0.0012\ \text{in})}$$

Overall height of piston 50 mm (1.968 in), A 3S 52.5 mm (2.066 in).

Height from piston bottom edge to centre of gudgeon pin bore is 24 ± 0.1 mm (0.944 ± 0.0039 in).

Protective pins are fitted at right angles to gudgeon pin axle on the bottom side 54 ± 3° on either side. Gudgeon pin bore dia

$$\varnothing\ 10\ ^{+\ 0.007}_{+\ 0.002}\ (0.3937\ ^{+\ 0.0002}_{+\ 0.0001}\ \text{in})$$

Groove for wire circlip must be semicircular in shape – by no means should Sg-circlip be used.

Width of piston rings

$$2\ ^{-\ 0.010}_{-\ 0.022}\ (0.078\ ^{-\ 0.0004}_{-\ 0.0008}\ \text{in})$$

Gap of piston ring inserted into a used cylinder is 0.1 – 0.8 mm (0.0039 – 0.0314 in), at the maximum. Check gudgeon pin dia in relation to piston bore hole.

When completing the cylinders with pistons, care should be taken that group marks on piston crown and cylinder match.

### Checking the Cylinder Head

Check cylinder head for possible mechanical damage. Examine cooling ribs lest they should be cracked or broken off or bearing surface on the cylinder side deformed. Check also thread for spark plug for possible damage. Bearing surface is checked on the levelling plate. If necessary, level it first on abrasive paper. Filing or grinding is not allowed since it may alter the engine compression ratio.

### Checking and Dismantling the Clutch

Remove Sg-circlip with pliers for rings and separate clutches 1st and 2nd gear. Remove distance rings. Check if drum deflection is centered according to the following sequence: mount drum to the crankshaft, along with sintered bush. Fix the crankshaft between centering points. Crankshaft is held with one hand while drum is rotated clockwise so that drum with needle clutch is locked on the shaft. Centering should be within 0.1 mm (0.004 in) and deflection within 0.2 mm (0.008 in). Needle clutch is dismounted only when it is to be replaced. Check drum sliding surfaces. If damaged, drum is replaced instead of repaired. Check also the sliding surface of the larger gear on the drum. Check sliding linings for wear. If worn, the complete shoe should be replaced. Dismantle both clutches.
Spring is removed with a screwdriver which is pushed from the opposite side between two shoes under the spring. In this manner, brake strips are released and all three shoes can be removed. Press pins out of shoes. Check brake strips, springs, pins and inside of shoes and replace these parts, if necessary. Check 2nd speed clutch gear along the edges of teeth and inside sliding surface.

### Assembling the Clutch

First assemble 1st speed clutch. Fix main pin of device 731.798 into vice with thinner part facing upwards. Put clutch hub with grooves facing downward and place spring washer on it. Insert pins into clutch shoes. Clutch shoe must not sit firmly with its bottom grooves on the hub and must rotate free of excessive torsion (before spring is fitted). Fit brake strips so that they protect each other against falling out, the longer end is placed over the next one where it is fastened behind the strip eyelet. If necessary, compress clutch spring on eyelet to avoid unfastening of joint. Spring joint should be in the middle of one shoe and not behind the eyelet on the brake strip. When mounting the spring into the clutch, it is necessary to hold brake strips and shoes to prevent their slipping. Fit spring as described hereabove but only half of it. With lever of device No. 731.798, insert the other half of spring into the groove on lever. Lever is rotated counterclockwise until spring is stretched enough to allow its being pushed from lever groove into shoe groove with a screwdriver, as shown in the Fig. 16. Shoe with lining along the whole length of shoe is mounted to the 1st speed clutch while the one with shorter lining is mounted to the 2nd speed clutch.

Fig. 16

To assemble 2nd speed clutch, turn pin of device No. 731.798, mount hub with gear so that gear is on bottom. Mount shoes so that gap between two shoes fits into the main pin prong to prevent clutch rotating when incorporating the spring. Fit spring as with 1st speed clutch. There is no spring washer in 2nd speed clutch. Needle clutch in the drum is pressed out only when it is to be replaced since it gets excessively deformed when dismounted. A new needle clutch is pressed into the depth 10 ± 0.15 (0.393 ± 0.0059 in) with special tool No. 732.268 as shown in Fig. 17. Tool No. 732.268 is for 0.08 mm (0.0031 in) smaller from crankshaft pole and larger dia is scraped off under negative angle 15°. Impressing with tool prevents radial deformations of needle clutch housing. Axial deformations in impressing the clutch may prevent needles from moving freely for which reason the mentioned device must be applied.

The needle clutch is pushed with the marked side forward or else, it may operate in the reverse direction.

Fit 2nd speed clutch with gear into drum and fit Sg-ring.

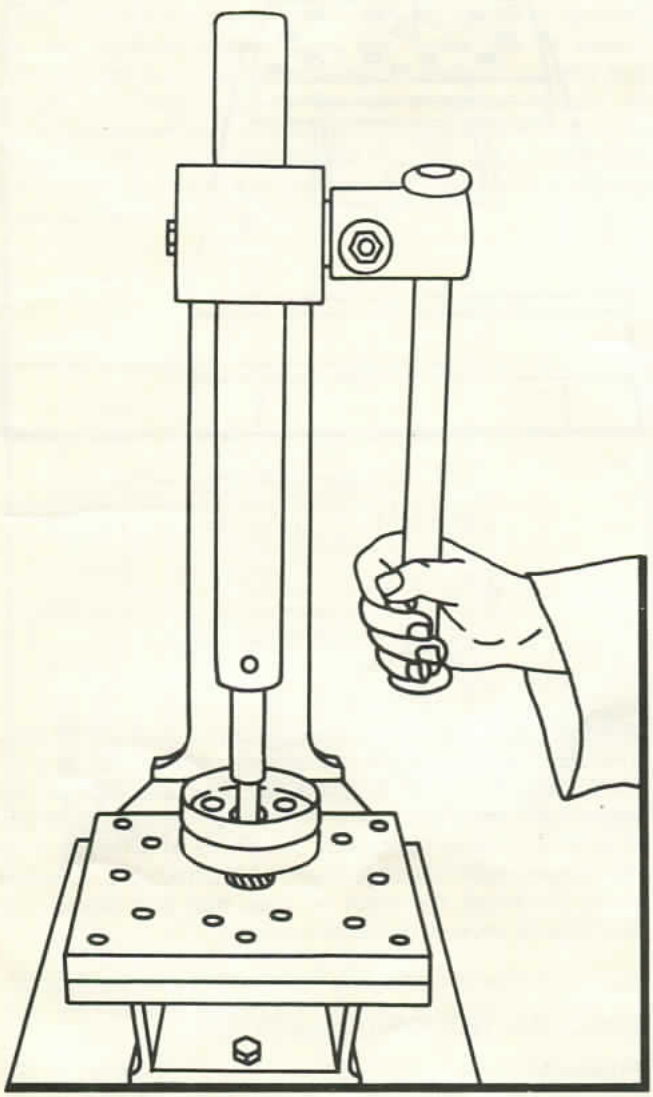


Fig. 17

**Dismantling, checking and assembling the countershaft**

With two-speed engine, fix countershaft into vice lined with aluminium shoes. Loosen the nut. With a suitable accessory, lock 2nd speed gear and unscrew nut with spanner 19. Remove 2nd speed gear, 1st speed gear and shake the rollers out of the cage. Remove Sg-ring at the end of toothing on the shaft. With both models, unfasten wire spring under rollers and separate small chain sprocket with cage.

Check maximum dia of countershaft between tips: maximum ovalness allowed is 0.03 mm (0.0012 in). If troubles appear in the selflocking clutch, consisting of rollers with 1st speed gear hub, possible damage of the countershaft may be repaired by grinding the surface at the larger dia for 0.1 mm (0.0039 in) at the most. When rollers make smaller hollows in the hub, the latter can be honed. If hollows are rather large, the gear should be replaced. Mount one or both gears on the shaft and check deflection of gears between tips. Allowed axial deflection 0.05 mm (0.0019 in). Fix shaft with gears into vice lined with aluminium shoes. Fit protective washer and screw on nut with spanner 19. Second speed gear is locked with a suitable tool.

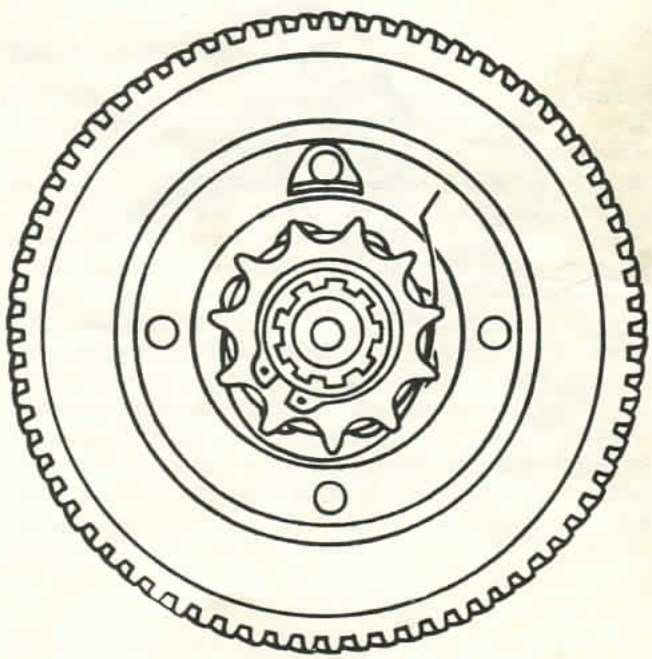


Fig. 18

Nut is screwed on with 3 kg/m (22 1b/ft) torque. Secure nut with suitable pliers. Turn shaft, insert 8 rollers into hub seat. Use of grease is not allowed since lateron it may impede the operation of self-locking clutch. If rollers are worn out they should be replaced. Put chain sprocket with cage so that the beginning of wire spring is turned for 90° leftward from spring nose. Hitch wire spring to riveted nose on the 1st speed gear. Insert Sg-ring into groove on the shaft. See position of wire spring on Fig. 18.

### Checking pedal shaft and transmission chain

If it is necessary to replace chain sprocket or claw collar on pedal shaft, proceed as follows: with light blows remove protective ring from spring washer (Fig. 19/1), with pliers for outside rings widen spring washer (Fig. 19/2) and remove it from the shaft. Remove distance bush, chain sprocket and claw collar. Remove brake spring. Check all parts and replace them, if necessary. Special attention should be paid to teeth on the claw collar and chain sprocket hub. Pedal shaft is checked between tips. Maximum allowed deflection is 0.03 mm (0.0012 in).

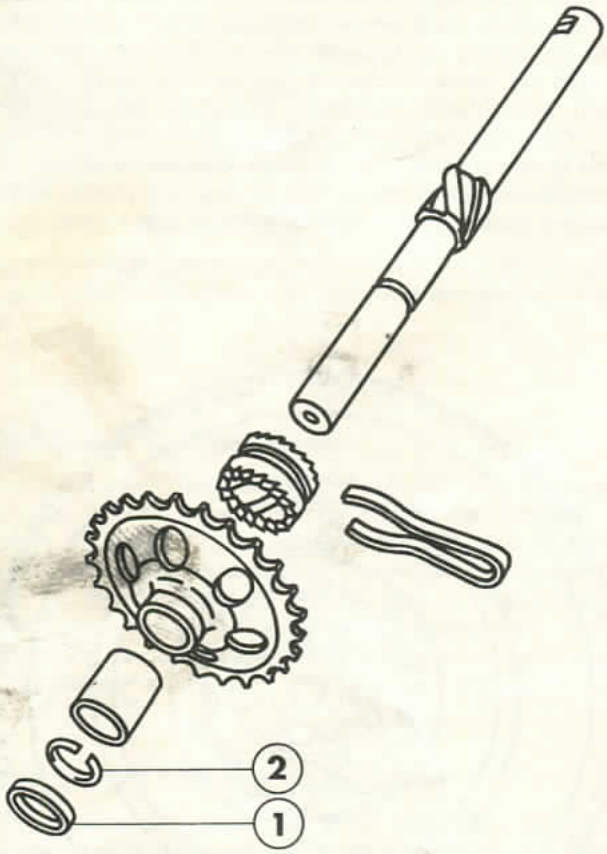



Fig. 19

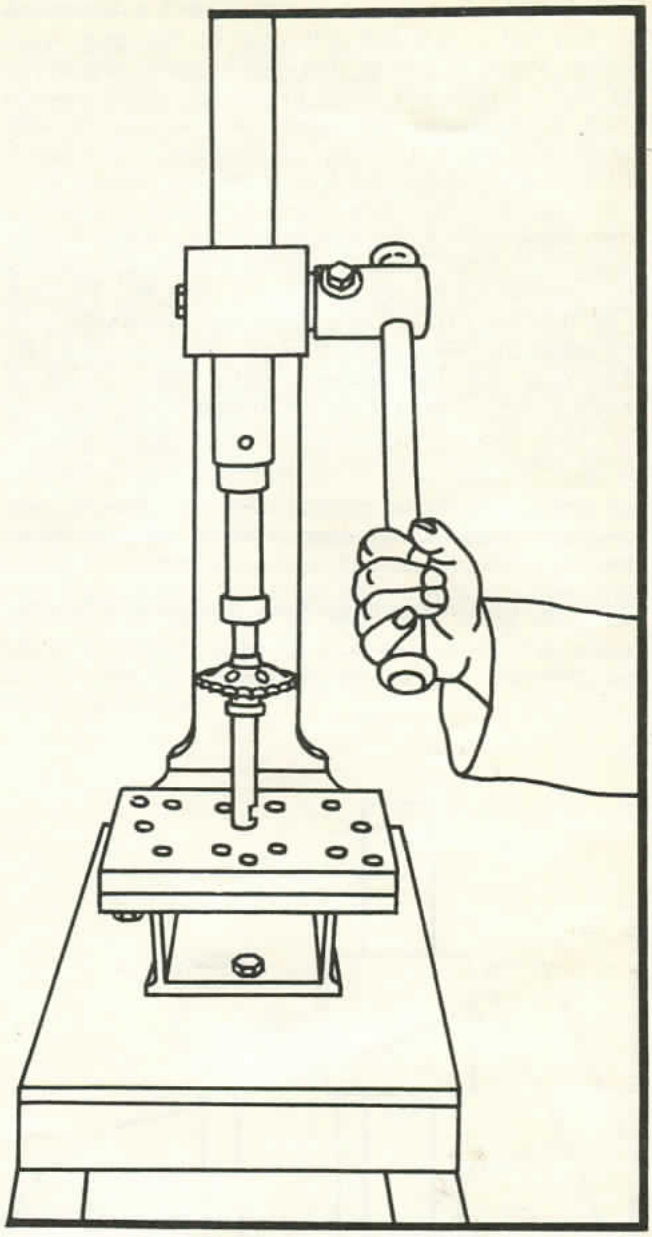


Fig. 20

The pedal shaft is assembled following the reverse sequence of dismantling. The claw collar is mounted on the shaft with thinner part forward or else, brake spring slide across the chain sprocket. To mount the protective washer, use special tool No. 702.856, as shown in Fig. 20.

Put chain on chain sprocket and insert small chain sprocket into the chain. Check the chain for overtension or some other damage and replace it if necessary. Needle bearings in the gear are dismounted only when worn out or when sealing ring in the first bearing leaks oil. Dismounted bearings should always be replaced. The bearings are knocked out with suitable tools. To assemble, first insert bearing with sealing ring facing outward.

Bearings are impressed with special tool No. 732.367. The second bearing is impressed only as far as hub front part, however, it must not protrude. Dia of pin with tools for these bearings must be for 0.08 mm (0.003 in) smaller from pedal shaft dia and thrust must be scraped with negative angle 15°. Check the sprocket along the edge, the teeth on gear hub and thread and chain sprocket seat on the other side.

## CHECKING THE IGNITION SYSTEM

### Flywheel

Fit the flywheel to the crankshaft conical part and fix it with nut.

Then fix the crankshaft between the tips of the gauge and check the axial and radial deflection of the flywheel. Maximum axial deflection of the flywheel measured on rim is 0.3 mm (0.012 in). Maximum radial deflection of the flywheel is 0.1 mm (0.0039 in). Check the setting cam on flywheel hub for wear or damage.

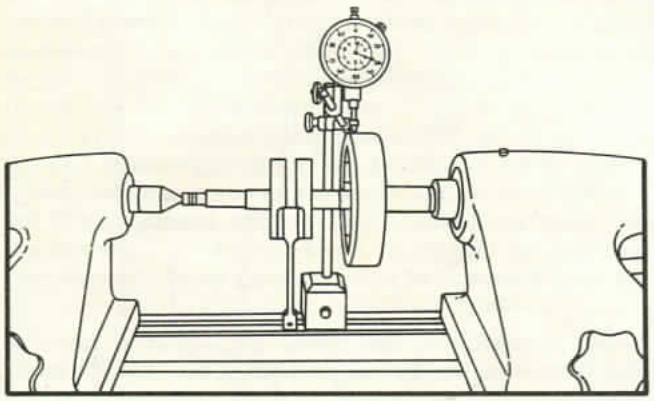


Fig. 21

Inspect the hub conical parts and attachment or the hub to the flywheel (make sure the rivets are in order). Should the rivets be completely or partly loose, the hub must be riveted again. Special attention should be paid to the position of riveting effected by the manufacturer or else, cam position of the magneto amounting 8–12 mm (0.314–0.472 in) may be altered. The setting cam angle is 237° (Fig. 30).

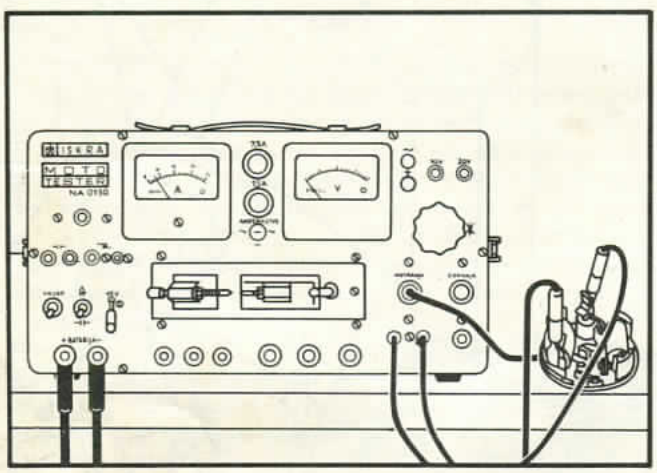


Fig. 22

To test the magneto ignition performance with the engine not yet disassembled, proceed as follows: connect the high-tension end of the flywheel magneto ignition coil to an automotive tester, connect the instrument with the metal part of the engine (earthing). The spark on tester is set to 5 mm. Then uscrew the spark plug so that engine can be turned with the starting number of revs. During engine rotation the spark plug discharge should be normal. If the discharge is weak, the contact breaker gap should be set to the correct value. If the gap is incorrect, it should be adjusted to 0.35–0.45 mm (0.0137–0.0177 in).

### Ignition Coil

Check the ignition coil in the base plate assy. or separately. If checking is effected in the base plate assy., place insulating paper between the contact breaker points.

In case the ignition coil is checked separately, it should be removed from the base plate. First remove tin solder from the primary wire contact on the capacitor. With a screwdriver unscrew two screws fixing the coil to the base plate and detach the coil from its seat. Connect the ignition coil to the automotive tester, set the spark on tester to 5 mm and switch on the tester. The sparking between the contact points on the tester should be perfect; the spark length should be at least 6 mm (0.236 in). The testing should last 1 to 2 minutes at the minimum so that the ignition coil heats to its normal temperature during engine operation. If sparking is irregular, replace the ignition coil. Install the coil in the base plate by proceeding in the reverse sequence of operations.

### Checking the Capacitor

Remove tin solder from wire contacts on the capacitor. Connect the capacitor with terminals to the marked points on the tester. Turn on the main switch. If the capacitor is in order, the glow lamp on the tester will light up instantaneously and then go out. When the capacitor is defective, the glow lamp will blink at short intervals. If the capacitor is punctured, the glow lamp will glow continuosly. If the capacitor is interrupted, the glow lamp will not light up. Lighting up of the glow lamp at long intervals is allowed. The capacitance of the capacitor should be 0.2 u F ± 10%. A capacitor of higher or lower capacitance must not be installed since it would cause burning of the breaker contact points. Replacement of defective capacitor with a new one: press out the old capacitor from the base plate. Always clean the bearing surface on the base plate before mounting the new capacitor.

Press in the new capacitor with a wooden or brass attachment on a hand press until the capacitor bottom side is level with the base plate on the back side. Solder the wire connections to the capacitor.

### Checking the Contact Breaker Points

Check if the contact breaker points are oxidized or burnt or if the Pertinax cam is excessively worn. The force of contact breaker heel thrust spring is 600 g ± 50 (1.32 ± 0.11 lb).

Slightly oxidized breaker points can be cleaned with a contact file or very fine emery paper while burnt contacts should be replaced as follows: detach the primary circuit wire connection and with a screwdriver unscrew angle plate securing screw and extract the

locking wire on heel axle. When installing a new contact breaker, take care a plain washer and a spring washer are placed under the angle plate securing screw or else, heel may have excessive axial play.

When fixing the heel spring to the angle plate bracket, make sure the spring and screw (attach wire connections from the capacitor and from the short circuit switch) are insulated from the bracket by a plastic insert.

### Checking the Spark Plug

Check the spark plug for possible mechanical damage of thread or excessively burnt electrodes. Spark plug BOSCH W225T1, AET S225 E2 or BOSNA F75 (AUTOLITE AE3, HITACHI M44). When fitting a new spark plug of any make, check its heat value according to the comparative table. The heat value should comply with the heat value of the above mentioned spark plugs.

All other engine parts not specifically mentioned hereabove should also be examined, their functioning tested and checked for possible mechanical damage. Any worn part must be replaced.

## REASSEMBLING THE ENGINE

Screw the cylinder fixing stud bolts into both crankcase halves. With the bush No. 702.856 press the crankshaft bearing outer races all the way in as shown in the Fig. 23.

Crankshaft bearing outer and inner races must not be interchanged. Spring in the sealing ring in the LH half of crankcase is turned against the connecting rod while in the RH half of crankcase it is turned away from the connecting rod.

Gear bearing and sealing ring are pressed in with a suitable tool of 52 to 54 mm dia (2.04–2.12 in). The sealing ring spring faces the crankase inside. Push in the replaced bearings and mainshaft bush, if any. Countershaft bearing in LH half of the crankase is pressed in with tool No. 702.856, mainshaft bush in the cover with tool No. 732.367 and countershaft and crankshaft bearings in the RH cover with a suitable tool of 24 to 25 mm (0.94 to 0.98 in) dia. When impressing bearing into RH cover, a suitable stand should be used, preferably, lest cover paint should be damaged. Irrespective of the fact that old crankshaft and bearings are incorporated, the axial clearance of the crankshaft should be checked.

When incorporating new parts, calculate axial clearance and determine number of washers under the crankshaft bearing.

Put LH half of crankcase on stand No. 714.011. Insert gear with previously impressed needle bearings. On a special stand, press both main bearing inner races into the crankshaft with special tool No. 702.856, as shown in the Fig. 25.

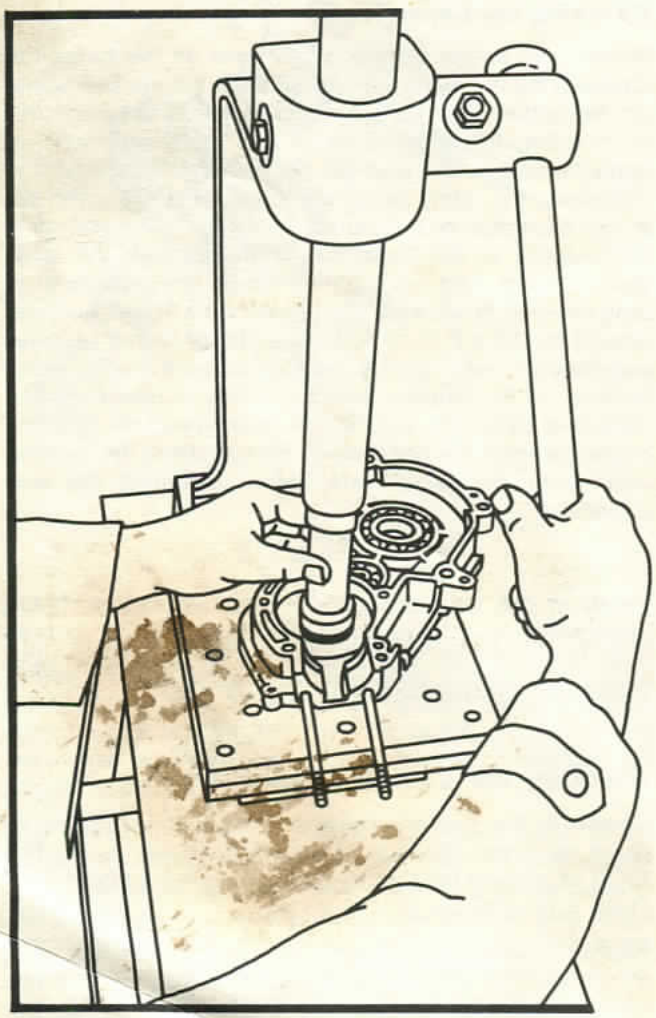


Fig. 23

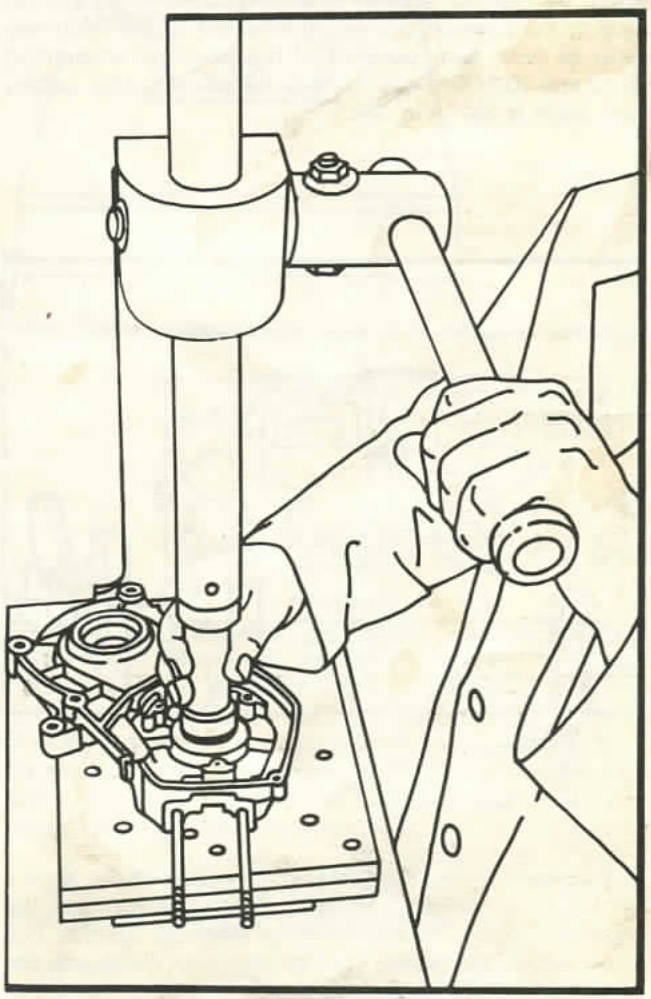


Fig. 24

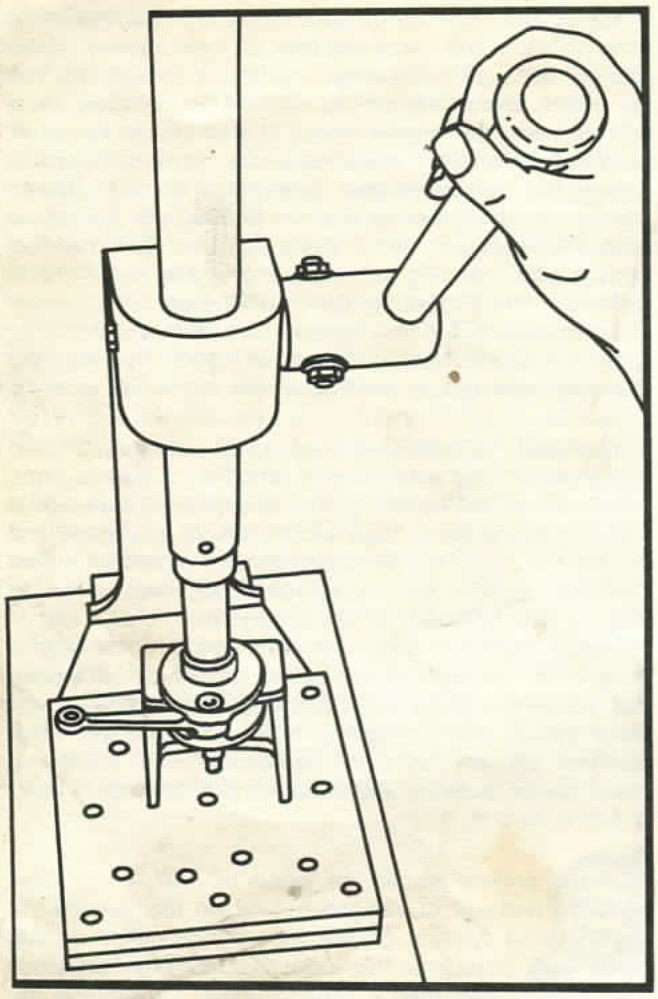


Fig. 25

Put on both bearing races. Care should be taken that races do not get mixed up. Insert crankshaft into crankcase half and give it a few turns so that it seats properly in the bearing. Insert centering pins and fit a new paper gasket. Grease or oil the gasket. Mount RH three screws and compress the crankcase by screwing on three screws facing each other. On RH crankcase put special tool No. 731.148 for measuring crankshaft axial clearance and secure it with two screws and suitable distance tubes as shown in the Fig. 27. Insert dial indicator No. 975.709 into device and screw on spanner No. 706.761 to crankshaft on the side of the flywheel magneto. Put engine in the vertical position and by pushing the spanner toward the crankcase, determine axial clearance which should be from 0.02 do 0.12 mm (0.0008 to 0.0047 in). If axial clearance is excessive, adjusting washers of 0.1 or 0.2 mm (0.004 or 0.008 in) should be placed under the two crankshaft bearings so as to obtain correct clearance. If crankshaft or crankcase is to be replaced, proceed as follows: the ideal spacing of the crankshaft supports is 36.00 mm (1.4173 in) which, of course, is difficult to obtain. For this purpose, a marking is provided on the crankshaft counterweight on the magneto side, stating the allowed deviation in minus. E. g.: marking 96 on the counterweight means that the actual spacing of the counterweight bearing supports is 35.96 mm (1.4157 in).

The ideal distance between the two bearings, impressed in either crankcase halves, when bolts have been tightened is also 36 mm (1.4173 in) (without the inserted paper gasket).

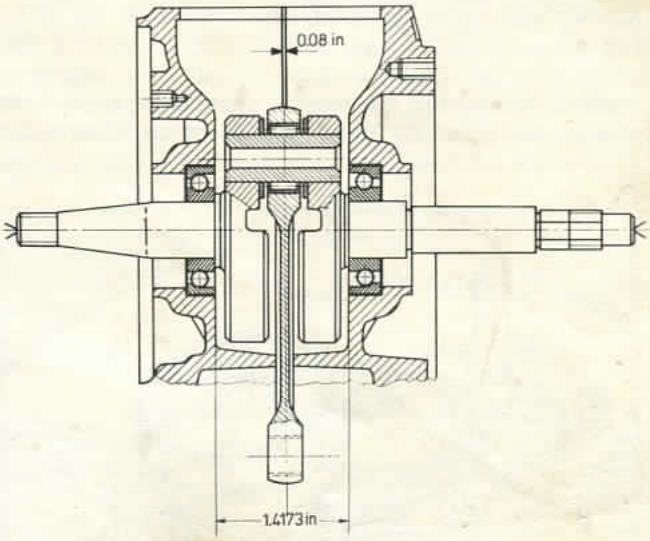



Fig. 26

The deviation from the ideal dimension is marked inside each crankcase half. E. g.: crankcase LH half + 0.11 mm (0.0043 in), RH half + 0.15 mm (0.0059 in). Thus the actual spacing of the bearings without gasket is 36.00 + 0.15 + 0.11 = 36.26 mm (1.4173 + 0.0043 + + 0.0059 = 1.4275 in). The paper gasket pressed between the two halves of the crankcase is 0.2 mm (0.008 in) thick. On basis of these values, the crankshaft axial clearance is calculated as follows:

36.26 + 0.2 = 36.47 mm (1.4275 + 0.008 = 1.4355 in)
36.46 – 35.96 = 0.5 mm (1.4355 – 1.4157 = 0.0198 in)

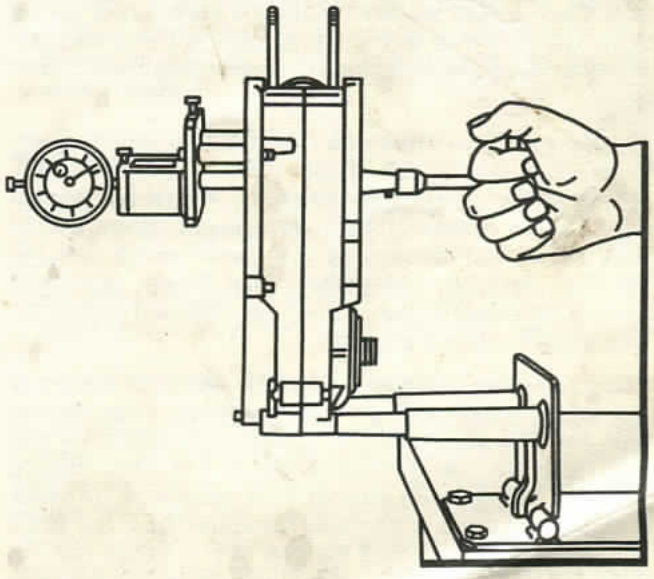


Fig. 27

If there is no marking inside the crankcase halves, the distance from the bearing race to the crankcase contact surface should be measured with a depth gauge. Since the crankshaft axial clearance can only be from 0.02 (0.0008 in) to 0.12 mm (0.0047 in), adjusting washers of a total thickness of 0.5–0.1 = 0.4 mm (0.0196–0.004 = = 0.0156 in) should be inserted under the crankshaft bearing inner races. Adjusting washers 0.1 mm (0.004 in) and 0.2 mm (0.008 in) are available from stock. In the aforementioned example 0.2 mm (0.008 in) adjusting washers are inserted, one on either side of the crankshaft or else, two washers 0.1 mm (0.005 in) on either side.

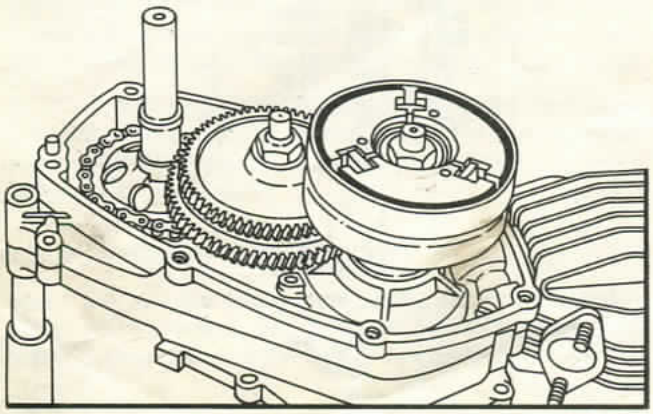


Fig. 28

Mount washers and bearings on crankshaft, assemble and check as described previousluy. Insert the remaining screws and tighten them with 1 kg/m (7 lb/ft) torque.

Insert a washer on the mainshaft needle bearing, taking care it does not slip between the crankcase halves since it is rather difficult to take it out.

Insert pedal shaft together with countershaft into bearings. Care should be taken that claw collar brake spring seats well in the recess in the RH half of the crankcase. Place on the crankshaft close to sealing ring and sintered bush.

Incorporate clutch drum with mounted 2nd speed clutch. When incorporating the clutch drum on the crankshaft, roller clutch impressed into the drum should be handled carefully. To prevent rollers from being driven out of their seats, thus destroying the clutch which has not yet been mounted along the whole length, push and turn, if necessary, the drum only leftward (direction where rollers do not engage).

Place adjusting washers under the clutch, incorporate 1st speed clutch and protective washer. With special tool No. 732.202 lock the clutch and screw on nut with spanner 19. Torque 2.5 kg/m (18 lb/ft). Before securing the nut with washer, it is necessary to check if centrifugal assy. is correctly separated from the drum and make sure the nut at the end of crankshaft has not locked the drum. Firmly hold 2nd speed driven gear with the left hand while gripping the clutch drum with the right hand: when clutch drum rotates leftward, both clutches idle, when it rotates rightward the motion is transmitted to the crankshaft so only 1st speed clutch rotates. In case 2nd speed clutch is locked against the clutch drum, the vehiche cannot be pedalled as in this way also the engine would operate. If, on the other hand, the clutch drum is locked on the crankshaft, engine cannot run in neutral gear. Clearance between shoes and clutch drum rim is 0.4 mm (0.0157 in). Excessive axial clearance of clutch drum on the shaft can be removed by inserting the adjusting washers of 0.3 mm (0.0118 in) or 0.5 mm (0.0196 in) between clutch drum and clutch. Axial clearance must be within 0.1 (0.004 in) and 0.3 mm (0.0118 in). When all has been checked and mounted, lock nut by turning up the protective washer.

If necessary, fit adjusting washers to countershaft and pedal shaft. Axial clearance of pedal shaft can be from 0.1 (0.004 in) to 0.3 mm (0.0118 in) or else, claw collar may not correctly engage when pedalling forward and the vehicle could not be ridden as a bicycle. Same axial clearance applies to countershaft. Insert two centering pins to the RH half of crankcase and fit new paper gasket. Check the torsion spring 209.048 for proper location in its seat in the partition wall of crankcase half. Leave the pedal shaft alone until engine is closed since spring may spring out of its seat and get stuck between starter chain and crankcase wall. Fit cover, insert seven screws and screw them on with 1 kg/m (7.2 lb/ft) torque.

Turn the engine placed on stand for 90°. First, clean possible rests of crankcase gasket on the outside. Fit slightly oiled cylinder gasket. Incorporate piston so that piston ring pins face the exhaust. Carefully insert two wire circlips and mount oiled cylinder. By rotating the crankshaft, check piston travel in the cylinder. Mount cylinder head, washers and nuts and crosswise screw on nuts to ensure uniform fitting of cylinder head and cylinder flange. Torque 1.2 kg/m (8.7 lb/ft). Turn the engine on stand so that magneto is on top. Insert rubber stopper with inserted cables into the crankcase and place flywheel magneto base plate into LH half of crankcase. Put plain and toothed washers under base plate screws and lightly screw them on. If necessary, slightly oil felt insert piece in the middle of base plate. Clean conical part of the crankshaft and magneto flywheel. Insert roller into bore hole on the crankshaft. Fit flywheel, taking care that groove on the flywheel coincides with roller on the crankshaft. Insert washer and screw on nut with 3 kg/m (21.7 lb/ft) torque. When screwing on the flywheel nut, lock flywheel with special tool No. 732.202.

By no means should magneto flywheel be locked with screwdriver between poles of flywheel and ignition or lighting coil.

### Adjusting Contact Gap and Ignition Advance

To adjust the contact gap, turn the flywheel so that the cam separates the contacts to the maximum. Loosen the relevant screw. Insert a screwdriver in the slot of the base plate and angle plate and turn the angle plate to obtain a contact gap of 0.35 to 0.45 (0.0137 to 0.0169 in). Measure the gap with a feeler gauge. Tighten the screw and recheck the gap. To adjust the ignition

advance, unscrew the spark plug and screw in its place in the cylinder head a special device No. 732.193 with the incorporated dial indicator No. 975.709. Tighten three screws securing the base plate to the crankcase. To check the moment of breaker points opening, use the 6 V bulb of 3 W maximum rating. The battery 6 V or suitable battery insert may be used instead. Connect the battery minus pole to the crankcase and connect the bulb between the battery minus pole and the connection of the short circuit switch conductor. For this purpose, it is best to apply a checking instrument with an incorporated bulb and battery (see Fig. 29). Turn the magneto flywheel with hand in the direction of engine turning (counterclockwise, looking at the magneto flywheel) and watch out the moment when the bulb lights up faintly. Now observe the dial indicator, screwed in the cylinder head, and read off the dial indicator (in millimeter or tenths of millimeters) to establish the distance the piston pushes gauge pin toward TDC. This is the distance the piston travels from the ignition point to TDC. The ignition advance should be from 1.8 to 2 mm (0.07 to 0.078 in) BTDC. If by checking it is established that ignition advance is excessive, loosen three screws of the base plate and turn the base plate in the direction of rotation of the magneto flywheel, then tighten the screws and recheck the ignition advance. Apply the same procedure in case of too small ignition advance but turn the base plate in the opposite direction of rotation of the flywheel.

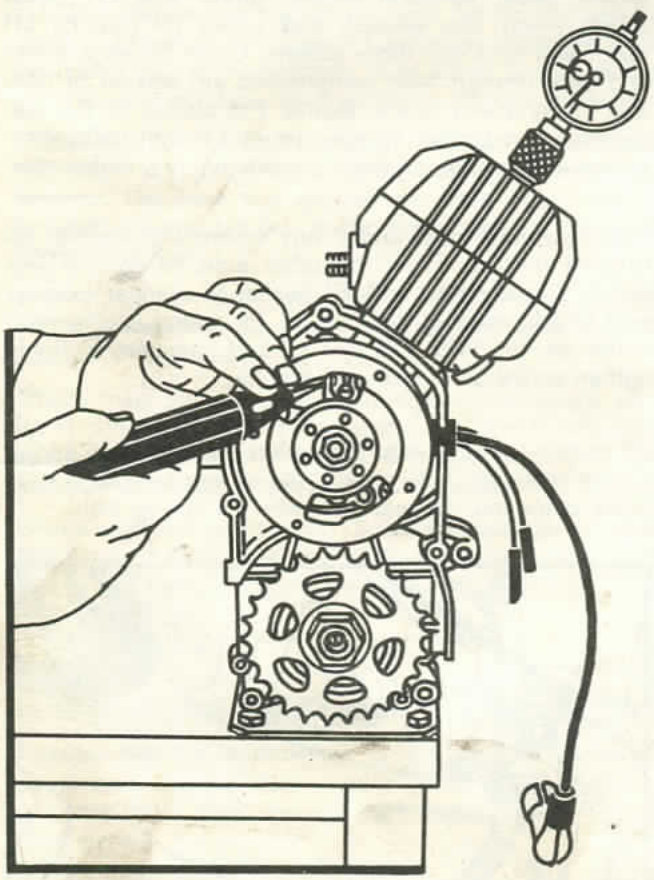


Fig. 29

When checking the ignition advance, let the checking lamp be switched on only for a short time. Lengthy use or stronger bulb may have a damaging effect on flywheel magneto (demagnetization).

**Combined checking of Contact Breaking Gap and Ignition Timing**

The contact breaking gap is determined by the position of magneto flywheel pole in relation to the ignition coil core in the moment of primary circuit interruption. The contact breaking gap is an accurately determined value on which depend the ignition voltage and the sparking strength on the spark plug.

Measure the contact breaking gap at the moment when the checking lamp slightly lights up indicating that the primary circuit is interrupted and sparking has begun.

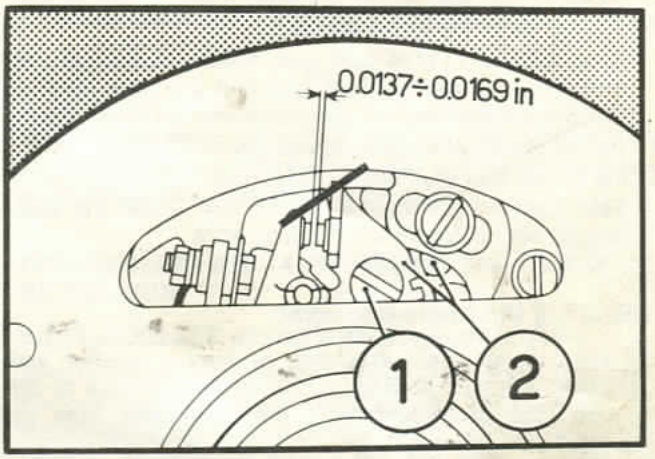



Fig. 30

Do not set the ignition timing with the contact gap or else, also the contact breaking gap will change. Magneto base plate is provided with oblong securing openings for setting the contact breaking gap and ignition timing. Check the contact breaking gap every 6000 km (3500 miles) since the gap alters with wear of cam and cam lobe in the flywheel magneto.

If the contact breaking gap is too large or too small, the ignition power is smaller. This is noticed particularly at slow travelling speed with switched on lights when the ignition power which is barely sufficient for starting, is further weakened by the reaction of the light coil, reducing, of course, in this manner power of the magnetized flywheel.

**Trafficator**

Your TOMOS AUTOMATIC SILVER BULLET is equipped with trafficator system and dry battery to make riding safer.

When the kill switch is switched On current flows from dry battery to either left or right winker which will function.

**Battery – SILVER BULLET model**

In the battery box are dry NiCd 6 V – 1.5 Ah battery, relay 6 V and fuse 15 A. It is not recommended to charge dry battery by using standard charger, because current higher than 2 A may damage battery. It is enough to charge new dry battery by running engine for about 15 minutes. After that the battery is ready for use. Dry NiCd battery is completely closed so that no special maintenance is required.

**OIL PUMP**
**SILVER BULLET model**

**After reparing of models SILVER BULLET A3SP an SILVER BULLET A3GM you must keep to the following instructions:**

The pump is connected to magneto nut on the crankshaft by a special clutch.

When mounting the oil pump always make sure that the clutch is properly incorporated or otherwise several engine damage may occur.

- Unscrew vent screw on the oil pump and wait until oil from the tank under the seat flows to the pump. The screw is then screwed on.
- Pour approx. 1 l (1/4 gall) gas mixture in the ratio of 1:50 (2% oil) into the fuel tank and start the engine. Let the engine run for approx. 5 min so as to make the oil pump push oil to the engine.
- Fill up the fuel tank with regular gas.
- Take care lest oil level in the oil tank under the seat should not fall under the marking MIN.

**Installing the Chain Sprocket**

Fit ring, install chain sprocket, protective washer and screw on nut with 4–5 kg/m (29–36 lb/ft) torque to the part of gear protruding from the crankcase. Turn up washer to secure nut.

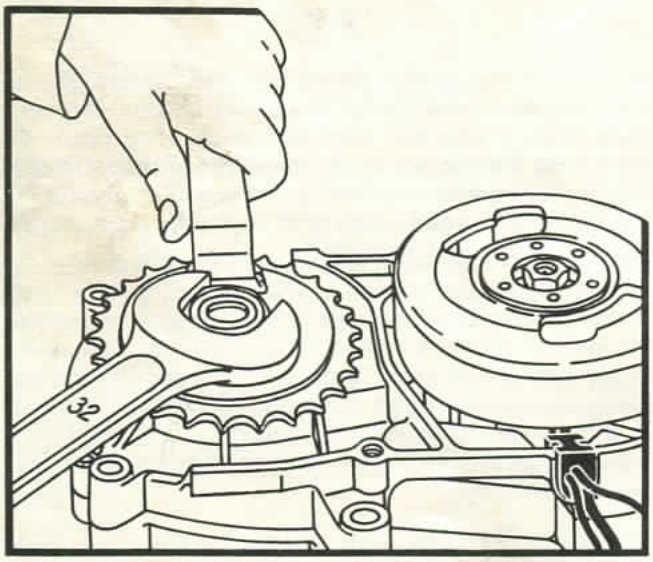



Fig. 31

**Incorporating the engine into the frame**

First mount intake silencer to its place in the frame. Silencer tube must be mounted on the intake silencer. Fix engine into frame and first insert bottom supporting screw through the frame and support eyelet on the crankcase (nut on the engine RH side). Adjust the engine so as to make openings on the frame coincide with the support eyelets on the crankcase and insert the two screws left. Put plain and spring washers on screws and, besides, spring carrier for centre stand on the bottom screw. Screw on all three nuts. Connect electric cables as follows: the yellow to yellow, the black to black. Screw on spark plug and cable plug and put cable plug on the spark plug. Mount chain on the chain sprocket in engine and connect both ends with master chain link and adjust it, if necessary (as shown in Figs. 32 and 39).

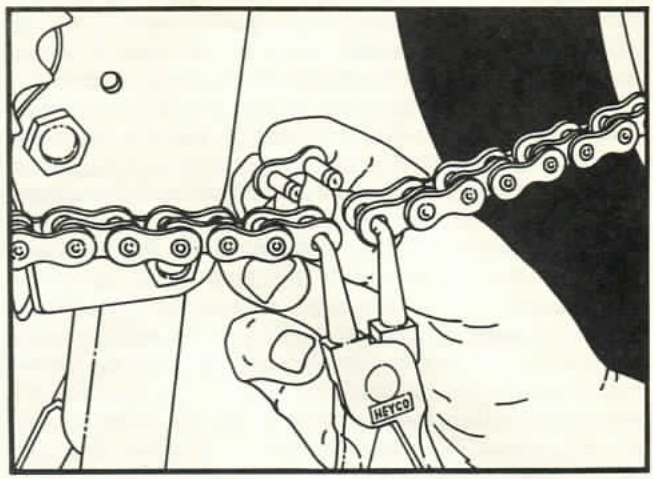



Fig. 32

With its closed part, the master link circlip must face the direction of engine rotation.

Mount chain sprocket plastic guard and LH pedal crank. Insert pin, washer, and screw on nut. Fit LH cover and fix it with three screws. Clean (wash in petrol and blow through with compressed air) and oil air filter and insert it into rubber sleeve. Put sleeve on the carburettor, put gasket on cylinder and mount carburetor. Insert and screw on two screws on the carburettor.

Mount exhaust pipe and insert screw with washer on exhaust bracket. From the other side, fit washer and screw on nut with hand. Fit gasket to cylinder exhaust port and fit exhaust pipe flange. Fit spring washer and screw on nut. With spanner 10 and screwdriver, firmly tighten screw on the exhaust bracket.

Fit centre stand spring: first insert top hook into spring carrier then carefully stretch the spring so that bottom hook jumps into its seat on centre stand (Fig. 33).

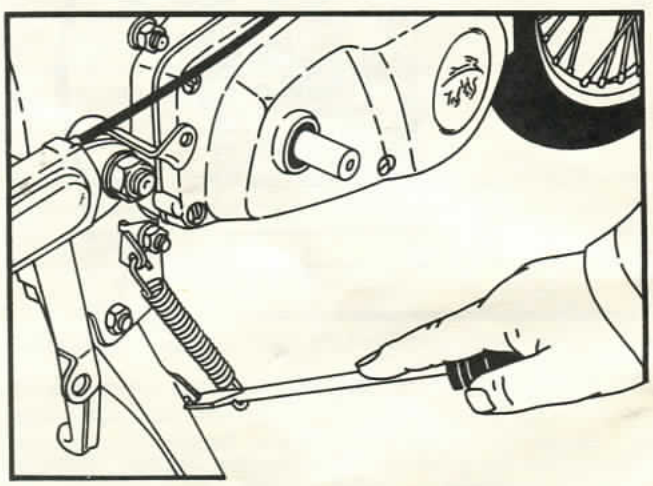


Fig. 33

On the right hand side of engine put washer, spring and cup on pedal shaft. Fit RH pedal crank and push the crank along the shaft so as to make spring compress to enable insertion of pin. Fit also washer and screw on nut.

With a screwdriver screw on oil drain plug and sealing washer. Unscrew two plugs for filling and checking oil level. Pour approx. 220 (1/2 pint) cc of oil for automatic gearboxes into the gearbox. When filled up, oil should come flowing out of the checking opening. Stop both openings by screwing on screws and sealing washers.

Connect rubber fuel supply line to carburettor float chamber cover. Fit RH engine shield and fix it with three screws. Likewise, fit LH engine shield.

Check operation of engine and all systems when engine is running.

## DISMANTLING THE »ENCARVI« CARBURETTOR

After the carburettor with intake flange has been detached from engine, disassemble and check it in the following order. First loosen with a screwdriver the tightening screw on the carburettor and detach flange from the carburettor.

Unscrew throttle piston cover with hand. Compress spring and loosen end of control cable wire upon which throttle piston, throttle piston spring and cover are released. The dismantled carburettor with all its component parts is shown in the Spares Catalogue. Unscrew main jet holder with a screwdriver or spanner 9 and, with a smaller screwdriver, unscrew main jet out of holder.

Unscrew screw on fuel supply connection with spanner 11. Separate screw, fuel supply connection and fuel strainer. Unscrew two screws on float cover with a screwdriver and remove cover. Carefully remove cover gasket and float.

First check all carburettor parts, main jet and throttle piston. Check throttle piston for possible wear and replace it, if necessary.

Check main jet and blow it through, if necessary, with jet of compressed air. Never clean the jet with thin wire since tiny openings may get enlarged, fuel flow will increase and engine operation will be essentially altered.

Check carburettor float for possible damage or leak. Make sure it is in order by shaking the float. Presence of fuel in the float indicates damage of float. Then check all other parts.

## REASSEMBLING THE »ENCARVI« CARBURETTOR

Reassemble the carburettor in the reverse order of operations. Special care should be taken when fitting throttle piston cover into the carburettor, along with all other parts.

During reassembly, you should make sure the needle points upward and float moves freely (by shaking it). Check engine operation, cold start mechanism and set neutral gear by adjusting throttle control cable on throttle twist grip.

When carburettor has been fixed to flange and mounted on the cylinder, check if it is vertical and pushed forward as far as possible.

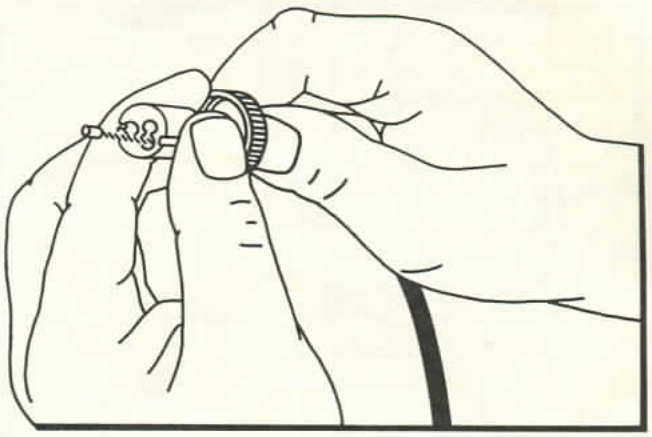


Fig. 34

Uneven operation in neutral gear may be corrected by slightly tilting the carburettor. On the other hand, the carburettor may inadvertently be damaged.

## DISMANTLING AND ASSEMBLING THE FRONT WHEEL HUB

### SILVER BULLET model with magnum wheels

With spanner 10 unscrew nut on front lever (Fig. 35). Put out fixing screw and control cable. With spanner 10 retain adjusting screw on the control cable and with another spanner 10 loosen the nut. With spanner 19 unscrew both nuts on the knock-out spindle, remove two washers and raise front forks to release the wheel. Hold nut on the other side of brake plate with one spanner 19, and remove washer and complete brake base plate on the side of brake plate with the other spanner.

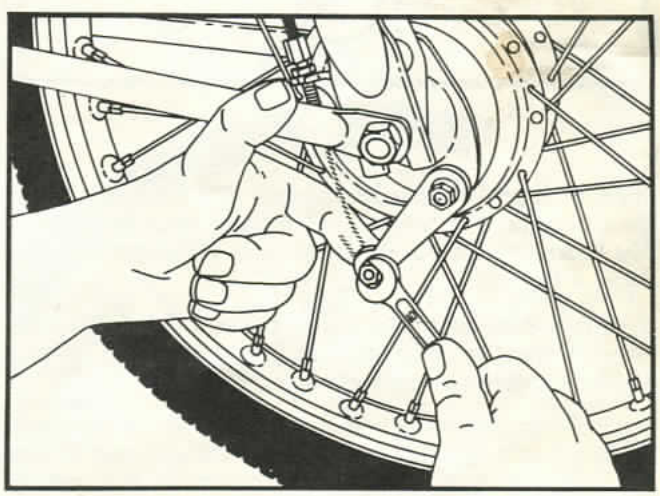


Fig. 35

Fix the brake base plate into vice. With spanner 10 unscrew nut on brake lever, remove washer and with a screwdriver detach lever from cam. With a screwdriver remove one hook from spring, detach shoes and extract cam (Fig. 36).

With two spanners 19 unscrew two nuts at bearing cones. Remove distance washer, with spanner 17 unscrew bearing cones and remove spindle. With a screwdriver remove both protective rings. Shake balls out of both sides and wash bearing cups in petrol and blow

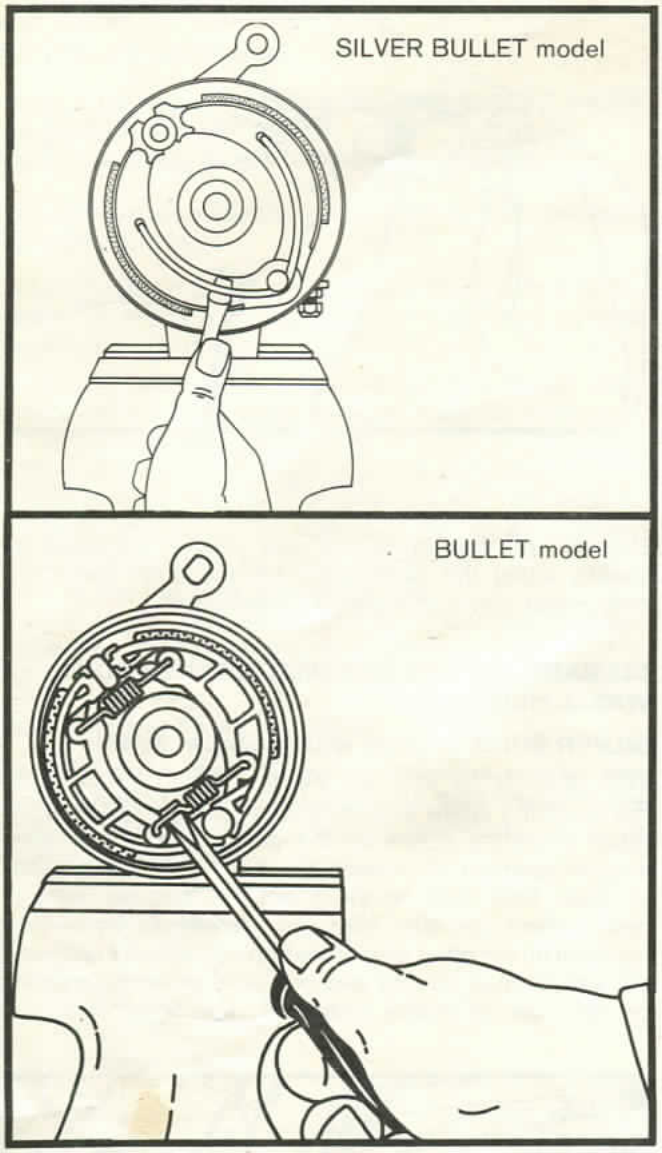



Fig. 36

them through with compressed air. Check bearing surface of cups and replace bearings, if necessary. Drive out bearings with a suitable bolt (dia 12, length 100 mm /4 in/ – Fig. 37).

Impress new bearing cups with special tool No. 702.856. Insert protective rings so that they are placed 1.5 mm (0,06 in) lower than bearing cup edge.

Fill in the gap between both cups and inside of cups with grease. Insert 10 balls on either side. Check brake linings wear. This check is effected by measuring with a calliper gauge the brake shoe dia when the shoes are most apart (by the brake cam, of course) then measure the inside dia of brake drum. If the dia of the brake shoes spaced apart is only for 0.5 mm (0.02 in) greater than that of the drum, the brake shoes should be completely replaced or else. The brake linings wear can also be checked visually, without a calliper gauge.

Check brake cam for excessive wear and also inspect the toothed part where the brake lever is attached. If the brake lever is worn or brake lever fixing teeth are damaged, the cam should be replaced by a new one. Check also other brake drum parts and replace them, if necessary.

Reassemble the front wheel hub in the reverse sequence of dismantling. Fit brake cam into brake base plate, fixed in the vice, and grease it in its seat. Set brake lever, fit washer and screw on nut. Fit both brake shoes and insert spring with one hook fitting into the shoe. With suitable pliers stretch the spring and hitch the other hook. Check opening and closing of shoes. insert knock-out spindle into the hub and screw on both bearing cones. Compress the cones to such extent that wheel while holding the spindle, rotates easily and is free of axial clearance.

On left hand side set distance washer and screw on both thin nuts. Hold bearing cones with spanner 17 and tighten two nuts with spanner 19. Insert brake base plate, using and screw on this nut with spanner 19.

Insert complete front wheel into the forks so as to make brake base plate slot hitch on RH leg of forks. Fit mudguard stay, on either side fit nut under the washer and check if wheel is properly fitted in the middle of legs. Attach front brake and adjust it by help of screw. Brake lever on the handlebar must have 2 to 3 mm (0.08 to 0.12 in) clearance. Turn front wheel while checking the brake operation.

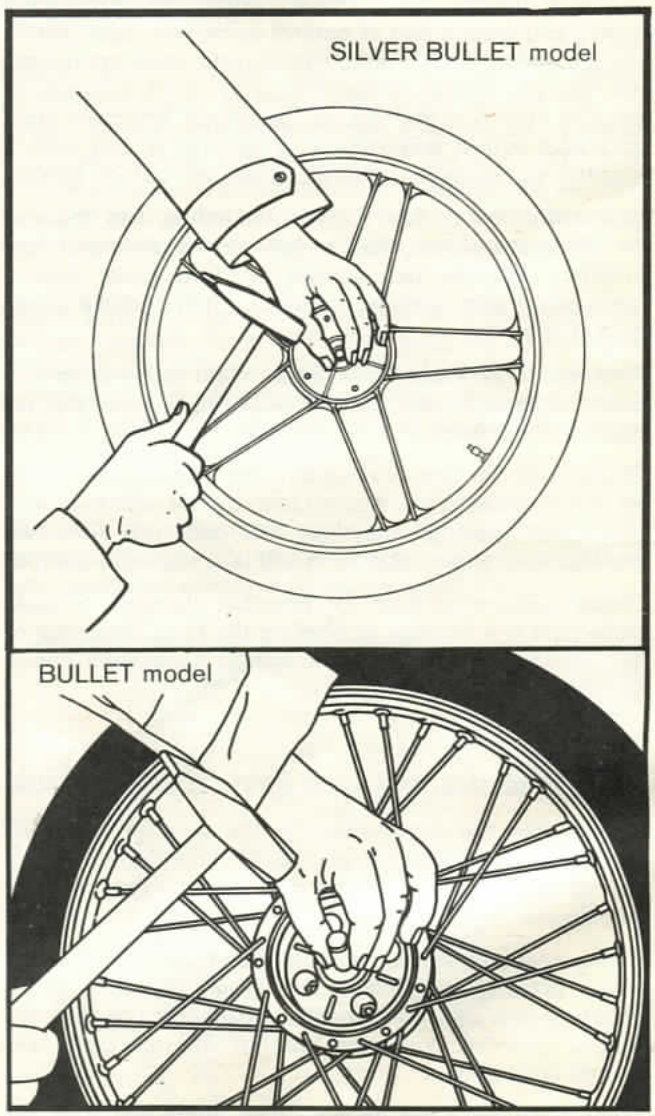



Fig. 37

## DISMANTLING AND REASSEMBLING THE REAR WHEEL HUB

### SILVER BULLET model with magnum wheels

With spanner 10 unscrew nut on rear brake lever. Put out fixing screw and control cable. With spanner 10 hold adjusting screw on the control cable, with spanner 10 release adjusting screw nut. Unscrew adjusting screw on hub and detach control cable from the hub. Turn the wheel with hand and locate chain master link. Extract circlip, plate, master link and remove chain from the rear chain sprocket. With spanner 19 unscrew both nuts of the rear knock-out spindle, remove washers and push the wheel forward so that spindle is put out of lugs on swinging arm. Tilt the vehicle, release slot on brake base plate and extract complete rear wheel. For dismounting the chain sprocket, first unfold protective washers from screws, with spanner 11 unscrew all 4 screws and dismount protective washers and chain sprocket. In this manner also 4 nuts in the hub inside are released. Disassembling of hub and brake base plate is similar as with front wheel hub.

Assembling rear wheel hub:

Check individual parts in the following sequence: check chain sprocket for wear or possible damage. The most reliable check of chain wheel is by testing the fitting of new chain to chain sprocket. If necessary, the sprocket should, of course, be replaced. Assemble following the reverse sequence of dismantling. Fit chain sprocket and protective sheet.

Insert nut into socket spanner 11 and place it under screw M7 which must be screwed on from the other side. This can be done also with suitably narrow pliers, as shown in the Fig. 38.

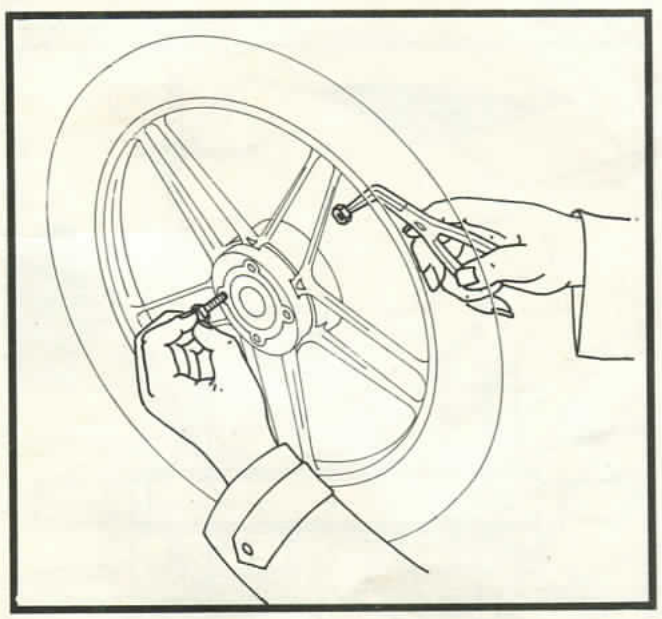


Fig. 38

Screw on all four screws with 1.2 kg/m (8.8 lb/ft) torque by turning up protective washer. Further assembling is effected following the reverse sequence of dismantling, similar as with front wheel only that distance bush is placed under the thin nut on brake base plate.

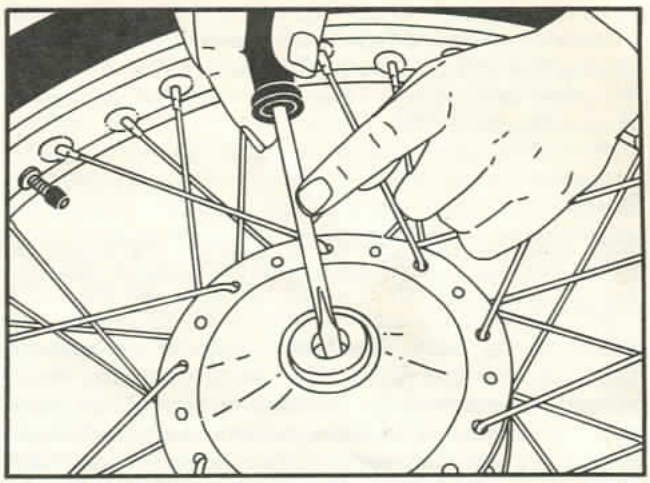


Fig. 39

## DISMANTLING AND REASSEMBLING THE FRONT WHEEL HUB

### BULLET model with ball bearing wheels

Following the described disassembly under the heading »Dismantling the front wheel hub – SILVER BULLET model with magnum wheels«, remove the front wheel from forks. Hold spindle nut on LH of wheel hub with spanner 17 and unscrew spindle nut on brake base plate side with another spanner 17. Extract two washers from spindle, brake base plate and distance tube. The spindle is thus released and can be extracted along with the distance bush then also the nut is unscrewed. Carefully remove bearing protective cap with a screwdriver or other suitable tool, Fig. 39. By slight knocks on a suitable bolt dia 8×150, drive out the bearing at the brake base plate, Fig. 40; the distance tube is thus released and can be extracted.

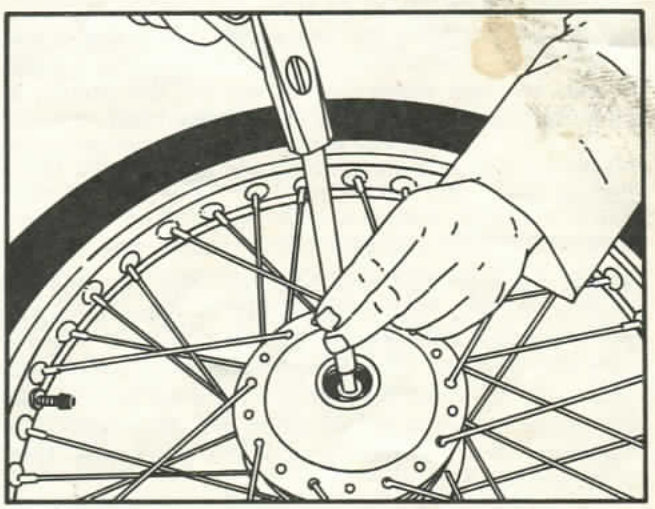


Fig. 40

Turn the wheel and with bolt Ø 15×150 (1/2×6 in) drive out the other bearing. Thoroughly wash and dry all parts. Check and replace, if necessary, all damaged or worn parts. Measure also distance tube since unsuitable length of tube affects the axial load of bearings and causes their early wear.

Reassembling the front wheel hub:

Grease well distance tube and both wheel hub bearings. Impress bearing into hub from left hand side with a

suitable accessory of 27 dia (1.1 in). From the other side, insert distance tube, insert previously impressed bearing with and accessory of 27 dia (1.1 in) and impress the other bearing into wheel hub with an accessory of same dia 27 (1.1 in).

NOTE:

Both bearings 12 × 28 × 8Z should be impressed so that the closed side of bearing faces outward. Impress also protective cap.

Screw on the nut to the end of spindle with shorter thread, fit distance bush close to the nut and insert both into wheel hub. On the side of brake base plate, mount to the spindle the other distance bush, brake base plate assy., two washers and then screw on nut (with 0.5 to 1 kg/m (3.6 to 7.2 lb/ft) torque).

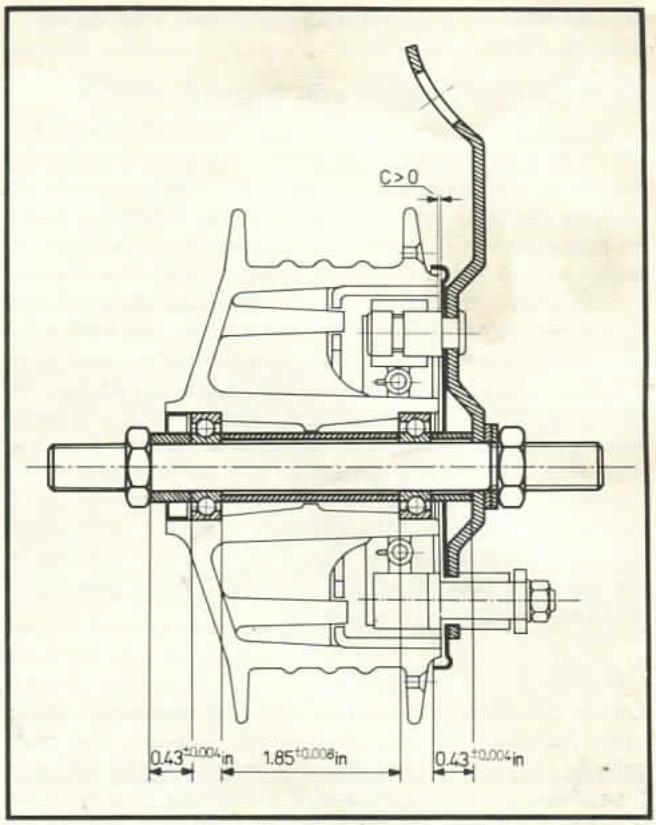



Fig. 41

## DISMANTILING AND REASSEMBLING THE REAR WHEEL HUB

### BULLET model with ball bearing wheels

As described under the heading »Dismantling the rear wheel hub – SILVER BULLET model with magnum wheels«, remove rear wheel from the swinging arm.

Hold spindle nut on the side of chain sprocket with spanner 17. With another spanner 17, unscrew spindle nut on the side of brake base plate. Extract distance bush, brake base plate assy. and the other distance bush. From the other side, extract spindle on which the third distance bush is fitted. Remove the chain sprocket. Dismounting and mounting the chain sprocket is done by following the instructions under the heading »Dismatling and reassembling the rear wheel hub – model with cones«. The bearings are driven out in the same manner as with the front wheel (first driven out the bearing at the brake base plate and extract distance tube).

Wash and dry all dismounted parts and replace them, if necessary.

Reassembling the rear wheel hub:

Grease distance tube and both bearings. Impress the bearing into the hub on the side of chain sprocket, turn the wheel and insert distance tube and impress the other bearing. When impressing the bearing, the previously impressed bearing should be set to a suitable accessory of 27 dia (1.1 in) while the other bearing is impressed with the accessory of the same size. Then fix the chain sprocket.

NOTE:

Both bearingas are impressed so that the closed side of bearing faces outward. Screw nut on the spindle end with shorter thread. Close to the screwed nut put the longer distance bush 13 mm (1/2 in) on spindle and insert the latter into the wheel hub from the side of chain sprocket. Put distance bush 11 mm (0.43 in) on spindle on the side of brake base plate, brake base plate assy., the other distance bush 11 mm (0.43 in) and screw on nut with 0.5 to 1 kg/m (3.6 to 7.2 lb/ft) torque.

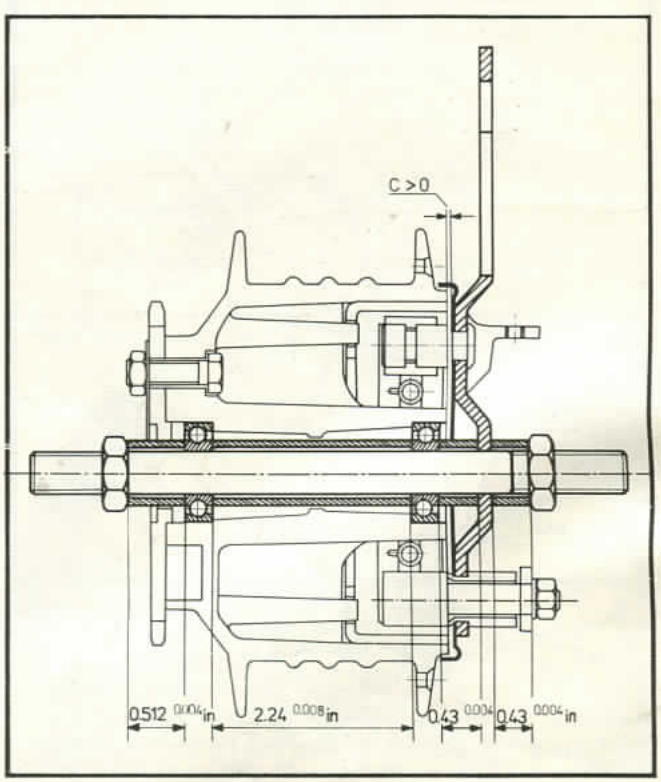



Fig. 42

## INSTALLING THE REAR WHEEL INTO THE FRAME

Place the complete rear wheel into the swinging arm by taking care that slot on the brake base plate hitches on the RH leg of swinging arm. Install chain tension adjuster and screw on the nuts all the way in with hand. Install the chain and join the two ends as shown in the Fig. 42.

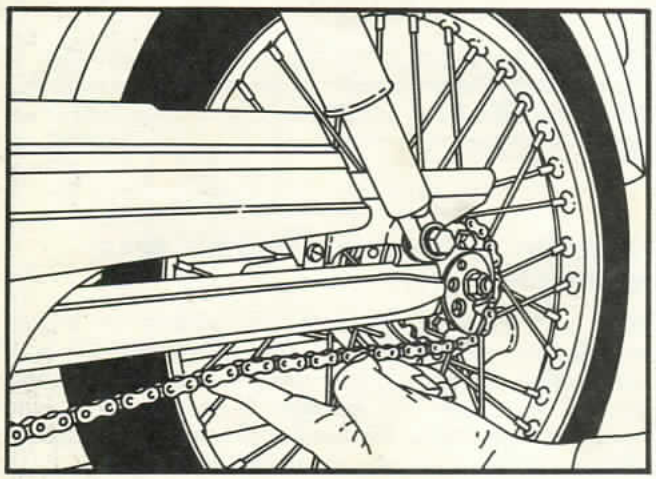


Fig. 43

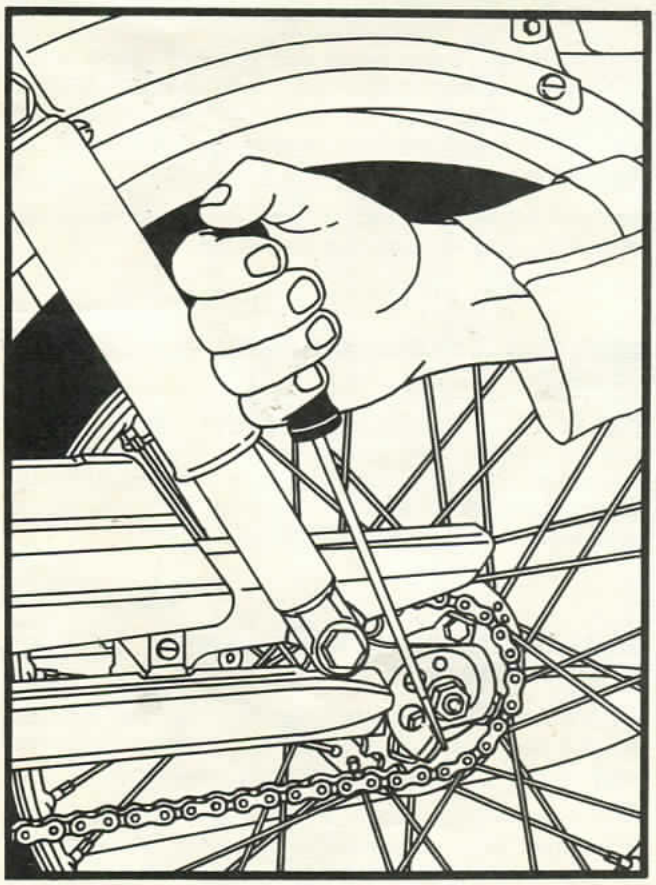


Fig. 44

Adjustment of the drive chain tension is extremely important and greatly affects the life of chain sprocket, the chain and also spindle bearings. The upward sag of chain should be 10 mm (0.4 in) with the motorcycle resting on its wheels, Fig. 43. The chain should be tensioned enough not to show sag or else, when shifting up from 1st to 2nd gear, the chain will undulate and the vehicle will give a jerk. Chain tension is adjusted by turning the chain tension adjusters, as shown in the Fig. 44. When tensioning the chain, check also with a straight bar or a tight rope if front and rear wheels are aligned. Chain tension adjusters are rotated with a screwdriver or slight knocks of mallet. Upon having obtained the correct tension of chain and proper alignment of wheels, first screw on the two nuts to the end with spanner 17. Upon that, recheck chain tension. Attach rear brake control cable following the reverse sequence of dismantling.

## REMOVING AND REINSTALLING THE REAR SHOCK ABSORBER

With spanner 17 unscrew both screws fixing the spring shock absorber into frame and swinging arm. Extract the two screws, washers and dismount the rear shock absorber.

The shock absorber is no further dismantled. Besides, spares for this unit are not available so that in case of damage the complete shock absorber is replaced. When shock absorber needs greasing, it will do to unscrew the top lug and grease the spring.

## REMOVING THE FRONT FORKS AND HANDLEBAR FROM FRAME

Remove the front wheel from forks (see chapter on removing the front wheel from forks).

With the fork spanner 10 unscrew 4 nuts fixing the front mudguard on fork legs, remove 4 spring washers, extract screws and detach the mudguard from forks. With spanner 10 unscrew the two screws on the headlamp and detach the headlamp from forks. Remove clip on bottom part of the headlamp with hand and extract the headlamp. Press connections with hand, one by one, release wires and remove headlamp bracket. With spanner 10 unscrew horn fixing screw, unscrew both wires with a screwdriver and detach horn. From both brake levers pull out front and rear brake control cables (extract the two rollers). Pull out throttle control cable on the throttle twist grip (unscrew only protective nut). Pull the throttle twist grip rightward and detach the control cable.

With spanner 14 release handlebar center screw for approx. 5 turns. Raise the handlebar and remove it. If the handlebar is too firmly pressed into the tube, knock the screw head with a plastic or wooden mallet. With spanner 30 unscrew crown nut and remove washer above the handlebar bearing. With spanner 13 unscrew two closed nuts remove washers and detach fork lug from forks. With tubular or box spanner 13 unscrew both nuts on top part of legs and extract both sliding

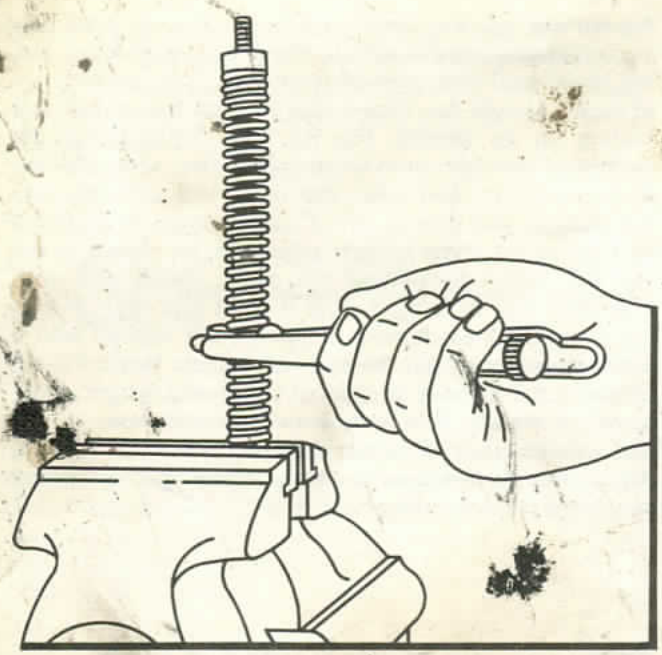


Fig. 45

tubes. Fix the RH sliding tube on bottom end into vice and with spanner 19 unscrew spring with two screwed plugs. Fix the screwed plug into vice and by help of suitable pliers, unscrew spring (Fig. 45). Repeat same operation with the other screwed plug.

Remove rubber dampers from both legs.

With pointed nose spanner unscrew grooved nut, remove protective cover, top bearing cup and remove front forks from frame. So 42 balls are loosened, 21 on top and 21 on bottom. With plastic or wooden mallet drive out of frame top and bottom bearing cups. Check balls, bearing cups and fixing places for mounting the forks on the frame. Check forks for possible deformation. Check all other fork parts for possible mechanical damage. In top part of forks plastic sleeves are inserted which are dismounted only when they are to be replaced.

## REASSEMBLING THE FRONT FORKS

Assemble and install the front forks into frame following the reverse sequence of dismantling. When inserting the balls, make use of grease on bearing cups; grease also both springs in forks. Attach brakes under the described order of operations under the heading »Assembling the front wheel hub«. Upon the effected assembly, test the controle and lights. All ellectrical connections are showned on wiring diagram Fig. 46.

## REMOVING AND REINSTALLING THE SWINGING ARM FROM/INTO THE FRAME

With screwdriver unscrew 6 screws on both engine shields and detach shields. Remove rear wheel as described under the heading »Dismounting the rear wheel«. Dismount both rear spring shock absorbers as described under the heading »Dismounting«. With screwdriver unscrew the screw on chain guard and detach chain guard from forks.

With one spanner 19 hold screw on the fork centre of rotation, with the other spanner 19 unscrew nut on the other side. With bolt of 9 mm dia (0.35) in drive out screw and detach swinging arm from frame. With bolt of 16 mm (0.63) in dia drive out distance bush from sliding bearings on the frame. Drive out sliding bearings with a suitable bolt only when they are to be replaced. Check all parts and replace them, if necessary.

Mount swinging arm following the reverse sequence of dismounting. Distance bush is greased before installing the forks. This bush should turn in its seat and must not be firmly rammed into place.

## REMOVING AND REINSTALLING THE REAR MUDGUARD

With a screwdriver unscrew four screws on engine shields and detach the two shields. Detach the light cable. With a screwdriver unscrew tail light screw, detach cover and with spanner 7 unscrew both nuts from the light (from the inside of mudguard). Detach tail light cable and dismount tail light housing.

With a screwdriver and spanner 10 unscrew six screws of rear mudguard and detach mudguard from frame.

Install following the reverse sequence of dismounting.

## REMOVING AND REINSTALLING THE CENTRE STAND

Put out centre stand recoil spring with suitable pliers. During this operation, the motorcycle should rest on its wheels. With spanner 13 unscrew lock nut the right side of the stand. Remove washer, unscrew screw and detach the stand from frame.

Reinstall the centre stand following the reverse sequence of dismounting, as shown in the Fig. 33.

## REMOVING AND REINSTALLING THE LUGGAGE CARRIER

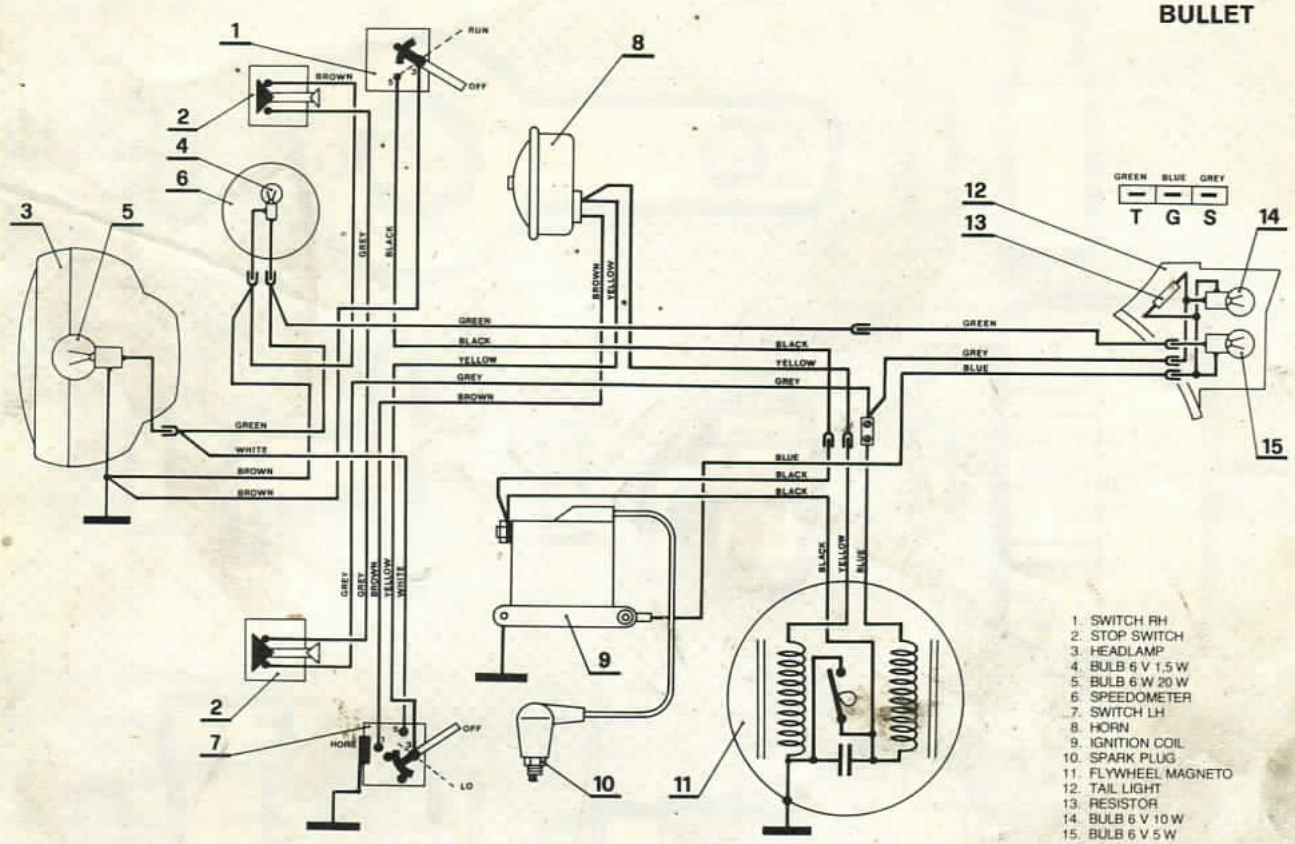
With spanner 13 unscrew nut on screw under the seat, remove washer and extract screw. Detach tool bag. With spanner 10 unscrew two screws and detach luggage carrier. Reinstall the luggage carrier following the reverse sequence of operations in removing.

## DISASSEMBLING AND ASSEMBLING THE EXHAUST PIPE

Dismount the exhaust pipe assy. From the frame following the sequence of operations described under the heading »Removing the engine from the frame«.

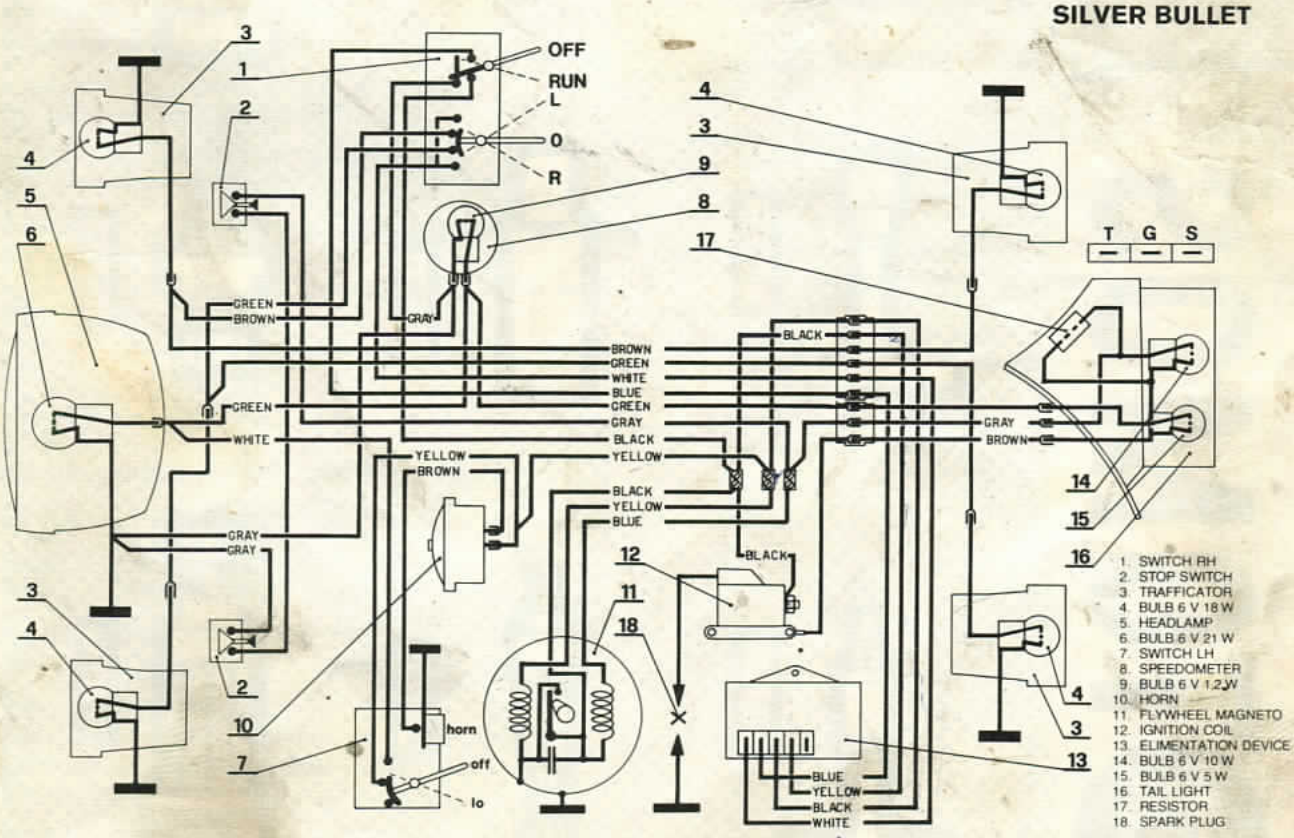
With a screwdriver unscrew at the end of exhaust pipe and extract exhaust pipe baffle tube. If necessary, clean the pipe and the baffle tube. Assembly and mounting of exhaust pipe are effected by following the reverse sequence from disassembly.

## BULLET




1. SWITCH RH
2. STOP SWITCH
3. HEADLAMP
4. BULB 6 V 1,5 W
5. BULB 6 W 20 W
6. SPEEDOMETER
7. SWITCH LH
8. HORN
9. IGNITION COIL
10. SPARK PLUG
11. FLYWHEEL MAGNETO
12. TAIL LIGHT
13. RESISTOR
14. BULB 6 V 10 W
15. BULB 6 V 5 W

## SILVER BULLET




1. SWITCH RH
2. STOP SWITCH
3. TRAFFICATOR
4. BULB 6 V 18 W
5. HEADLAMP
6. BULB 6 V 21 W
7. SWITCH LH
8. SPEEDOMETER
9. BULB 6 V 1,2 W
10. HORN
11. FLYWHEEL MAGNETO
12. IGNITION COIL
13. ELIMENTATION DEVICE
14. BULB 6 V 10 W
15. BULB 6 V 5 W
16. TAIL LIGHT
17. RESISTOR
18. SPARK PLUG

FIG. 46. WIRING DIAGRAMS

White 6v out
Black ~~6v supply~~
Yellow 6v supply
Blue kill

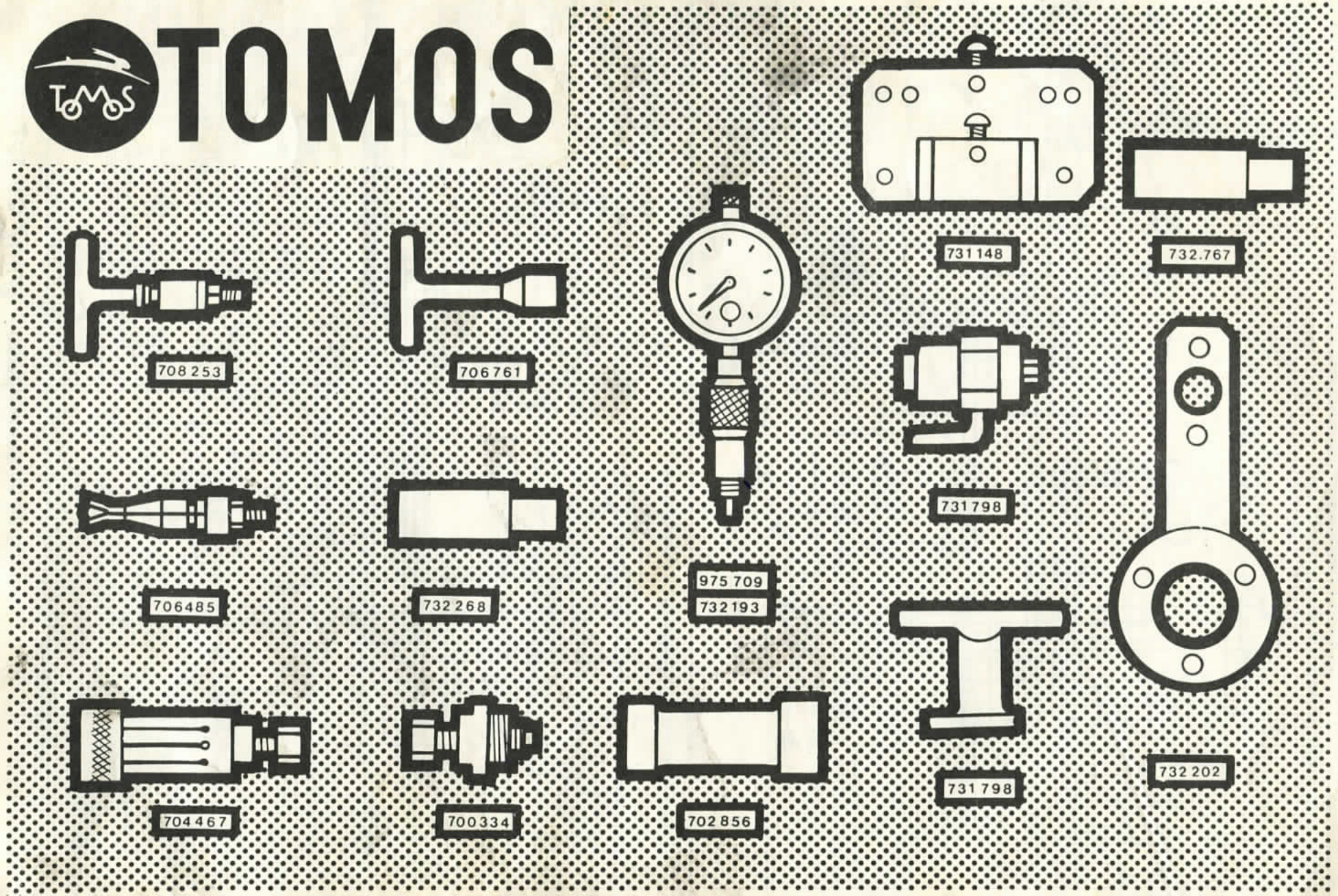



Fig. 47

Tomos set of speciale tools

## TRACING TROUBLES AND REMOVING

### Troubles in fuel supply system

If engine fails to start or falters it may be due to:

- Choked fuel supply:
  Check if there is enough fuel in the fuel tank and if feed tap is open.
- Choked fuel strainers:
  Blow through fuel strainer in carburettor and on fuel feed tap.
  The carburettor is damaged or leaking air the joint.
- Incorrect use of choke button:
  Follow instructions for cold starting.
- Incorrect mixture:
  Drain off fuel tank and fill it with standard mixture.
- Incorrect setting of free play:
  Increase number of engine R.P.M, by help of adjusting screw on throttle control cable.

### Troubles in ignition system

If engine does not operate and it is not due to damage in fuel supply system, fault should be traced in ignition system. Check sparking. If there is no spark on plug:

- Wet spark plug or bridged electrodes:
  Clean spark plug.
- Spark plug electrodes worn:
  Set correct gap or replace plug.
  Over heated spark plug.
  Repleace with plug of correct heat range.
- Incorrectly fitted cable plug or grounded:
  Fit well cable plug or replace it.
- Incorrect contact breaker point gap dirty
  Set correct gap and clean.
- Condenser, ignition coil or contact breaker are not perfect:
  Have them checked and repaired by a service workshop.

### Troubles causing loss of engine power

Loss of engine power may be due to:

- Spark plug or cylinder head are not tightened:
  Screw on spark plug nuts on cylinder head.
- Air filter on carburettor clogged:
  Rinse it in petrol, blow it through and slightly oil it.
- Exhaust system clogged:
  Clean it by following instructions.
  Incorrect contact breaker point gap.
  Set correct gap
- Wheel brakes sliding:
  Oil brakes control cables and adjust them by following instructions.
  Chain tension too fight.
  Adjust chain tension periodically.
- Incorrectly set ignition advance (timing):
  Have it set by service workshop.
- Worn out or broken piston rings:
  Have them replaced by service workshop.
  Defective spark plug.
  Replace spark plug with correct.

### Troubles in gearbox

- When starting, engine runs in neutral gear and also with higher number of revs clutch does not engage. Throttle down and restart engine (oil is still cool and dense). When driving off, throttle up step to step to reduce jerks.
  In case of frequent troubles, have the fault checked by service workshop.
- Clutch skidding (especially in cool weather):
  Incorrect oil in gearbox – replace oil with standard one.
- Clutch does not shift from 1st into 2nd gear or does not engage at all:
  Engine not powerful enough – clean exhaust or replace jet in carburettor with smaller one:
  Clutch seized – try to operate clutch at higher number of revs with motorized bicycle supported by stand:
  Excessive oil in gearbox – check lever;
  Brakes do not disengage – grease control cables.
- When shifting to 2nd gear, clutch shakes:
  Chain sagged – tighten chain on rear wheel;
  Not enough oil in the gearbox – fill up to the required level.
- With engine disengaged, the motorized bicycle is difficult to move forward-rearward;
  have the fault examined by a service workshop.

### Troubles in engine excessive smoke, overheating and noise

- Damaged cylinder piston or rings
- Replace damaged parts
- The clearance between the piston and cylinder is increased
- Replace with correct
- Too worn connecting rod, large or small end produces knocking
- Replace damaged parts
- Carbon deposit accomulation
- Disassemble and clean
- Incorret ignition timing
- Jet ignition timing

## TIME STANDARD

### NOTE

These standards are meant for calculating repairs of TOMOS AUTOMATIC under warranty. However, they do not apply to repairs effected by Service Stations and settled by them directly with customers.

| Marks for Standard | Section | Total time in hours TOMOS AUTOMATIC |
|---|---|---|
| | **Section 1 – Cylinder, Piston, Head** | |
| M-1 | Cylinder Head Exchange | 0,2 |
| M-2 | Cylinder Head Decarbonized & Resurface (Not Warrenty) | 0,3 |
| M-3 | Cylinder Base Gasket Ex. Only | 0,5 |
| M-4 | Cylinder Hone & Fit Piston | 0,6 |
| M-5 | Cylinder, Piston, Head, Decarbonized (Not Warrenty) | 1,0 |
| M-6 | Replaceing Conrod Bushing | 1,0 |
| | **Section 2 – Crankshaft, Crankcase, Clutch** | |
| M-7 | Crankshaft Ex. or Main Bearings (Side Jobs Included) | 3,0 |
| M-8 | L. H. Crank Oil Seal Ex. (Side Job Included) | 0,6 |
| M-9 | R. H. Crank Oil Seal Ex. | 0,7 |
| M-10 | Left or Right Crankcases Ex. (Side Jobs Included) | 3,0 |
| M-11 | Left Engine Cover Ex. | 0,2 |
| M-12 | Right Engine Cover Ex. | 0,5 |
| M-13 | Clutch Ex. First or Second or Clutch Drum | 0,6 |
| M-14 | Transmission Parts Ex. (Except Main Shaft) | 1,2 |
| M-15 | Main Shaft Ex. (Side Jobs Included) | 2,5 |
| M-16 | Engine Support Ex. | 0,1 |
| M-17 | Exchange Starter Shaft Oil Seal | 0,3 |
| M-18 | Exchange Engine Sprocket Oil Seal | 0,5 |
| M-19 | Exchange Engine Sprocket | 0,4 |
| M-20 | Oil Pump Ex. | 0,4 |
| | **Section 3 – Intake and Exhaust System** | |
| M-21 | Fuel Petcock Ex. | 0,2 |
| M-22 | Fuel Line Ex. | 0,1 |
| M-23 | Carburettor Ex. | 0,3 |
| M-24 | Carburettor & Element Clean or Replace Float | 0,5 |
| M-25 | Air Filter Ex. or Clean | 0,3 |
| M-26 | Rubber Joint Ex. | 0,3 |
| M-27 | Air Box Ex. | 0,7 |
| M-28 | Exhaust Manifold Gasket Ex. | 0,2 |
| M-29 | Exhaust Pipe Ex. | 0,2 |
| M-30 | Muffler Baffle Ex. or Clean | 0,2 |
| | **Section 4 – Frame** | |
| F-1 | Frame Complete Ex. | 3,0 |
| F-2 | Swing Arm & Bushing Ex. | 0,8 |
| F-3 | Chain Guard Ex. | 0,1 |
| F-4 | Rear Fender Ex. | 0,4 |
| F-5 | Front Fender Ex. | 0,3 |
| F-6 | Luggage Rack Ex. | 0,2 |
| F-7 | Seat Ex. | 0,1 |
| F-8 | Center Stand Ex. | 0,1 |
| F-9 | Handle Bars Ex. | 0,6 |

| Marks for Standard | Section | Total time in hours TOMOS AUTOMATIC |
|---|---|---|
| | **Section 5 – Wheels, Suspension, Brakes** | |
| W-1 | Rear Tire, Tube or Wheel Assy. Ex. | 0,5 |
| W-2 | Front Tire, Tube or Wheel Assy Ex. | 0,4 |
| W-3 | Rear Hub, Rim or Spoke Ex. (A11) | 2,0 |
| W-4 | Front Hub, Rim or Spoke Ex. (A11) | 1,8 |
| W-5 | Tighten Spokes, Realign Wheel | 0,5 |
| W-6 | Front Wheel Bearing Ex. | 0,6 |
| W-7 | Rear Wheel bearing Ex. | 0,7 |
| W-8 | Speedometer Drive Ex. | 0,2 |
| W-9 | Rear Brake Shoes, Cam or Brake Plate Ex. | 0,5 |
| W-10 | Front Brake Shoes, Cam or Brake Plate Ex. | 0,4 |
| W-11 | Rear Wheel Sprocket Ex. | 0,5 |
| W-12 | Chain Ex. or Clean (Not Warrenty) | 0,2 |
| W-13 | Fork Sliding Tube Ex. (One) | 0,6 |
| W-14 | Second, Fork Sliding Tube Ex. (At Same Time) | 0,2 |
| W-15 | Front Fork Ex. | 0,9 |
| W-16 | Front Fork Complete Ex. | 0,8 |
| W-17 | Steering Head Race Ex. | 1,0 |
| W-18 | Fork Lock Ex. | 0,2 |
| W-19 | Rear Shock Ex. | 0,1 |
| | **Section 6 – Electrical** | |
| E-1 | Magneto Complete Ex. | 0,5 |
| E-2 | Ignition Points Ex. | 0,4 |
| E-3 | Ignition Points & Condenser Ex. | 0,8 |
| E-4 | Ignition Timing Adjusted (Not Warrenty) | 0,2 |
| E-5 | Replacing Magneto Parts other than Points | 0,8 |
| E-6 | Ignition Coil Ex. | 0,2 |
| E-7 | Horn Ex. | 0,2 |
| E-8 | Wire Harness Ex. | 0,8 |
| E-9 | Main Switch Ex. | 0,2 |
| E-10 | Stop Switch Ex. | 0,1 |
| E-11 | Light & Horn Switch Ex. | 0,2 |
| E-12 | Kill Switch Ex. | 0,2 |
| E-13 | Headlight Rim Ex. | 0,1 |
| E-14 | Headlight Shell Ex. | 0,3 |
| E-15 | Headlight Bulb or Seal Beam Ex. | 0,2 |
| E-16 | Taillight Lens or Bulb Ex. | 0,1 |
| E-17 | Taillight Assy Ex. | 0,2 |
| E-18 | Speedo Light Ex. | 0,1 |
| E-19 | Taillight Wire Harness Ex. (All Wires) | 0,4 |
| E-20 | Blinker Bulb or Lens Ex. (Not Warrenty) | 0,1 |
| E-21 | Blinker Assy. Ex. | 0,2 |
| E-22 | Blinker Power Pack Ex. | 0,1 |
| E-23 | Power Pack Flasher or any Part Ex. | 0,3 |

| Marks for Standard | Section | Total time in hours TOMOS AUTOMATIC |
|---|---|---|
| | **Section 7 – Controls & Instruments** | |
| C-1 | Twist Grip Throttle Ex. | 0,2 |
| C-2 | Throttle Cable Ex. | 0,2 |
| C-3 | Brake Lever Ex. | 0,1 |
| C-4 | Speedometer Cable Ex. | 0,1 |
| C-5 | Front Brake Cable Ex. | 0,2 |
| C-6 | Rear Brake Cable Ex. | 0,3 |
| C-7 | Speedometer Ex. | 0,2 |
| C-8 | Meter Panel Assy Ex. | 0,2 |
| C-9 | Pedal & Crank Ex. | 0,1 |
| C-10 | Mirror Ex. | 0,1 |
| | If an item is not listed in this manual the actual repair time along with a complete description of the job performed should be listed on the warranty claim forms. | |