Application

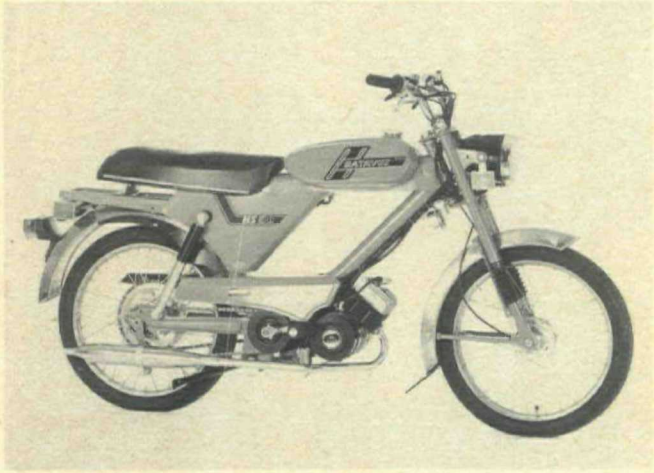
This workshop manual applies to Batavus VA and HS 50 moped with Laura engine M 48.

Batavus VA

Foreword

This manual is meant in the first place to assist those, who have to maintain and repair these mopeds, to carry out their work in an expert and time saving manner and to make them familiar with them.

Undoubtedly some problems will arise in practice, which have not dealt with in this manual.
In case you might not be able to overcome them, our Service Department is fully at your disposal to assist you in every possible way.



Batavus HS 50

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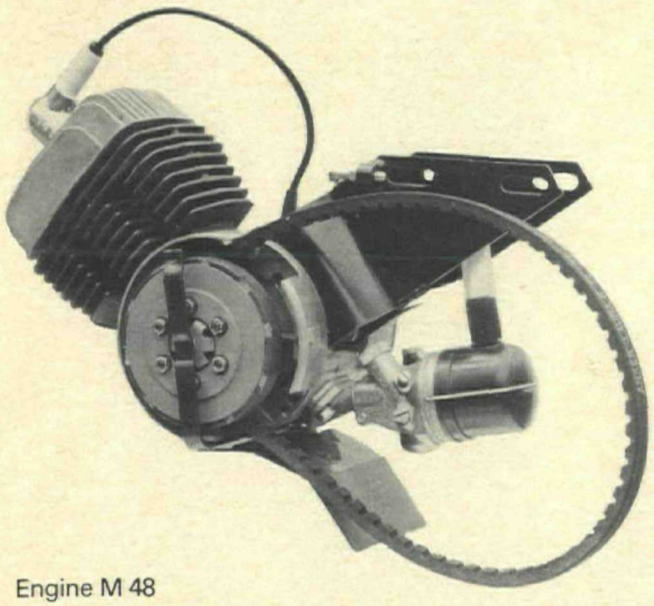


Engine M 48

Important notice

Only original BATAVUS and LAURA parts guarantee ultimate safety and protection against needless damage. Warranty claims will not be accepted when assembly or use of imitation replacement parts are established.

Technical data engine

Type of engine	Two stroke engine, reed valve controlled.
Bore x stroke	40 x 38 mm.
Cubic capacity	48 cc (2.9 cu. in.)
Cylinder	Special cast iron
Cylinderhead	Aluminum alloy
Cylinder base gasket	Klingerit
Inlet gaskets	Klingerit
Crankcase gasket	Paper
Piston	Very special alloy and shape. Oversize 40.20 mm.
Pistonrings	Cast iron, 2 rings, oversize 40.20 mm.
Gudgeon pin	Floating
Crankshaft	Build up type, ball bearing on each side
Bearings	Bigend bore honed trough wich extremely high accuracy.
	Connecting rod: big-end needle bearing
	little-end bronze bushing
	Clutch housing: Needle bearing with seal on one side.
Mixture	Pulley: Two needle bearings with seal on both sides.
	Regular gas (not premium!) and a good quality two stroke oil.
	Proportion during break in period 1 :40 (2,5%) thereafter 1 : 50 (2%).

Execution

	20 mph.	25 mph.	30 mph.
Compression ratio	6 : 1	7 : 1	8 : 1
Output HP	1.2	1.7	2.0
Torque ftlb	2.0	2.3	2.5
Carburettor type	S 23 A	S 8A	S 22 or S 25
Throttle valve nr.	190	190	405 167
Yet size	52-50	54-52	58-56
Ignition	valid for engines to nr. 772302 6 V-29/5 W.	valid for engines to nr. 779301 6 V-29/5 W.	valid for engines to nr. 780501 6 V-29/5 W.
6 V-22/10/5 W.	Valid for engines from nr. 772302 6 V-22/10/5 W.	Valid for engines from nr. 779301 6 V-22/10/5 W.	Valid for engines from nr. 780501 6 V-22/10/5 W.
Sparkplug	Bosch W 175 T1 Champion L 85	Bosch W 175 T1 Champion L 85	Bosch W 240 T1 Champion L 81
Gear ratio prim.	4.1 : 1	3.6 : 1	3.6 : 1
Gear ratio sec.	48 : 11	50 : 13	50 : 13

Technical data frame

Frame	Single tube frame with seperate fuel tank.
Position of frame nr.	Right side of stearing head.
Frontfork	Telescopic type; 5 cc. grease Retinax A per fork leg.
Rear fork	Swing axle type.
Fuel tank	Batavus VA .92 gal. (3.5) litres.
	Batavus HS 50 1.3 gal. (5 litres).
Lighting	Headlamp 6 V-21 W.
	Brakelight 6 V-10 W.
	Tailight 6 V-5 W.
Electic horn	6 V-24 W.A.C.
Tyres	Front and rear 2-16".
Tyre pressure	Front 28 lbs.
	Rear 34 lbs.
Rims	Front and rear 1.20 x 16".
Dry weight	107 lbs. (48.5 kg.).
Max. G.V.W.	350 lbs. (160 kg.).
Chains	Engine transmission 1/2 x 3/16".
	Pedal transmission 1/2 x 1/8".

Tools

For special tools see spare parts list.

Metrical tools needed:

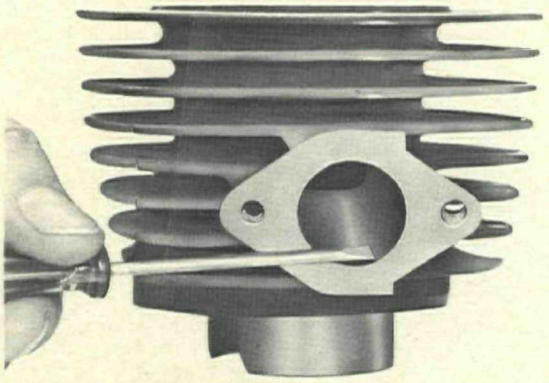
Tube spanner 10 mm.
Tube spanner 17 mm.

Open ended spanner 8 x 9 mm.
Open ended spanner 10 x 11 mm.
Open ended spanner 12 x 13 mm.
Open ended spanner 14 x 15 mm.
Open ended spanner 16 x 17 mm.
Open ended spanner 18 x 19 mm.
Open ended spanner 32 mm.

Close ended spanner 8 x 9 mm.
Close ended spanner 10 x 11 mm.
Close ended spanner 12 x 13 mm.
Close ended spanner 14 x 15 mm.
Close ended spanner 16 x 17 mm.
Close ended spanner 18 x 19 mm.

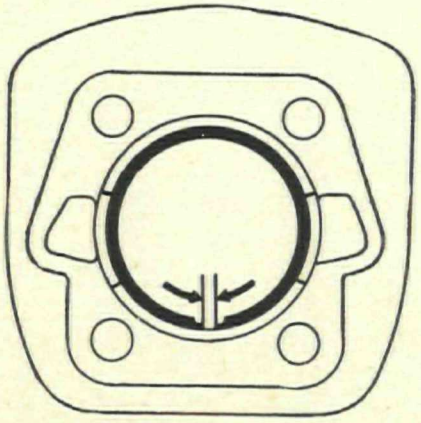
Cylinder and cylinderhead

The M 48 engine is equiped with a cast iron cylinder. A cast iron cylinder is cheaper than an aluminum one and has also the advantage that the cylinderbore can be rehoned after being damaged.
As the specific power of these engines is relatively low (abt. .7 hp/cu.in.) the heat abstraction is sufficient. Hence an aluminum cylinder is not necessary.
In the case of a rehoned cylinderbore an oversize piston should be applied.
In order to get the required piston clearance the diameter of the bore has to be rehoned to 40.245 - 40.255 mm.
Before dismantling the cylinder, the surroundings of the cylinderbase have to be cleaned with a brush and kerosine to prevent dirt from getting into the crankcase.
Remove the sparkplug.
Remove the 4 nuts of the cylinderstuds (take care that the plain washers and the spring washers do not get lost) and the two bolts of the exhaust pipe.
Remove the cylinderhead and carefully take off the cylinder.
Remove the cylinder base gasket.
Put a not fluffy rag around the connecting rod to prevent dirt from getting into the housing.
Take care that the joint surfaces will not be damaged.
Before assembling cylinder and cylinderhead the joint surfaces have to be cleaned very carefully (dont scratch!)
Decarbonize the cylinder (especially the exhaust port) and cylinderhead if necessary. Protect the cylinderbore with a rag when decarbonizing the exhaust port in the way as shown in pict. 1.



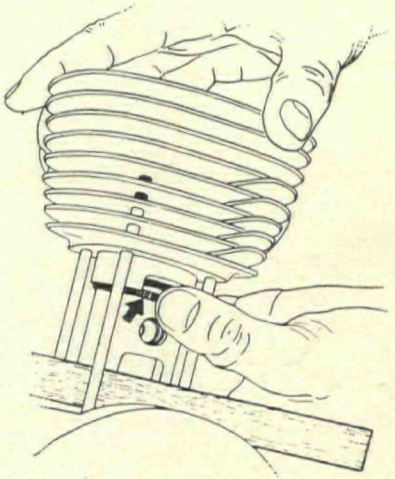
Pict. 1

To determine whether the cylinderbore is worn out too far put a new pistonring into the bore and check the gap, which has to be between .2 and .5 mm (.008" and .020"). See pict. 2.



Pict. 2

Always use a new cylinder base gasket **and never any seal!**
Put the base gasket in the right position, otherwise the gasket will partly cover the scavenging ports, thus causing lost of power.
Since the cylinderhead is the best cooled part of the engine, it is very important that the heat conduction from cylinder into the cylinderhead will not be disturbed. Therefore never use a gasket or any seal between cylinder and cylinderhead!!
The joint surfaces are machined in such a way that there will be no leakage at all, even without gasket or seal.
The cylinder bore is tapered so that the use of a clamp for the pistonrings is not necessary.
The piston rings can be pinched together as shown in pict. 3.



Pict. 3

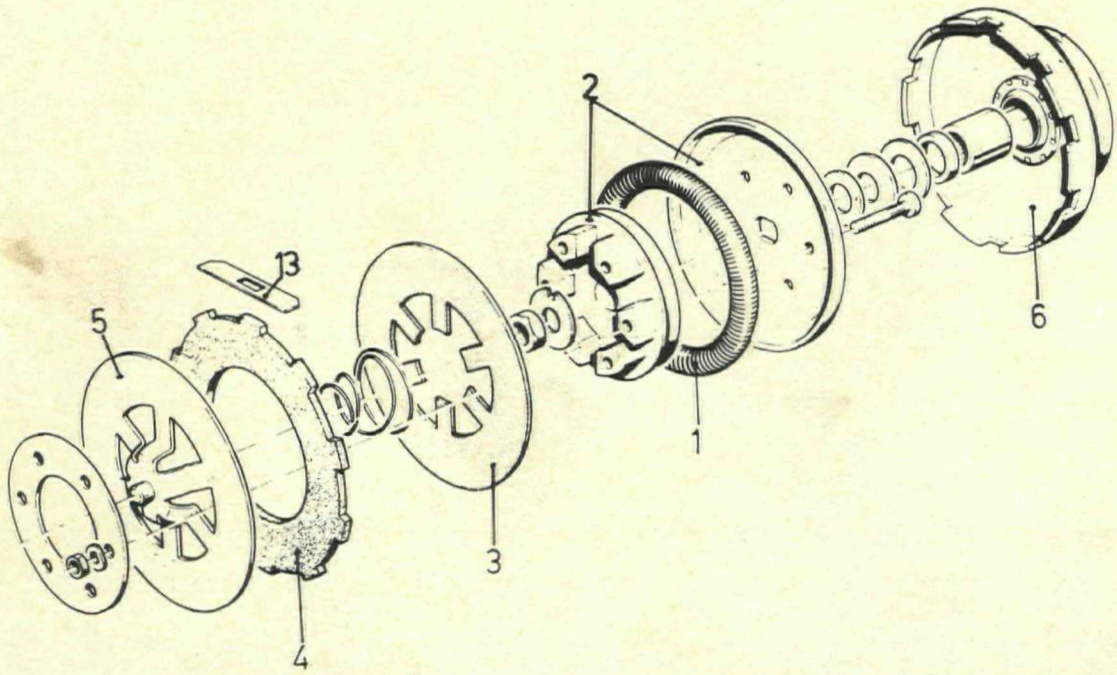
Be sure that the locating pegs in the piston are indeed inside the ring gaps. Before assembly the cylinderbore should be oiled.
After carefully pushing the cylinder along the piston on the crankcase, the cylinderhead with plain washers, spring washers and nuts can be assembled.
Tighten nuts crosswise!
Fit spark plug.

Piston

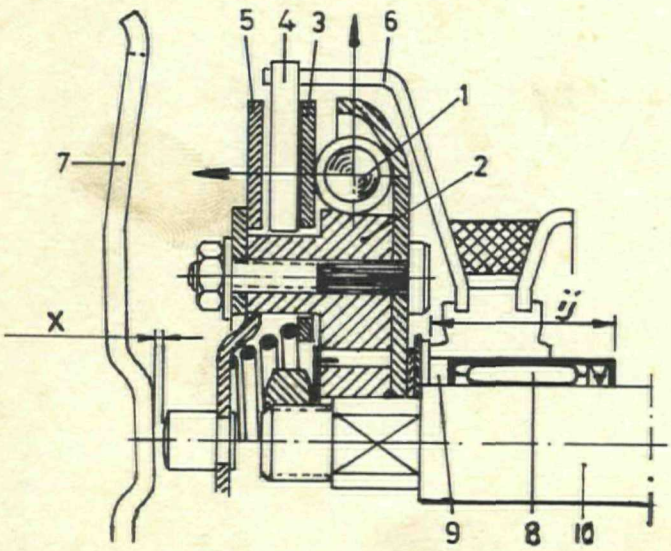
To minimize the difference in expansion between piston and cylinder the piston is made of a very special alloy.
Moreover the piston has a very specific shape.
Another advantage of this special alloy is that it is very hard so gudgeon pin bores do not wear out.
When demounting piston, first remove pistonrings. When reassembling the pistonrings be sure to put the rings in the same piston ring groove as before.
Thereafter remove both circlips with a pair of pliers with flat bits, and press gudgeon pin out of the piston.
Before reassembling the piston first check the gap of the piston rings. See pict. 2.
Clean the ring grooves in the piston carefully before assembling the rings.
Before assembling the piston, one of both circlips has to be placed in the gudgeon pin bore. Always use new circlips.
Push the gudgeon pin into the piston bore in such a way that the pin protrudes inside the piston about 3 mm. (.12").
Fit the piston on the connecting rod (first oil the little end bush) and press the protruding part of the pin into the little end bush.
Press the pin into the right position and fit the second circlip.
Fit the piston rings in previous grooves.
Be sure that the arrow on the piston bottom points at the exhaust port.

Clutch

The construction of the clutch is shown in pict. 4



Schematic the clutch is shown in pict. 5.

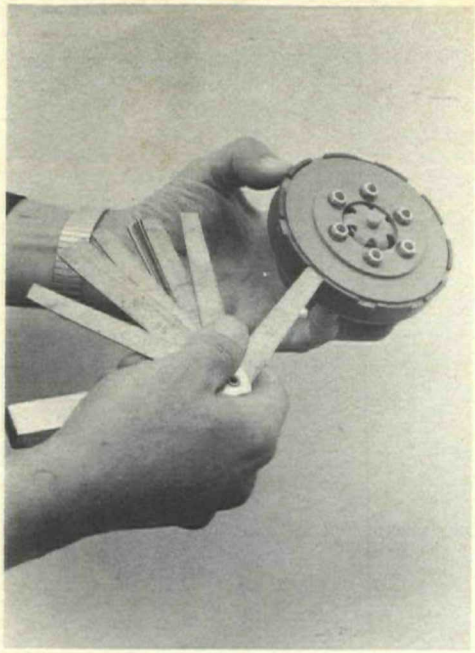


Pict. 5

Operation:
Spring 1 is filled with steel balls, the spring ends are screwd together.
The diameter of the spring is less than the diameter of the clutch hub on which the spring is fitted, so that mounting causes a certain prestress in the spring.
When the crankshaft is revolving, all the shaded parts and the clutch spring revolve since all those parts are attached to the crankshaft.

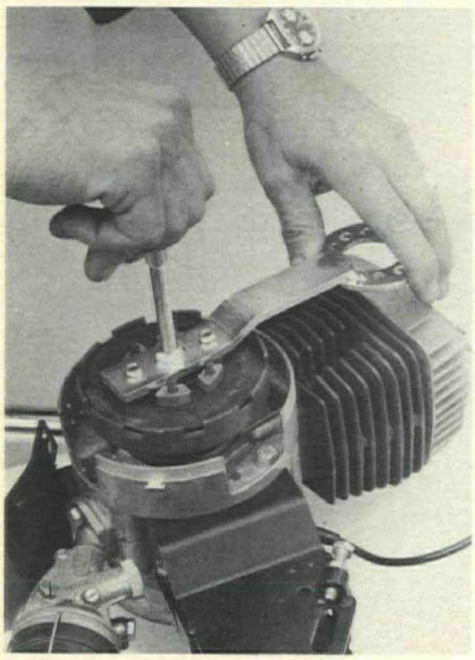
At about 2500 rpm. the centrifugal force on the balls in the spring has become sufficient to exceed the pre-stress force in the spring, resulting in an outward mouvement of the balls.
As the spring will now move along the sloping side of the clutch hub 2, it will at the same time be forced to move to the left side, pressing together pressure plate 3, clutch plate 4 and endplate 5.
In this way the clutch plate (with cams) will cause the clutch housing 6 to rotate.
When starting the engine the proces is reversed. Now the starter leaf spring 7 presses all plates together.
The distance between the starter leaf spring and the thrust piece (x in pict. 5) has to be .5 - 1 mm (.020''-.039'').
This distance can be adjusted by bending the leafspring fitted on the housing, in case the distance is to small. If the distance is to large the starter leaf spring has to be removed from the engine. After putting it in a vice it can be bended into correct position and refitted again.
Always grease the thrust piece!
A needle bearing, supplied with an oilseal at the crankcase side is fitted in the clutch housing.
A seperate seal is fitted in the opposite side of the bore. This is a feltring at first assembly.
Storing may cause the feltring to become dry. Therefore it is much better to fit an oil seal instead of a feltring, in case of repair.
If a new needle bearing has to be fitted it should be done in such a way that the measure ij in pict. 5 is 25.5 - 26.5 mm (1.0039'' - 1.0079'').

Only press on the marked side of the cage, otherwise the needle bearing will be damaged irreparable.
The clutch housing of the 20 mph. and 25-30 mph. engines are different broadwise, because the V-belt and the primary reduction are different for the 20 mph. and 25-30 mph. engine.



Pict. 6

Pict. 7



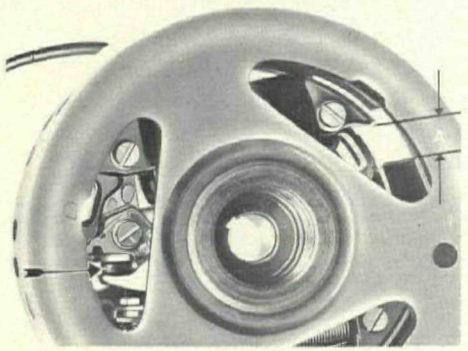
To distinguish them very clearly the housing of the 20 mph. engine is painted yellow-brown and the one for the 25-30 mph. engine is painted red-brown.
To prevent the clutch housing and clutch hub from wearing, a steel washer 15 x 28 x .5 mm (.59 x 1.1 x .020") nr. 11 in pict. 4 is fitted on the crankshaft.
Take care that this washer is well centered on the crankshaft!! When fitting this washer it is better to put the crankshaft in a vertical position.
In front of this steel washer a saucer spring has been placed. The hollow side of this saucer spring must be on clutch side (opposite engine side).
This is very important!
Only the 25-and 30 mph. engines have a second steel washer (12 x 24 x .5 mm. .47 x .95 x .020") in front of the saucer spring, to assure sufficient clearance between cultch hub and clutch housing.
Replacement of one of the parts 1 to 5 pict 5 has to be followed by checking the total clearance of the clutch by means of a feeler-gauge as shown in pict. 6.
This clearance has to be between .5 and .9 mm (.020 and .035").
If this clearance is too small the cause may be an undulated endplate or pressure plate, or because of the shape of the screwed spring ends.
The 6 nuts holding the total clutch packet have to be loosened before dismantling the clutch.
Secure the clutch by placing a screw driver between two of the nuts.
Press on clutch packet to prevent undulated washers from snapping away, when removing last nut.
Flatten the tab washer nr. 12 pict. 4. Use tool nr. 48.50.05 as a steady and loosen the central nut. Next take the reverse side of tool 48.50.05 and fit it to the clutch hub, tighten it with 2 nuts, screw the pin of the little end bush press into the threaded hole and pull of the hub from the crankshaft as shown in pict. 7.
The clutch housing can be pulled off by hand.
When reassembling the clutch be sure of the right order of the steel washers and saucer spring and the right position of the saucer spring.
Always take a new tab washer and flange the tab washer against one of the nut sides, after tightening the nut.
Between clutch housing and clutch plate a leafspring nr. 13 pict. 4 is fitted on one of the clutch plate cams. The only purpose of this spring is to prevent any noise while the engine is idling.
It does not interfere with the clutch function.

Ignition 6 V - 29/5 W.

Valid for: 20 mph. engines to nr. 772302
25 mph. engines to nr. 779301
30 mph. engines to nr. 780501

The ignition is supplied with:
1 Coil 29 W. for the headlight
1 Coil 5 W. for additional charging of the battery
1 H.T. coil

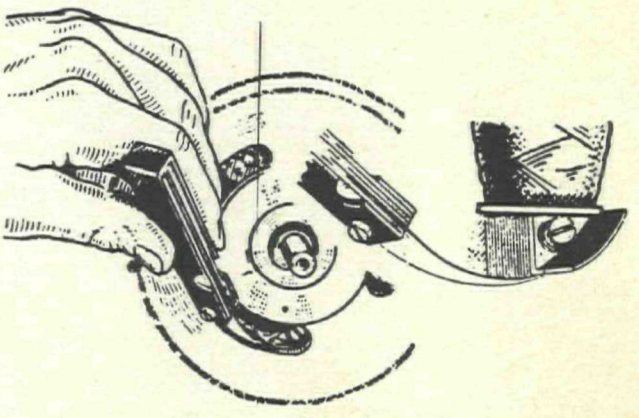
All these coils are mounted on the base plate, placed in the flywheel.
When dismounting the flywheel it must be secured by tool nr. 48.50.10.
After removing the nut, the flywheel can be pulled off with tool nr. 48.50.02 secured again with tool nr. 48.50.10.
Always put the flywheel with the open side upwards on the workbench to prevent iron parts, like small washers, to be attracted by the magnetos.
Loosen the 3 screws of the base plate and remove the baseplate out of its position in the crankcase.
In order to move the wires freely through the rubber grommets, oil them a little before.
Never pull the base plate to move the wires out of the grommets but always pull the wires themselves.
Mounting the ignition the wires have to be put into the grommets first. Some oil on the wires makes it easier.
Fit the base plate into the crankcase location, between the cams. Take care that this is done correctly and that no wire is pinched between base plate and casting.
Fit the 3 screws but doe not yet tighten them.
Next mount the flywheel and make sure that the key fits in the key groove of the flywheel. Fit plain washer, toothed washer and nut on the crankshaft.
Secure the flywheel again with tool nr. 48.50.10 and tighten the nut.
Now turn the flywheel clockwise until the breaker gap is maximum, visible through the holes in the flywheel. Check the breaker gap.
The gap must be between .35 and .45 mm. (.014 and .018").
If the gap is not correct it can be adjusted by loosening the screw of the breakerpoint set, and moving the fixed contact into the desired direction by means of a screw driver.
For the capacity of the spark the rupture distance (see pict. 8 distance A) is very important.



Pict. 8

This distance has to be 7-11 mm. (.28-.39").
This is an indication for such position of the flywheel where the magnetic field changes its direction: a position in which the electric current is maximum.

The rupture distance can only be changed by changing the breaker gap.
A larger breaker gap will give a smaller rupture distance, a shorter breaker gap means a larger rupture distance.
All parts are machined in such an accurate way that this rupture distance is automatically is correct when the breakerpoint gap is correctly adjusted.
The proceedings mentioned before guarantee maximum spark.
Now take care to have this maximum spark at the right position of the piston in the cylinder, which is 1.8 - 2.2. mm. (.071" - .087") before T.D.C.
To adjust this, screw a dial gauge into the sparkplug hole of the cylinderhead.
Turn the flywheel clockwise until piston is at T.D.C., which is the point where the dial pointer changes its direction.
Now connect an ignition adjusting apparatus, one wire grounded (for instance on cylinderhead) the other one to the cut-off wire of the ignition (black wire).
As long as the breaker points are closed the lamp of the adjuster will burn.
Turn the flywheel anti-clockwise. The moment the breaker points open the lamp will extinguish because of the interuption of the electric circuit.
Watch the dial gauge to see how far the piston has descended.
When the latter is less than 1.8 mm. (.071") the spark between the spark plug electrodes is too late or in other words the ignition is retarded.
In that case the base plate has to be turned anticlockwise.
When the descending of the piston in the cylinder at the moment of ignition, is more than 2.2 mm. (.087") the spark is too early, or in other words the ignition is advanced. In that case turn the base plate clockwise.
Thus having adjusted the moment of ignition, the three base plate screws can be tightened.
Instead of using a dial gauge a sliding gauge (vernier calipers) can be used as follows:
Turn the piston in T.D.C. and measure the distance between piston bottom and upperside of the spark plug hole.
Turn back the flywheel till the lamp extinguish and measure the distance again.
The difference between both sizes is the ignition advance. If one on the coils has to be replaced use a feeler gauge to check the air gap between inner rim (magnetos) and core shoes.
This gap has to be .2 mm. (.0079"). See pict. 9.



Pict. 9

Ignition 6 V - 22/10/5 W.

Valid for: 20 mph. engines from nr. 772302
25 mph. engines from nr. 779301
30 mph. engines from nr. 780501

The ignition is supplied with:
1 coil 22 W. for the headlight.
1 coil 10 W. for the brakelight.
1 coil 5 W. for the rearlight.
1 coil as a primary ignition coil.

All these coils are fitted on the base plate, placed in the flywheel.
The H.T. coil is mounted outside the flywheel.
This means an important improvement compared with the former construction, because the external coil can be dimensioned much larger and kept much cooler.
Burning out of the H.T. coil is now practically impossible.
Demounting, mounting and adjusting of this ignition is exactly the same as for the 6 V. - 29/5 W. ignition.
The only difference is that for the 6 V. - 22/10/5 W. ingnition the rupture distance is 20 - 25 mm. (.79''-.98'') and the cut-off wire is the blue one.

Carburettor

The 20 mph. engine is supplied with a carburettor type S 23 A, diameter 8 mm. (.32") jet 52 - 50, Throttle valve nr. 190.
The 25 mph. engine is supplied with a carburettor type S 8 A, diameter 8 mm. (.32") jet 54 - 52, Throttle valve nr. 190.
The 30 mph. engine is supplied with a carburettor type S 22 diameter 12 mm. (.47") jet 58 - 56, Throttle valve nr. 405.
Recently (October 1976) the 30 mph. engine is supplied with a carburettor type S 25, diameter 12 mm. (.47") jet 58 - 56, Throttle valve nr. 167.

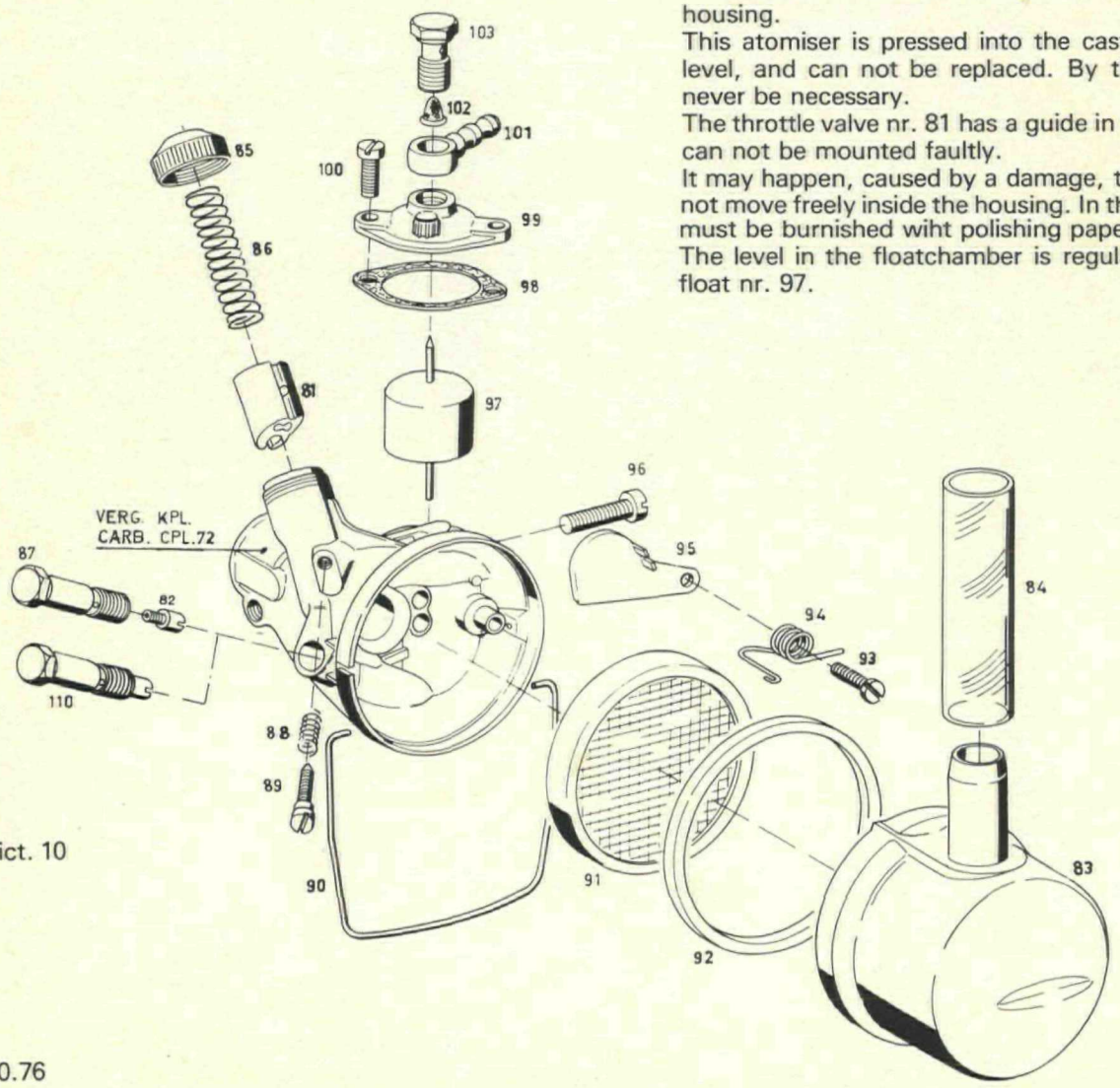
Demounting:

The carburettor is fixed on the induction pipe by a clamping screw.
First remove the intake silencer by detaching the silencer clip.

Loosen the screw top (nr. 85 pict. 10) of the throttle valve housing and take the throttle valve nr. 81 out of the housing.
Unhook the choke cable from the choke valve nr. 95, pull off the fuel line from the banjo nr. 101 and after loosening the clamping screw the carburettor can be pulled off from the intake pipe.
The jet holder nr. 87 with jet nr. 82 is fitted in the housing.
The jet holder can be screwed out of the carburettor housing with a scrwedriver.
In the same way the jet can be screwed out of its holder.
A new engine is always equiped with the largest of the two mentioned jets.
After the break in period this jet unsually must be replaced by the smaller jet.
In a few cases this jet may be too small, thus giving a mixture being too poor.
This can be determined easily as follows:
Ride the bike with fully opened gasgrip. After the bike has reached maximum speed and the engine is on working temperature the gasgrip must be partly closed (abt. 30%).
In the bike is apt to ride faster it is evident that the jet is too small.
In that case the larger jet must be fitted again.

In case of a dirty jet never try to clean it with a wire or a needle, always clean it by blowing air trough the jet!

The atomiser is fitted on the bottom of the throttle valve housing.
This atomiser is pressed into the casting on a precise level, and can not be replaced. By the way, this will never be necessary.
The throttle valve nr. 81 has a guide in the housing, so it can not be mounted faultly.
It may happen, caused by a damage, that the valve can not move freely inside the housing. In that case the valve must be burnished wiht polishing paper.
The level in the floatchamber is regulated by a plastic float nr. 97.



Pict. 10

10.76

Occasionally this float may be leak. This can be checked clearly by holding it up to the light, a leaking float shows the mixture inside.
When assembling the float take care that the float needle joins the guide in the bottom of the floatchamber as well as the guide in the cover.
This can be checked easely by shaking the carburettor after mounting the floatchamber cover (screws not yet tightened).
The float operates properly if one hears it moving up and down.
Make sure that the pointed end of the float needle is in an upward position.

The idling speed of the engine can be adjusted by means of the adjusting screw nr. 89. Turning the screw clockwise will increase the idling speed, turning the screw anticlockwise will decrease it (Throttle valve moves up or down).
Take care that the gascable has the right length, making sure that the throttle valve can descend to the bottom of the chamber indeed.

The carburettor also has a choke valve nr. 95. Pulling the choke will cut-off the air supply nearly, thus providing an additional rich mixture for the engine.
Also the choke cable must have the right length enabling a full open intake diameter.

The banjo bolt nr. 103 is supplied with a little fuel strainer nr. 102.
Due to the fact that the tap in the fuel tank is also supplied with a strainer, it very seldom happens that the banjo strainer is stopped up.

Intake silencer

The 20 and 25 mph. engines have similar silencers. Both are supplied with an intake tube diameter 14 mm. (.55").
The 30 mph. engines are supplied with a tube diameter 16 mm. (.63").
The filter of the silencer must be cleaned in gas every 500 miles and moistened with oil afterwards.
After fitting the silencer do not forget to apply the rubber seal on the junction carburettor-silencer.
Never ride a moped without an intake tube or with shortened intake tube.
By doing so the power of the engine will not increase, the only result is that dirt will be sucked into the engine, causing serious engine troubles!
This is also the case after drilling holes into the intake silencer!!

Reed valve

Of all possibilities to control a two-stroke engine, reed valve control assures the best cylinder filling especially in the lower revolution range.
For that reason the performance at low revolutions is better than with any other system, which is very important for acceleration and climbing power.
Another advantage is that this arrangement eliminates the waste of fuel which can occur in engines using other methods of intake control.
Important is that the reed valve has been manufactured with very high accuracy.
The reed valve is activated by variations in pressure in the crancase.
If the piston ascends the crankcase volume will increase causing decrease of pressure (below the atmosferica) which will open the reeds.
If the piston descends the reverse occurs.
It will be clear that it is extremely important that the reeds shut off the reed valve completely, not requiring any tension, so that they can follow the pressure variations freely.
Never try to check the elastic quality of the reeds with a knife or anything like it, nor clean them with any other object.
The only right way to clean them is with a soft brush dipped in kerosine.
In case of any doubt about the condition of a reed valve (for instance when seeing light between reeds and housing), put the pointed side of the reed valve in your mouth and try to breathe via the reed valve.
If inhaling is easy and exhaling impossible, the reed valve is still in a good condition.
Always use a new gasket when mounting the reed valve.

Crankcase

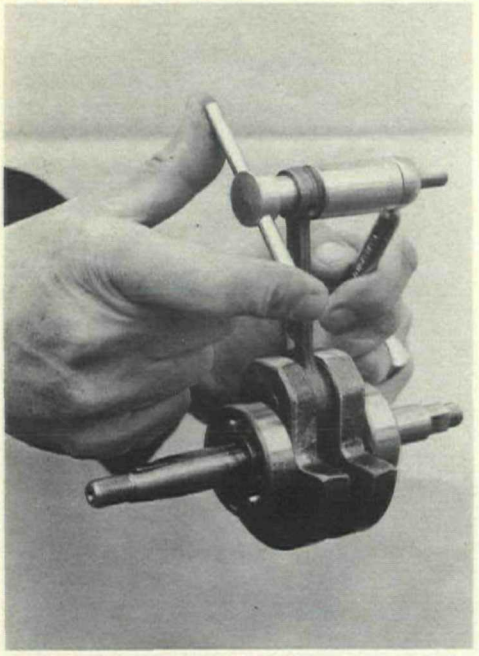
The crankcase consist of two parts connected and tightened with 6 screws of equal lenght and diameter, and fixed to each other by two dowel pins.
Because of the fact that the two parts have been machined connected together, replacement of one of the parts is not possible.
When the engine comes to working temperature the aluminum housing will expand more than the steel crankshaft bearings fitted in the crankcase. To prevent rotating of the bearings in the housing, the diameter of the crankcase bores is smaller than the outside diameter of the ball bearings..
Before demounting the crankcase, loosen and remove the 6 screws. To prevent the crankcase bores from inrreparable damage it is necessary to heat the housing parts up to about 100°C (212°F) by means of a Bunsen burner or a hot plate of 2000 W.
An easy way to check the temperature is to spit on the housing. Immediate evaporation means the housing has reached the right temperature.
Seize the housing at two cylinder studs of the same crankcase half, using a rag or gloves, and separate both parts by tapping all around the outside of the housing, using a plastic hammer.
Never hammer on the crankshaft!!
Before assembling the crankcase the parts also have to be heated up to about 100°C (212°F).
Start with that part in which the dowel pins are fitted to assure a correct position of the gasket. Before fitting the gasket the joint surface should be oiled.
Next insert the crankshaft, clutch side first, into the crankcase. Heat the other part and join both parts.
Then fit the 6 housing screws. After being tightened this operation has to be repeated when the crankcase has cooled down sufficiently.

Oil seals

Once a housing has been dismantled it is recommendable to fit new oil seals.
In case of leakage this must be done.
How to find a leak oil seal?:
Put the piston in T.D.C. to be sure that all ports of the cylinder are closed.
Pull of the carburettor from the induction pipe.
A leak now can be determined by blowing smoke into the induction pipe.
When fitting the oil seals alsways use tool nr. 48.50.11 respectively nr. 48.50.12 together wiht tool nr. 48.50.01 to prevent any damage of the oil seals and to be sure that the seals are in the correct position.

Crankshaft

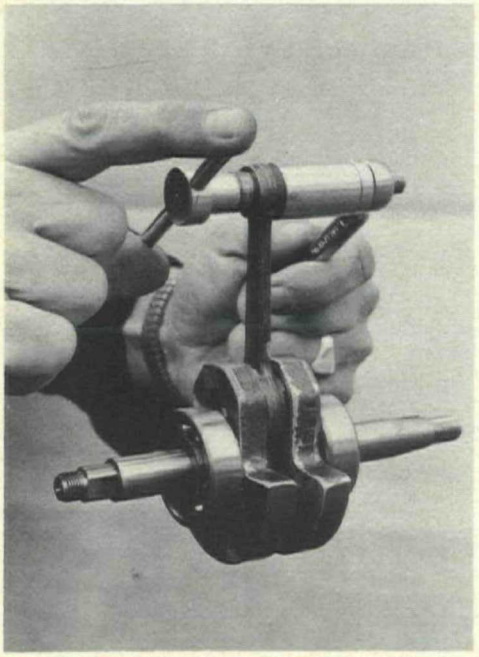
The crankshaft has been machined with the highest possible accuracy.
To obtain this optimal accuracy and inherent minimal clearances, very special machines and measuring tools are needed.
In a very sporadic case of a needed replacement of the connecting rod, we therefore strongly recommend replacement of a complete crankshaft.
Otherwise the accuracy can not be assured.
The little end bush in the connecting rod is made out of bronze.
This bush can be replaced, if necessary, by a new one as follows: Press the bush out of the connecting rod with tool nr. 48.50.03 as shown in pict. 11.



Pict. 11

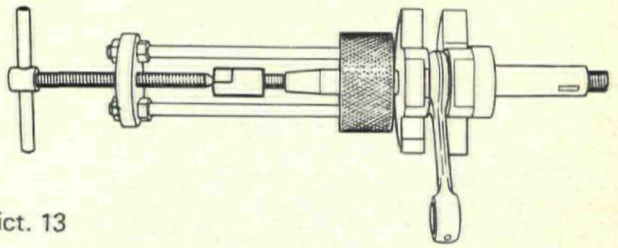
Press a new bush into the connecting rod with the same tool as shown in pict. 12.
Now the oil holes have to be drilled after which the bore of the bush has to be reamed to a diameter

$$12 \begin{smallmatrix} +\ .016 \\ +\ .020 \end{smallmatrix} \text{ mm.}$$



Pict. 12

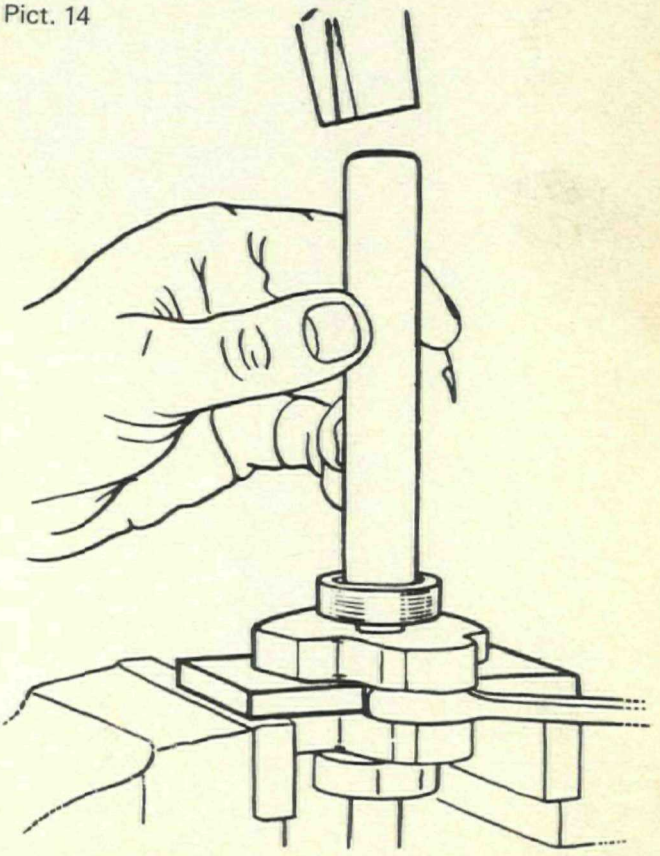
If measuring tools to check this diameter are not available, the reaming operations has to be done in such a way that the gudgeon pin fits in the bore freely (Floating).
The clearance has to be .020 mm. (.00079).
Be sure that the bore of this bush is square to the connecting rod.
In case of a needed replacement of the crankshaft ball bearings, these bearings first have to be extracted with tool nr. 48.50.09 shown in pict. 13.



Pict. 13

Protect thread on magneto side with tool nr. 48.50.07.
When pressing new ball bearings on the crankshaft tool nr. 48.50.08 has to be placed between the webbs of the crankshaft. This support plate must be laid on the bits of a vice (see pict. 14) so that no external forces will act on the crankshaft.
By not doing so the crankshaft will be irreparable damaged.
Put a new ball bearing on the shaft and fit in its right location by using a dolly nr. 48.50.01 see pict. 14.

Pict. 14



Dirt shield

The dirt shield, attached to the crankcase offers additional protection against dirt. Never ride the moped without this shield.
To protect the dirt shield against destruction special distance bushes are fitted in the bolt holes. Do not forget to fit these bushes.

Spark plug

The spark plug is one of the most important parts of the engine. Two temperatures are very important for the spark plug:

- The temperature at which the spark plug burns itself clean.
  This temperature is about 500°C (930°F).

- The temperature causing spontaneous ignition.
  This temperature is about 900°C (1650°F).

It will be clear that the temperature first mentioned always must be reached to give a clean spark plug and that the second temperature never may be reached to prevent damage of for instance the piston.
For that reason the sparkplug has a very specific heat grade, which has been determined experimentally for the engine.
The spark plug for the 20 and 25 mph. engines is fixed on Bosch W 175 T1 with Champion L 85 as an equivalent, and for the 30 mph. engines Bosch W 240 T1 with Champion L 81 as an equivalent.
The spark plug gap has to be .5 mm. (.020").
Always check this because there are similar spark plugs with a gap of .7 mm. (.028").
Always use the prescribed spark plug to prevent difficulties.
The sight of the spark plug gives much information about the condition of the engine.

- If the electodes are grey/yellow-brown, the engine is in a good condition.
  The heat grade of the spark plug is correct.

- A velvetlike dull black fur
  On the electrodes can be caused by:
  a too large jet
  a too large electrodes gap
  a heat grade to high, so a spark plug of a too cold type.

- A greasy black oily fur on the electrodes can be caused by:
  too much oil in mixture
  worn out cylinder or piston rings

- Electrodes burnt with melting pearls on the insulator bottom and a fur consisting of lead compounds can be caused by:
  a too small jet
  a leaky spark plug or a not tightened spark plug
  heat grade too low, so a plug of a too warm type.

- Glassy sand pearls between the electrodes can be caused by:
  a dirty air filter
  riding without or with a shortened intake tube
  riding without dirt shield.

Fuel

During the break in period (500 miles) the mixture must be 1 : 40 (2.5%) that means 1 part of oil to 40 parts of gasoline.
After the break in period the mixture can be reduced to 1 : 50 (2%).
Since the oil in the mixture is the only lubrication for all moving parts of the engine never use a lower percentage of oil than the percentage prescribed.
Only use a good quailty 2-stroke oil and regular gasoline, so never premium!!

Trouble shooting

Localizing defects should always be done systematically. In case the engine will not start the cut off wire has to be disconnected first, because it happens that this wire, owing to damage, contacts ground.
Thereafter check whether fuel comes into the carburettor, by pulling off the fuel line of the carburettor.
If there is no fuel just take off the fuel tank cap because the desaeration may be stopped up, causing too little pressure on the fuel in the tank.
Trouble can be located in most of the cases with the data mentioned below:

I Engine does not start or bad starting.

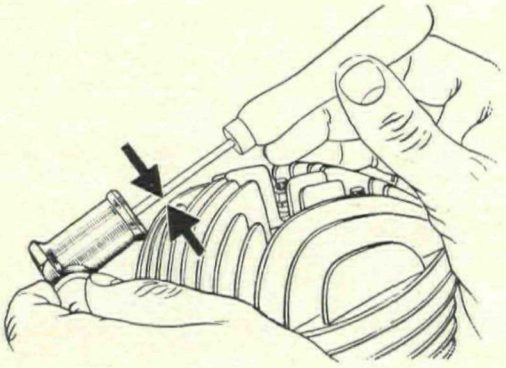
a-Short circuiting

Disconnect cut off wire from connecting block.

b-no fuel

- Desaeration of fuel tank cap is stopped up.
- Strainer of fuel tank cap is stopped up.
- Fuel line is pinched.
- Float gets stuck caused by bended needle or the guide in bottom of float chamber is polluted.
- Strainer of banjo bolt is stopped up.
- Dirt in jet.

c-No or a too weak spark Check as shown in pict. 15 below.



Pict. 15

Distance between arrows must be 3-4 mm. (.12-.16")

- Spark plug worn out.
- Plug gap too larg.
- Greasy spark plug caused by too much fuel, as a result of: — leaky float
  — float needle does not shut
  — air filter stopped up
  — choke valve partly closed.

- Breaker gap not correct. (Rupture distance.)
- Breaker points burnt. Replace!!
- H.T. coil damaged, no spark. Replace coil.
- Faulty connection of H.T. lead in H.T. cover or H.T. coil.
- Faulty condensor.

d-Miscellaneous

- Faulty reed valve
- Leaky oil seals and/or gaskets
- Slipping V-belt
- Worn out clutch plate
- Throttle valve does not reach the bottom of the throttle valve housing
- Exhaust silencer or exhaust port in cylinder carbonized.

II Engine starts well but stops after a short time.

- Desaeration in fuel tank cap stopped up.
- Faulty coil insulation.
- Fuel supply partly stopped up.

III Idling speed remains too high, in spite of adjustment.

- Leaky seals and/or gaskets.
- Throttle valve does not reach the bottom of the throttle valve chamber.

IV Bad tractive power and too high speed.

- Too small jet or jet partly stopped up.
- Leaky oil seals and/or gaskets.

V Clutch does not disengage at idling speed.

- Blistering of the clutch plate caused by excessive heating. This is mostly the result of bad handling, for instance continual opening the gasgrip with fully drawn rear break.
  By doing so all the engine power will be converted into the clutch.
  Maximum thickness clutch plate 3.6 mm.
- Undulated pressure plate and/or end plate.
- Deformed clutch hub by which pressure plate and/or endplate can not move.
- Faulty needly bearing in clutch housing.

VI Crankshaft does not rotate when pedalling with pulled starting handle.

- Slipping V-belt
- Bended starter leaf spring
- Worn clutch plate.

VII Bad or jerky acceleration of the moped.

- Clutch clearance too small caused by blisters on clutch plate
- Undulated pressure plate and/or endplate

VII At top speed too many vibrations as a result of so called four-stroking.

- Too large jet
- Stopped up air filter
- Partly closed choke valve.

IX Bad acceleration and bad climbing power.

- carbonized exhaust silencer
- carbonized exhaust port in cylinder.

X Starting the engine is impossible because crankshaft will not rotate.

seized piston caused by: too littel oil in the mixture
too small jet
dirt in cylinder as a result of riding without intake tube or with shortened intake tube
dirty air filter
riding without dirt shield

- Too small piston clearance
- Bending of the piston rod.

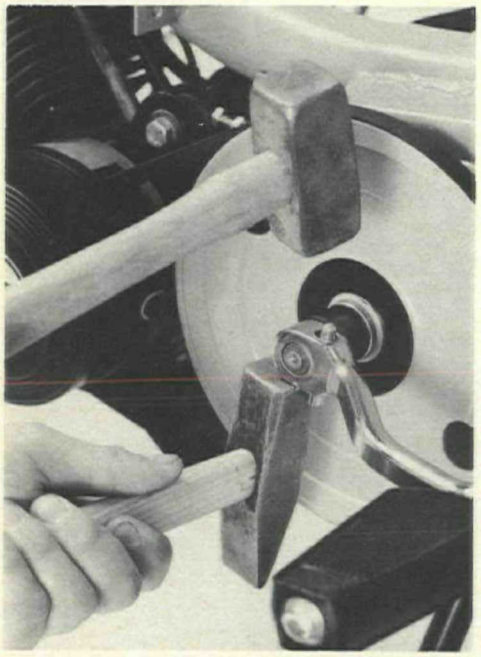
Crankaxle dis- and reassembly

Chain:

Remove pedal transmission chain by loosening the connector.

Left side crank:

Remove cotterpin nut and drive out the pin while supporting the crank (see pict. 16).

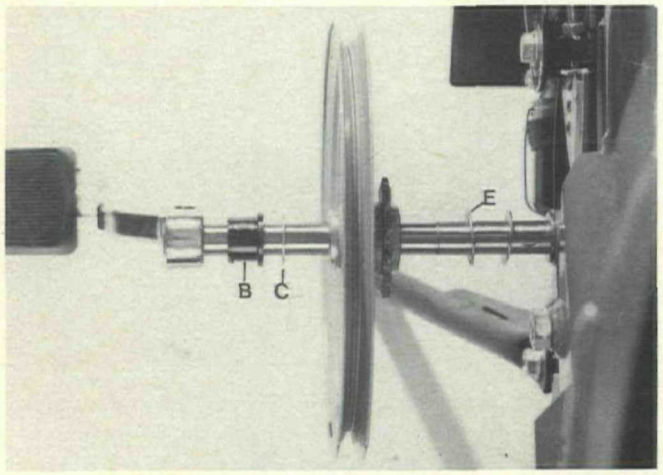


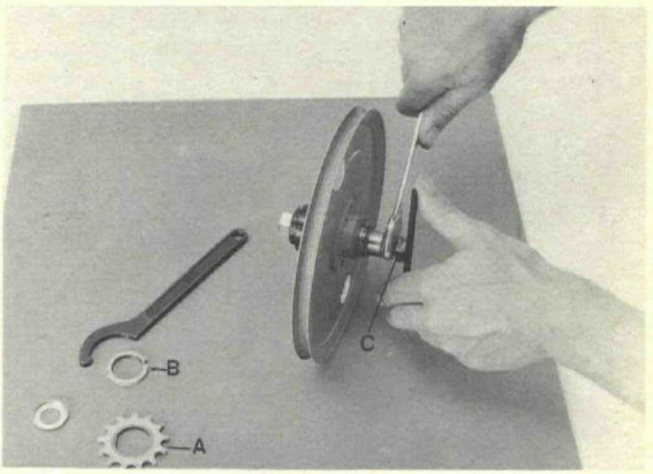
Pict. 16

Crankaxle and pulley:

First remove bushing B and retaining washer C and next the crankaxle by turning and pulling at the same time. Keep pulley supported when removing axle to avoid damages (see pict. 17).
The sprocket attached to the pulley (see pict. 18 item A) is secured by a locknut (see pict. 18 item B) with right hand thread.

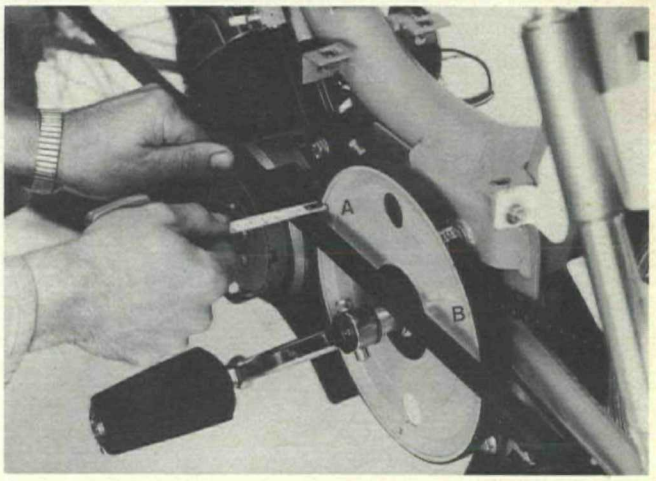
Pict. 17





Pict. 18

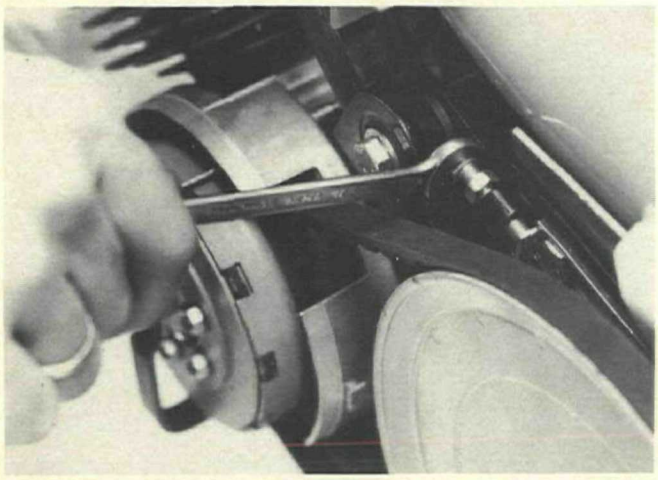
The 2 pulley needle bearings are pressed on to the pulley. Remove the pulley every 500 miles clean the bearings and provide them with some new grease.
Use a persussionstamp (drift) or a small home made press (see pict. 18 item C) for dis- and reassembly.
When pressing the needle bearing into its position also see to it, that the pressure comes to that side of the bearing that bears an inscription.
Before remounting the pulley, clean the bearing with petrol and put new grease into it.
Start reassembling with fitting the retaining washer (1 mm) to the axle and fit pulley temporarily with at least one washer E between pedal chainwheel and pedal shaft bearing. Take a straight rule and put it along the crankcase-face of the engine.
The distance between the crankcase-face and the pulley on the spots A and B (see pict. 19) should be exactly the same, viz 8-10 mm (.31''-.39'').



Pict. 19

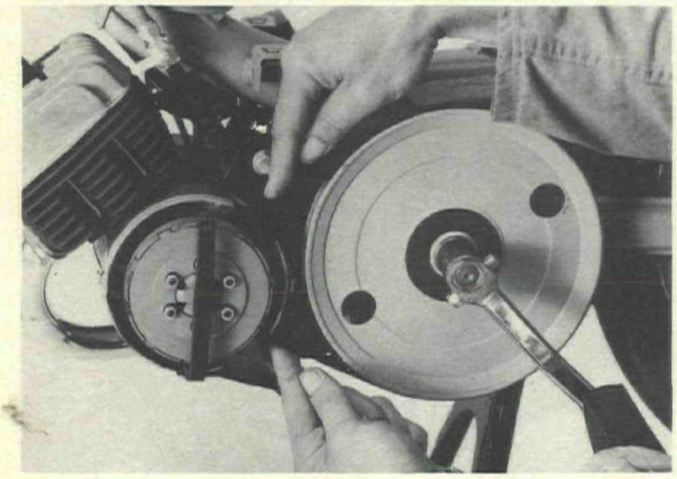
If they are not the same, the engine should be moved into a perfect alignment by partly loosening the 4 bolts by means of which the engine bracket is attached to the frame.
Fit the V-belt and check alignment by looking down on the V-belt.

If not properly aligned, correct by fitting a 0,5 or 1,0 mm spacer between pulley and axle bearing at location E (see pict. 17).
The V-belt can be tensioned by partly loosening the engine fastening bolts and completely loosening the exhaust muffler clamp.
After hafing done so, the V-belt can be tensioned by means of the tension adjustment bolt (see pict. 20).



Pict. 20

To remount the left hand crank first slide retaining washer (1 mm, see pict. 17 item C) and bushing (see pict. 17 item B). Fit as many washers C as necessary to achieve an axial clearence of the pulley which not exceeds 0,5 mm (.020").
The V-belt has the right tension when it can be depressed 0,5 cm (.020") by light finger pressing (see pict. 20A).



Pict. 20A

Engine removal

In order to remove the engine out of the frame, the following parts have to be removed first:

Engine shield:

Loosen the 4 fastening screws, lift the front end of the shield and remove it.

Chain:

Remove engine transmission chain by releasing the connector.

Intake silencer and airfilter:

Remove intake silencer housing and airfilter.

Pict. 21

Pict. 22

See to it, that the rubber gaskets A and B are properly fitted again when housing and filter are re-assembled (see pict. 21).

Exhaust system:

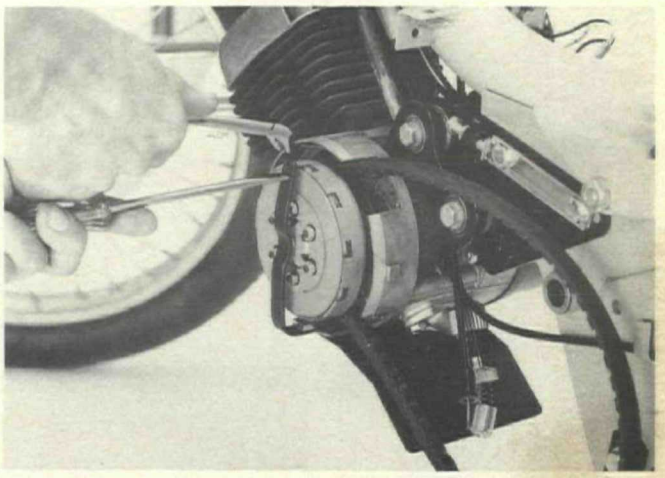
Remove exhaust pipe from cylinder and exhaust muffler from frame.

Carburettor:

Remove carburettor from intake pipe, then move carburettor downwards so that the throttle, choke cable and the fuel line can be removed.
The choke cable can be removed by unhooking the connecting spring (see pict. 22).

Engine cover:

Remove cover; turn adjusting screw of start cable to its extreme slack position and remove start cable from starter leaf spring (see pict. 23).



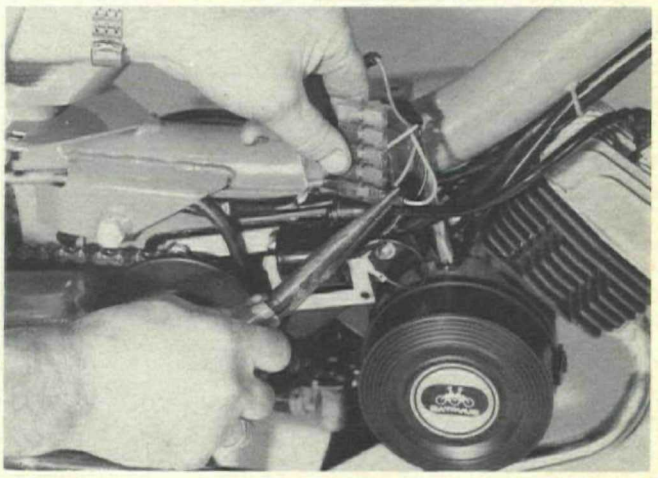
Pict. 23

Wiring:

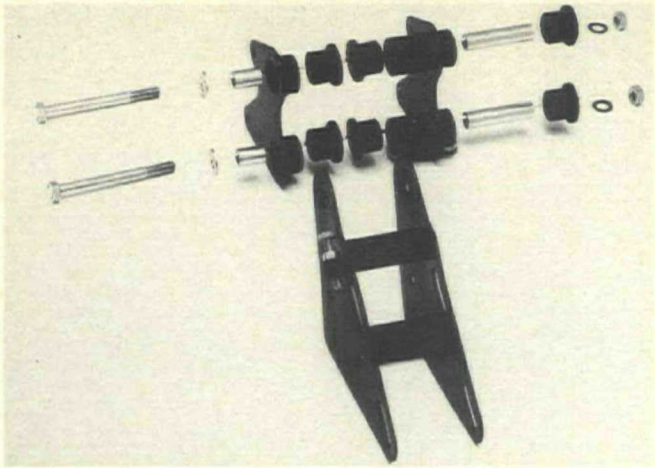
Remove the plugs, connecting the engine to the contacter and H.T.-coil (see pict. 24).

Engine support system:

The engine is attached to the frame by means of an engine support-bracket (see pict. 25) in rubber mountings.

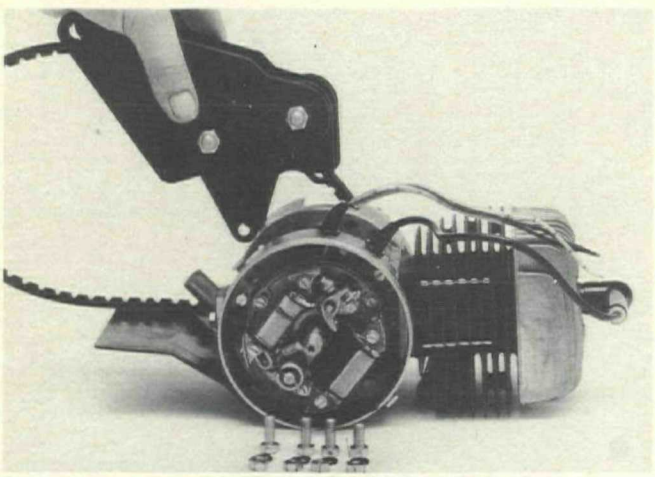


Pict. 24



Pict. 25

Loosen the fastening screws and take the engine out of the frame.
The engine support bracket is attached to the engine by means of 3 bolts M 7 x 18 and 1 bolt M 7 x 15 (see pict. 26).



Pict. 26

Swingarm dis- and reassembly

Swingarm:

The rearfork construction is based on the so called swing arm principle.
The advantages of this construction are, constantly equal chain tension during spring action and keeping away all engine vibrations from the rider.

Dis-assembly of the swingarm:

Remove the rear brake cable from the rear hub by unhooking it from the fastening lip.
Then the following steps have to be performed after having removed the engine:

- Remove the rear wheel;
- Release and remove the lower shock-absorber bolts;
- Release the locknut of the swingarm bolt;
- Release the swingarm bolt;
- Disassemble the wire plug (see pict. 24).

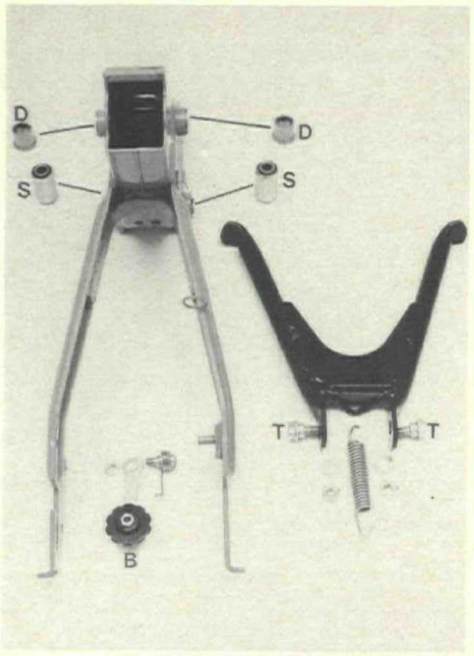
Pict. 27

Reassembly of the swingarm:

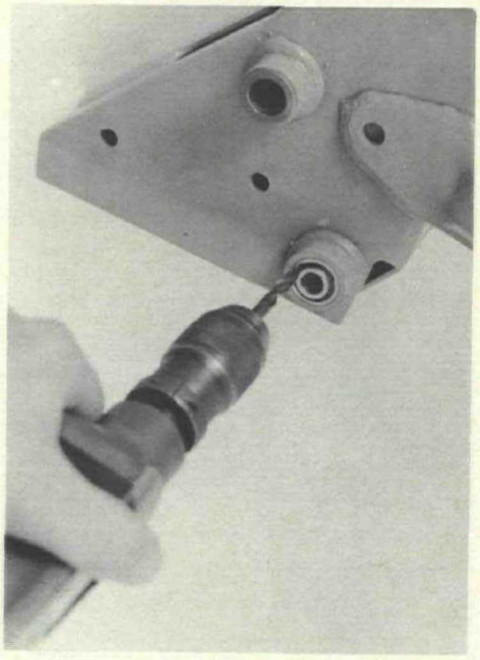
Follow the reverse order of the operations described above. Mount shock-absorbers before tightening swing-arm bolt and pre-tension them, center to center 290 mm (11,23") (see pict. 27).
This to achieve optimum pre-load of the silent blocs. Tighten swingarm bolt with 8 mkp (58 ft lb) (see pict. 27) and secure it with the counter nut.
Make absolutely sure that the swingarm bolt is tightened properly.
If tightened insufficiently the silentblocs (pict. 28 item S) will start turning around this bolt, thus causing serious wear and tear on the inner bushing.
For the sake of avoiding this it is **necessary after the first 500 miles** to release the counter nut and tighten the swingarm bolt, and then secure it again with the counter nut!

Disassembly of the silentblocs:

The silentblocs cannot be pressed out before the outerwall has been weakened by drilling holes between inner- and outer-bushing with a 6 mm (15/64") drill (see pict. 29) as the fitting of the silentblocs is very tight.



Pict. 28

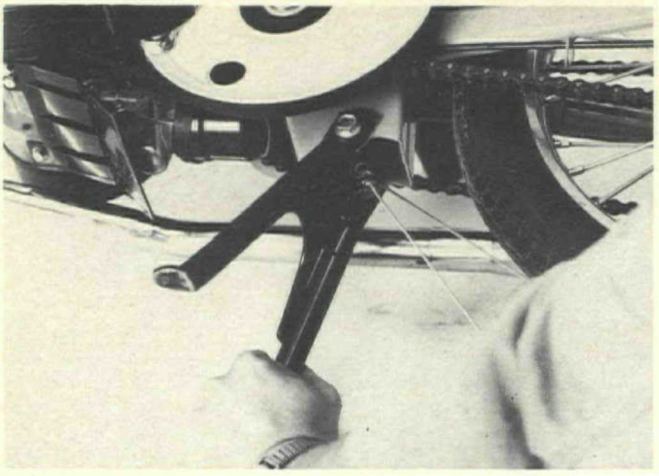


Pict. 29

A high load is needed to press new blocs into the frame. But if after the first 500 miles the bolt is retightened properly as described above, replacement will not be necessary.

Centerstand

The centerstand is attached to the rearfork by means of special M 8 bolts (see pict. 28, item T).

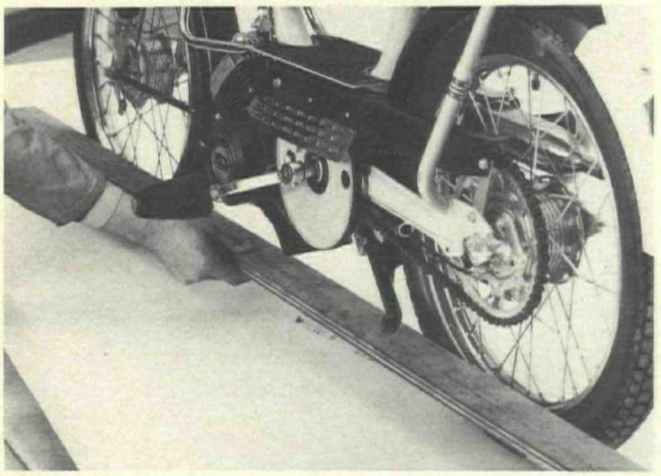


Pict. 30

For the assembly of the stand spring a piece of bowden cable in a tube can be a handy tool (see pict. 30).

Various

Also attached to the rearfork is the automatic chain tensioner (see pict. 28, item B) and the crankaxle-bearings (see pict. 28, item D).
See to it, that the chain-tensioner is properly aligned with the pedal chain.
The crankaxle bearings should be fitted by using a percussion stamp (drift), thus achieving centring of the bearing at the same time.
In case the axle nuts have been removed or loosened the alignment of the wheels should be checked by means of a rule, after retightening the nuts (see pict. 31).



Pict. 31

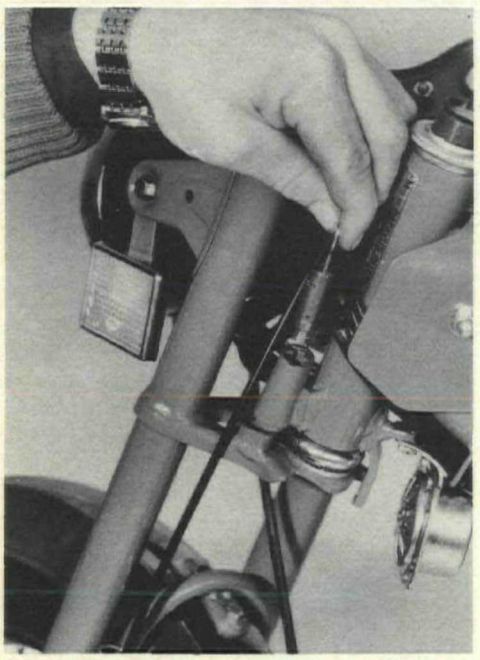
Steering lock

Perform steps as follows to replace the steering lock:

A) Remove lock plate, which is fixed with a pressed pin and a spring washer (see pict. 33).

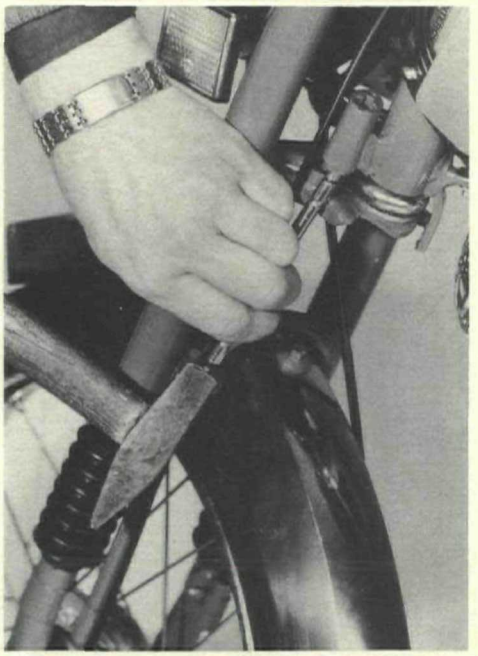
Pict. 33

B) Turn lock to the left if key is still available and remove lock (see pict. 34).



Pict. 34

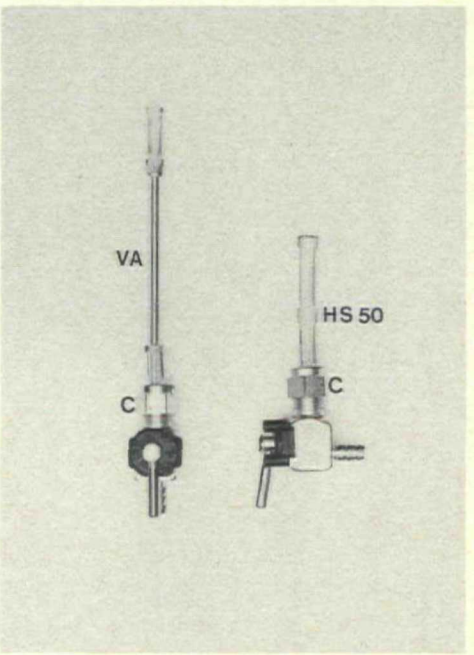
C) When lock is out of order or both keys are missing:
1. remove top fork plate (crownplate) with handlebar still assembled by loosening ballhead nut and fork top nuts;
2. loosen upper cone (appr. 20 turns) so far that the fork lowers under the fork steady;
3. turn fork to the right in such a way that the lock-pin is free;
4. remove lock by means of punch and hammer (see pict. 35); the small blocking pin will break allowing the lock to be removed from the housing.



Pict. 35

Fuel tap

The fuel tap has a reserve supply provision.
The upper and lower strainers (see pict. 32) filter the fuel when tap is open or in the reserve position.



Pict. 32

The tapnut (item C) has a left and a right hand thread on the inside.
The tap has a left hand thread, the tankfitting a right hand thread.
First turn the tapnut one half turn on to the fuel tap, when reassembling. Then fit tapnut to the tankfitting and turn on both threads, in such a way that the tapnut covers an equal number of threads on both tankfitting and fuel tap when tight. Don't forget the gasket!

Frontfork

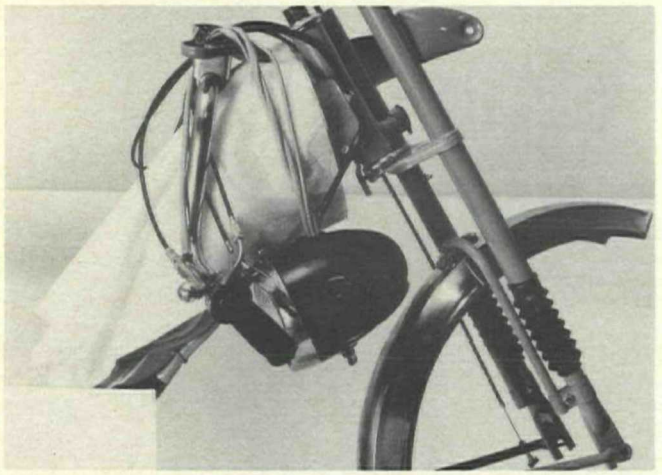
a) Replacement of complete fork and/or ballhead bearings.

b) Replacement of forkleg(s) with spring.

c) Replacement of slider bushings.

To achieve replacement as described under a):

— Remove frontwheel, fender and fender stays.
— Remove top forkplate (crownplate) with handle-bar still assembled, by loosening ballhead locknut and fork locknuts.
— Remove headlamp bolts.
— Protect fuel-tank against damage and put handlebar on tank (see pict. 36).



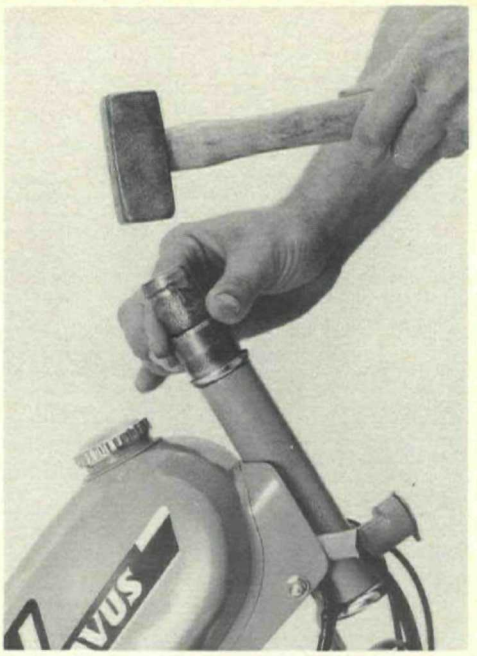
Pict. 36

— Release upper cone and remove frontfork.

Removal of the ballhead cups can be achieved by use of a long punch (see pict. 37).

Pict. 37

New cups can be assembled by using a punch that sits fully on the race (see pict. 38).

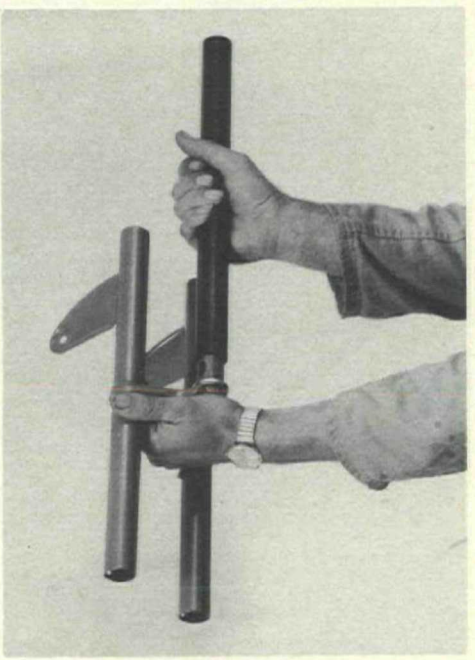


Pict. 38

Always use new upper ball-cage and lower balls (23 pieces). Grease with ballbearing grease.

The inner ballhead cone can be assembled by using a long pipe (see pict. 39).

A sufficient fit is achieved by using a starring (see spare-partslist page 6/7, item 14).



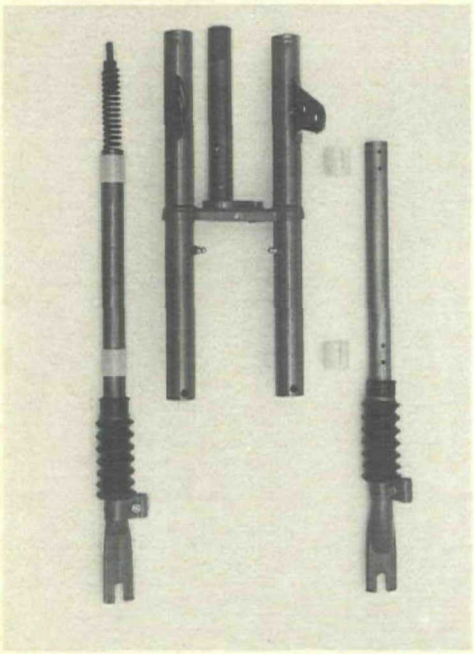
Pict. 39

To achieve replacement as described under b):

— Remove successively frontwheel, stabilizer with fender and top forkplate with handlebar and head-lamp (see pict. 36).
Then remove flat nuts and pull out fork legs.

To achieve replacement as described under c):

— Remove successively frontwheel, top forkplate with handlebar and headlamp and flat nuts.
Please note that the bushings are split and that their round cams fit into the holes of the forklegs (see pict. 40).

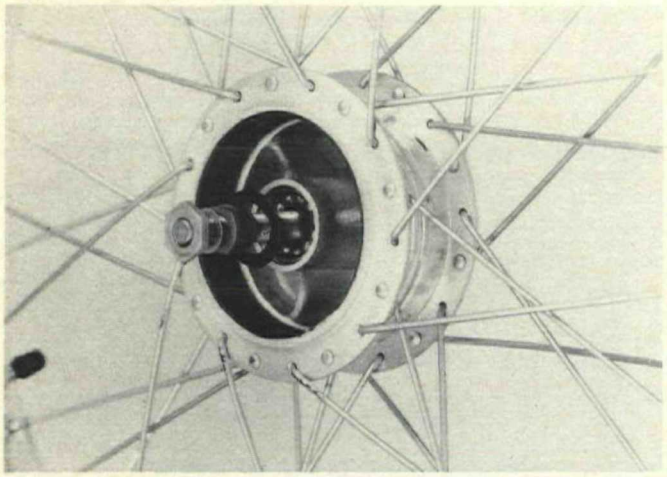


Pict. 40

Wheels

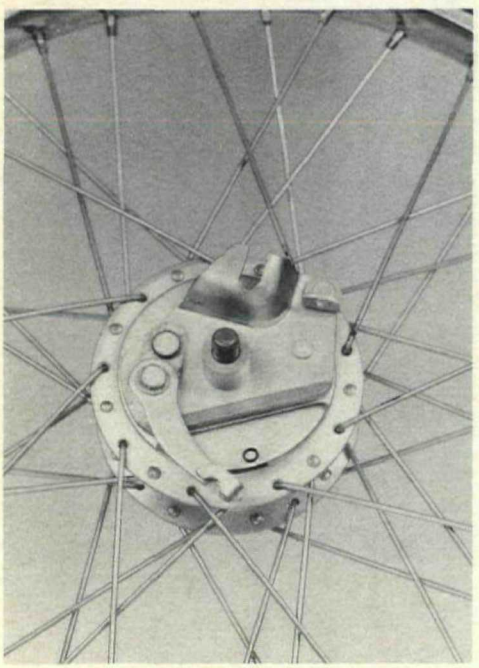
Rims size is 16" and tyres size is 2-16".
The frontwheel spoke-length is 168 mm, thickness Nr. 12 number of spokes 28.

The brakeside rearwheel spoke-length is 164 mm, thickness Nr. 11, the freewheel side spokes are 166 mm long and also of thickness Nr. 11.
Total number of spokes is 36.
Both wheels should be respoked with a "3 over"-pattern.
When respoking the rearwheel always start with the shorter brake side spokes.
For dis- and reassembly of the freewheel always use a freewheel-remover.
Both hubs are full drum hubs with cups and cone bearings.
The front hub has 11 balls 7/32", the rear hub 13 balls 3/16 " (see pict. 41).



Pict. 41

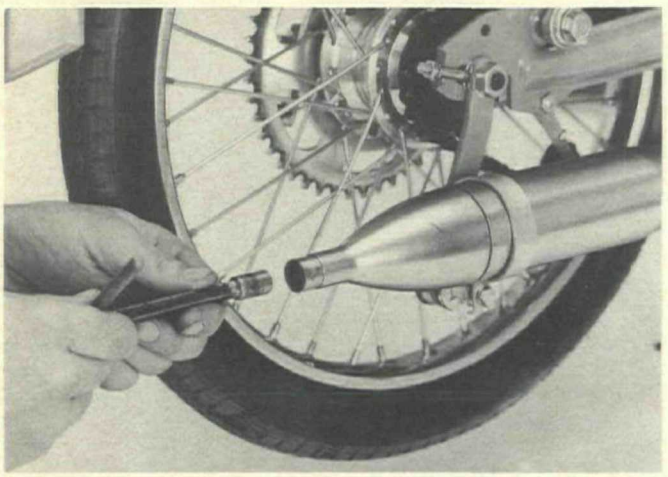
If the lining thickness is less than 2 mm the brakeshoes have to be replaced.
The thickness can be checked through holes in the brakeplate (see pict. 42).
A peculiarity is that the brakeshoes are selfcentring.



Pict. 42

Silencer

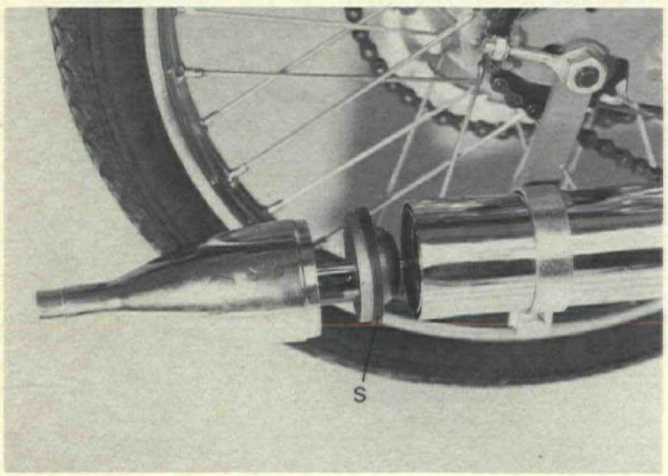
In case the engine performance is gradually noticed to decrease while the engine is still in a good mechanical condition, it is very likely that the exhaust muffler and sometimes even the exhaust-pipe and exhaust-port need to be decarbonized.
The conical end of the silencer can be removed by loosening the nut of the retainer inside the muffler (see pict. 43).



Pict. 43

Next remove the silencer insert. The holes in the insert need to be cleaned.

Use new rubberseal between the conical silencer-end and the silencer itself, when reassembling (see pict. 44, item S).



Pict. 44

Electrical equipment

Consult the electrical diagram for any repair work of the electrical equipment.

First of all make sure that all electrical parts are well grounded.

Ceck the bulbs for proper condition.

Check the wires for short circuiting or being disconnected.

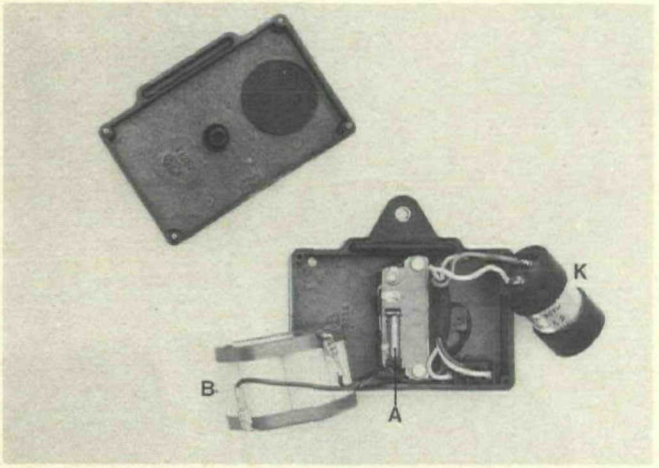
Turn signal kit troubles

A) Check bulbs, grounding, switch and connections.

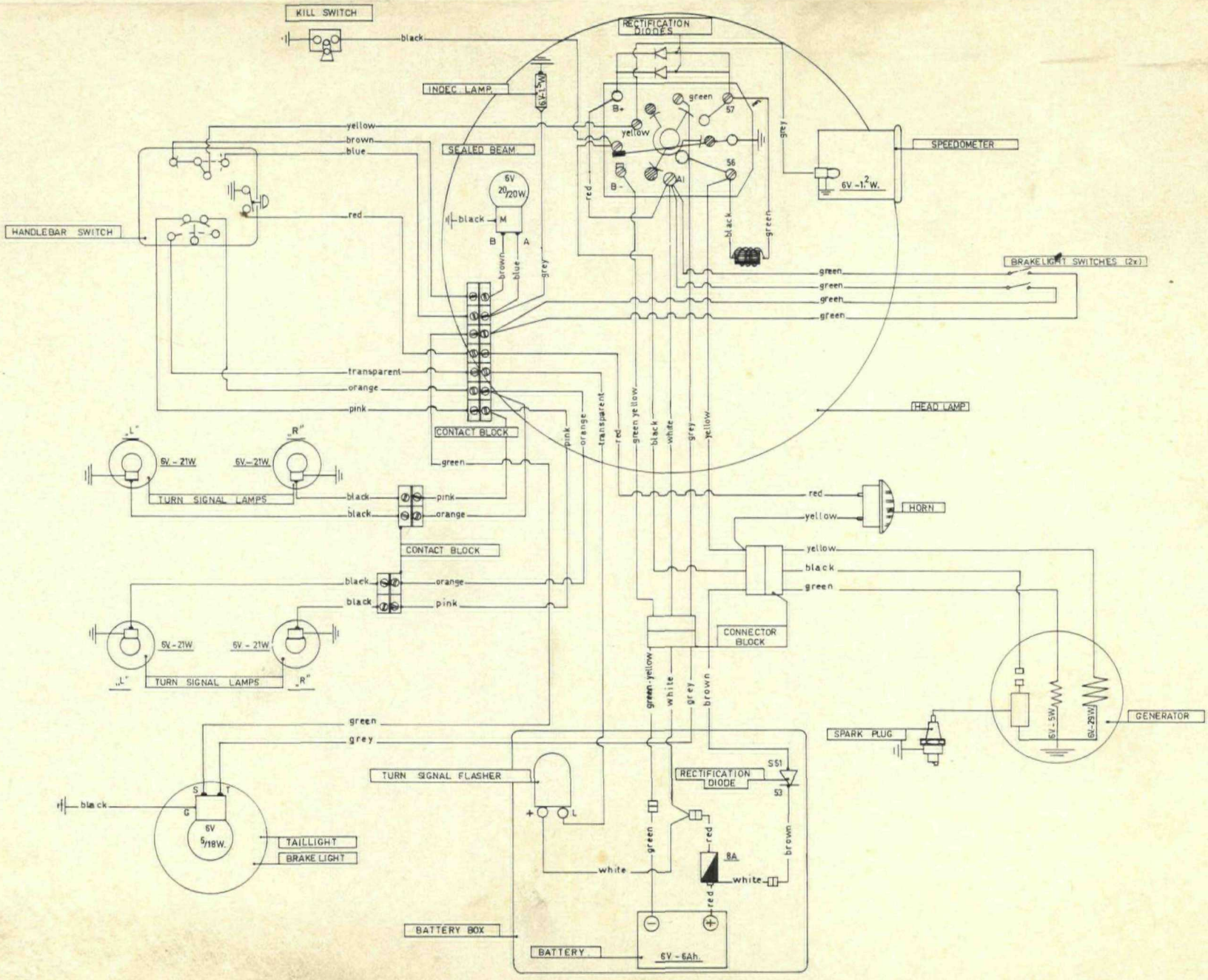
B) Check fuse (pict. 45, item A) in master pack.

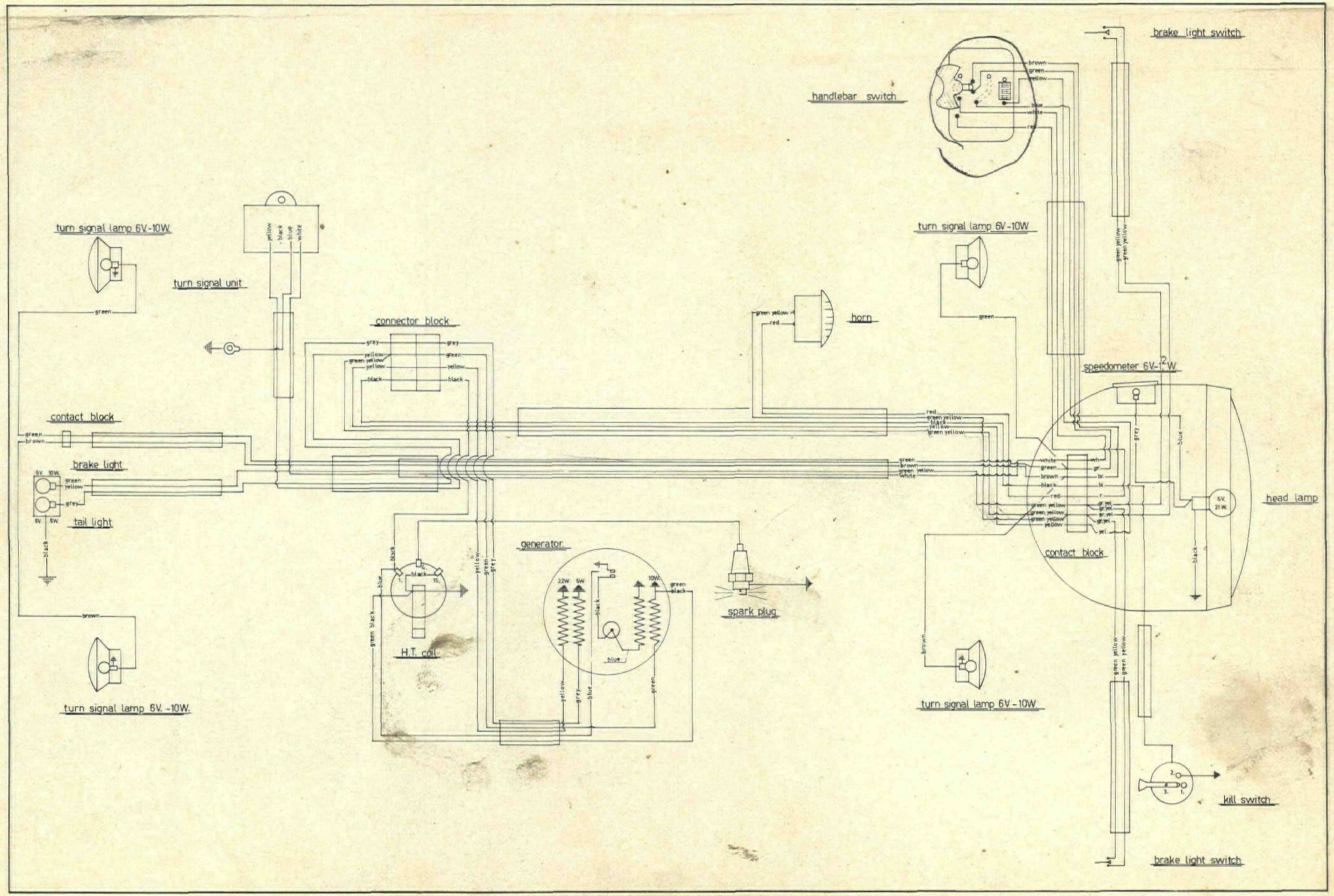
C) Check flasher K by replacing.

D) If the nickel-cadmium battery B is flat it may be recharged with a max. current of 1 Amps.
If recharging is not possible the battery has to be replaced.



Pict. 45


KILL SWITCH
black
RECTIFICATION DIODES
INDIC. LAMP
6V-1,2W.
yellow
brown
blue
SEALED BEAM
6V 20/20W
black
M
B
A
red
HANDLEBAR SWITCH
green
57
56
31
B+
B-
grey
SPEEDOMETER
6V-1,2W.
BRAKELIGHT SWITCHES (2x)
green
green
green
green
transparent
orange
pink
CONTACT BLOCK
HEAD LAMP
„L"
6V.-21W.
„R"
6V.-21W.
TURN SIGNAL LAMPS
green
black
pink
black
orange
CONTACT BLOCK
red
HORN
yellow
yellow
black
green
black
orange
black
pink
6V-21W.
6V-21W.
„L"
TURN SIGNAL LAMPS
„R"
CONNECTOR BLOCK
green-yellow
white
grey
brown
GENERATOR
6V-5W.
6V-28W.
SPARK PLUG
green
grey
TURN SIGNAL FLASHER
RECTIFICATION DIODE
S51
53
black
S
T
G
6V 5/18W.
TAILLIGHT
BRAKE LIGHT
+
L
green
red
brown
white
8A
white
red
BATTERY BOX
BATTERY
6V-6Ah.


brake light switch
handlebar switch
turn signal lamp 6V-10W
turn signal unit
connector block
horn
turn signal lamp 6V-10W
speedometer 6V-2W
contact block
brake light
tail light
head lamp
generator
spark plug
H.T. coil
contact block
turn signal lamp 6V.-10W.
turn signal lamp 6V-10W
kill switch
brake light switch