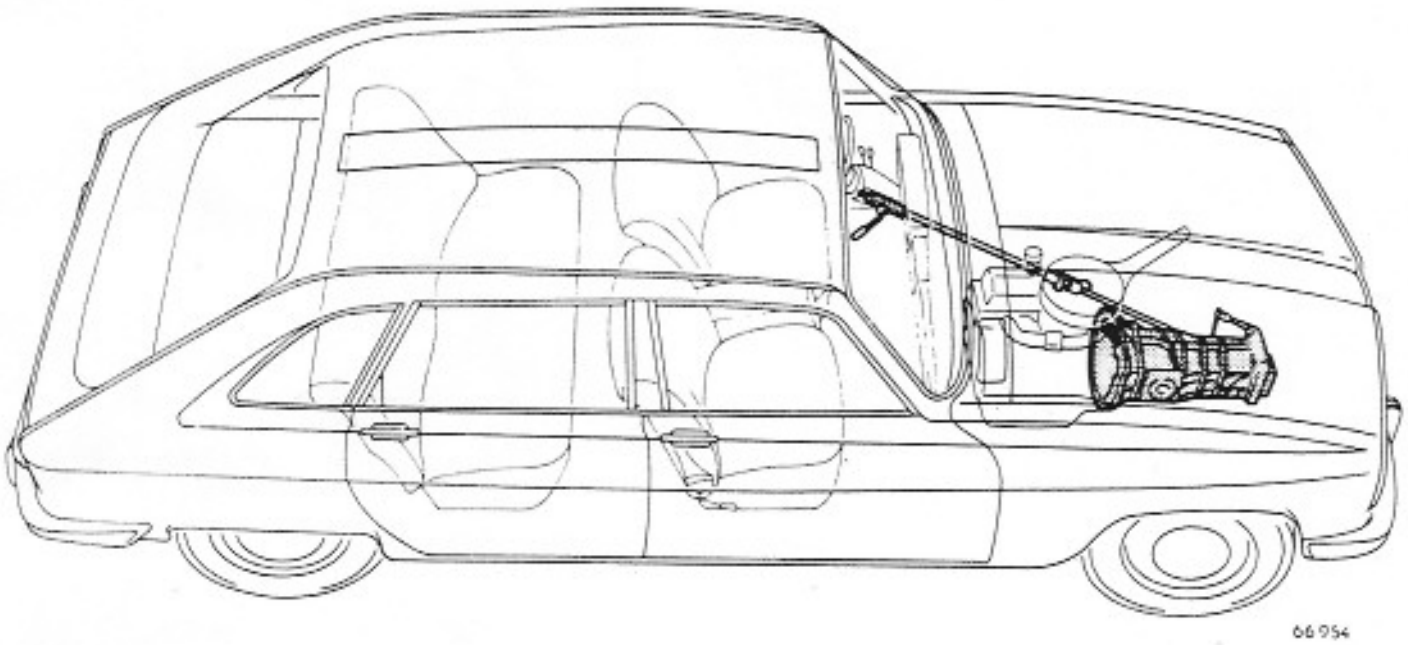
Chapter E

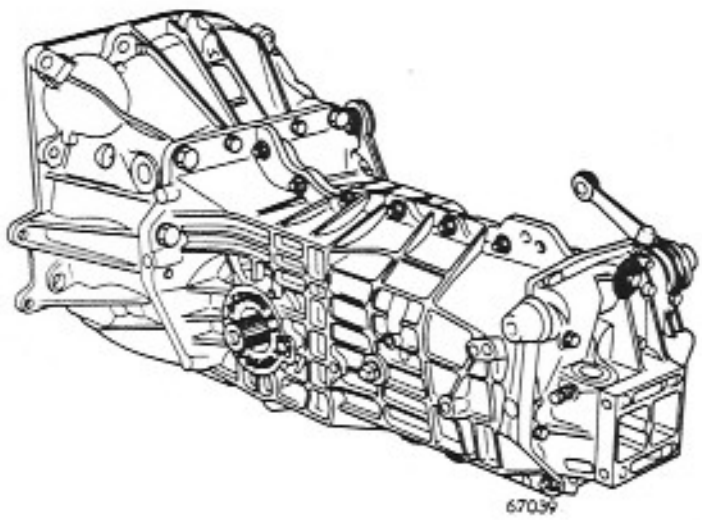
GEARBOX (TRANSMISSION CASE)

E

CONTENTS OF CHAPTER



I - IDENTIFICATION



The type, index and manufacturing number are given on a number plate on the front of the housing.

Type 336.

Index	Steering		Crown wheel and pinion		Differential adjustment		Good road	Poor road and special equipment
	Left-hand	Right-hand	9 x 34	8 x 34	Shims	Nuts		
02	x		x		x		x	
03		x	x		x		x	
06	x		x			x	x	
07		x	x			x	x	
10	x		x		x			x
11		x	x		x			x
12	x		x			x		x
13		x	x			x		x
14	x			x		x		x
15		x		x		x		x

II - SPECIFICATIONS

Pressure die-cast aluminium housing separating into two parts.

Four synchronised forward speeds :
1st - 2nd : Renault Synchroniser.
3rd - 4th : Borg-Warner Synchroniser.

One reverse gear.

Primary shaft :
5 gears integral with the shaft.

Secondary shaft :
4 gears running free on the shaft.
2 synchronisers.
3rd - 4th sliding gear wheel acting as reverse gear.

Reverse shaft :
1 gear running free on the shaft.

Differential :

Consisting of two sun-wheels and two planet wheels
One crown wheel with 34 teeth.
One final drive pinion with 8 or 9 teeth.

Speedometer drive :

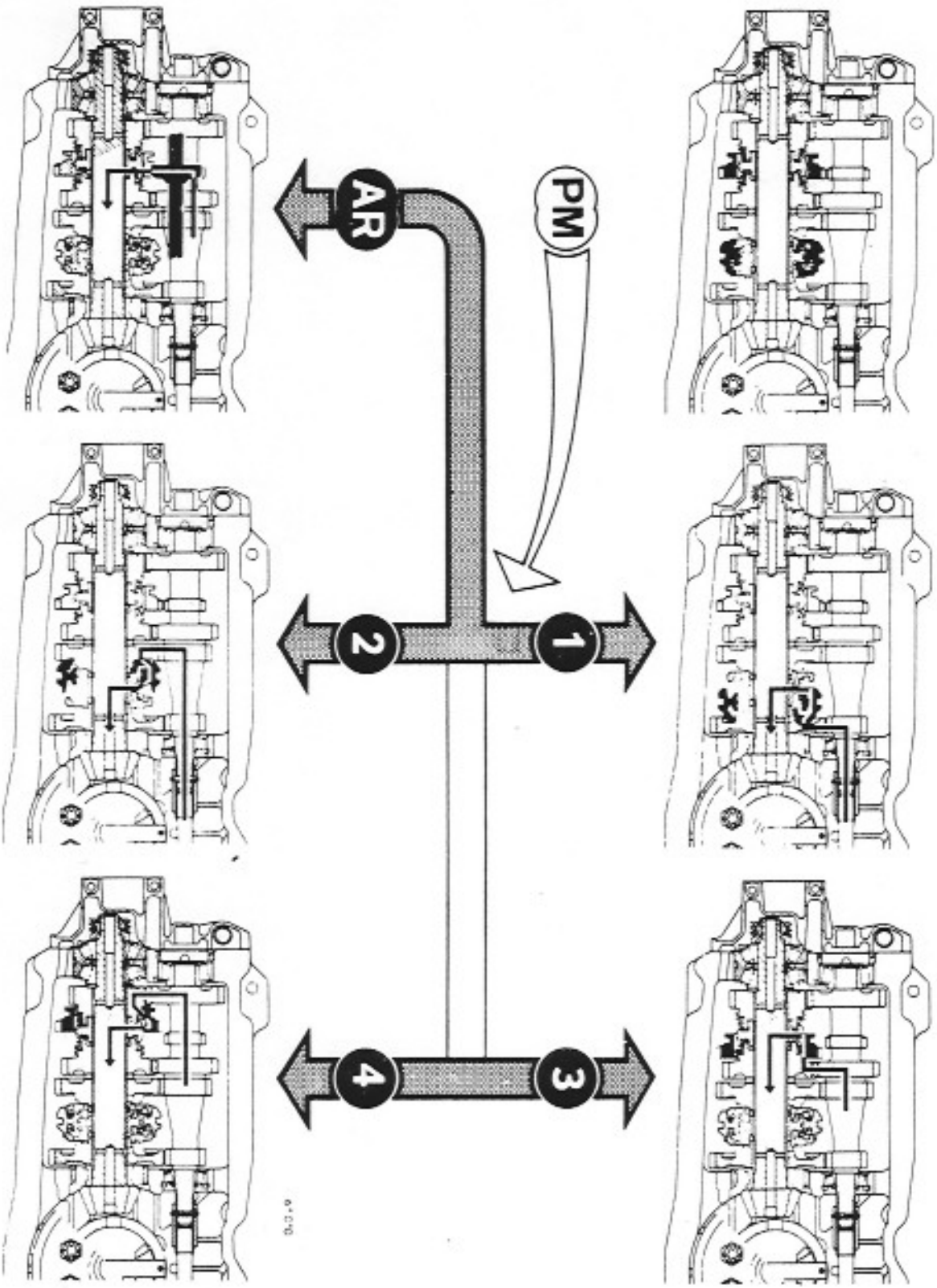
6 x 12 on the 9 x 34 crown wheel and pinion
6 x 14 on the 8 x 34 crown wheel and pinion.

Reduction ratios :

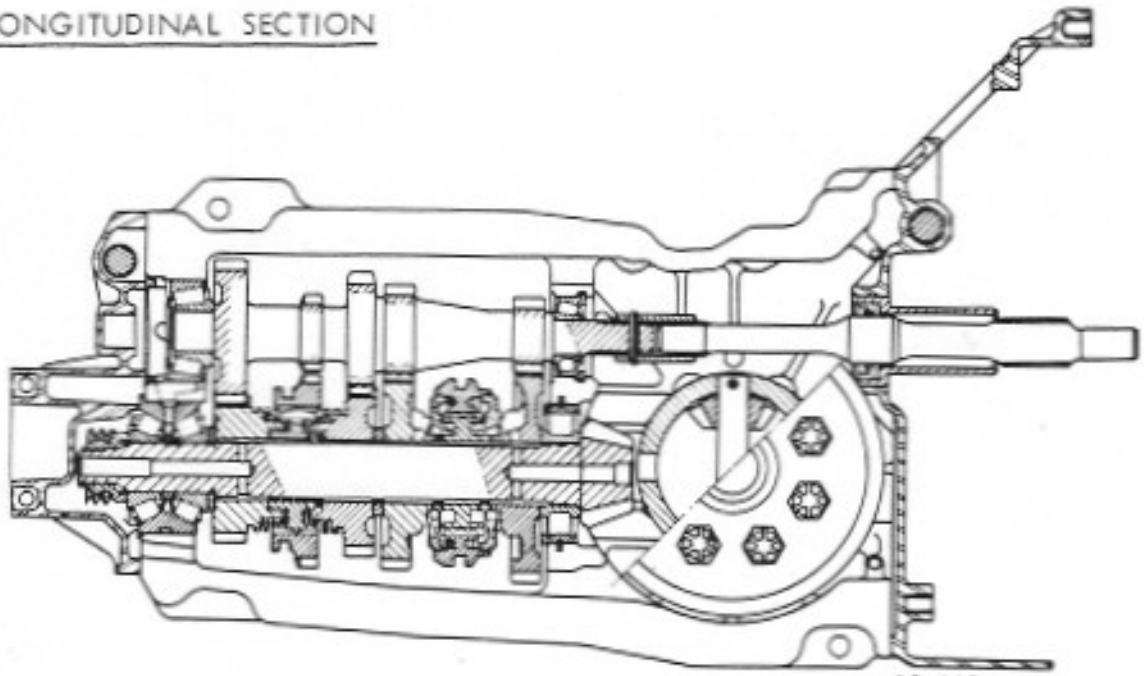
1st	3.61
2nd	2.25
3rd	1.48
4th	1.03
Reverse gear	3.07

Oil capacity : 1.64 litres (3½ pts. U.S. 3 pts. Imp.)
Oil grade : EP 80.

III - OPERATING DIAGRAMS



IV - LONGITUDINAL SECTION



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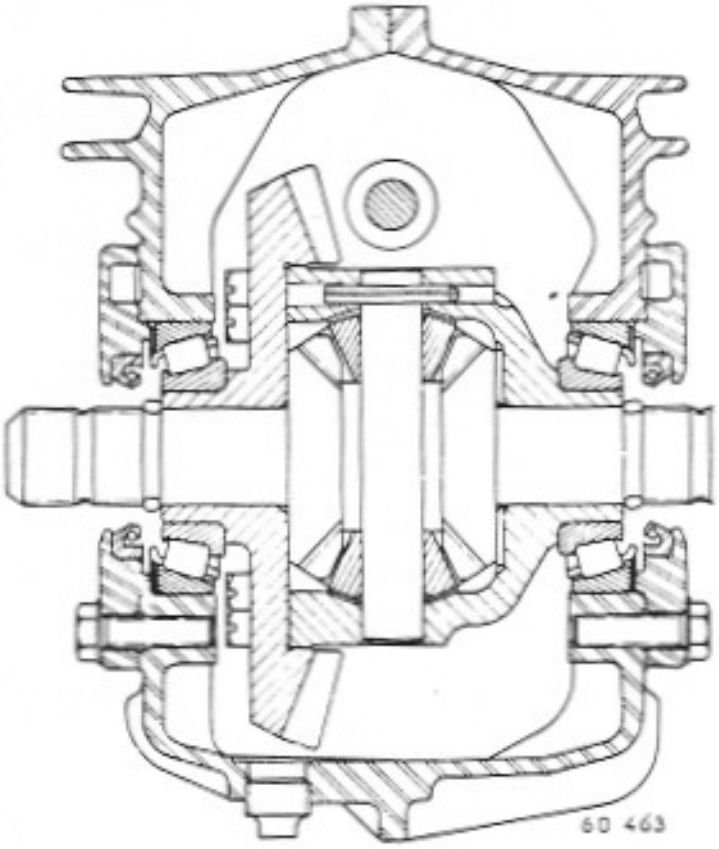
V - SECTION THROUGH DIFFERENTIAL



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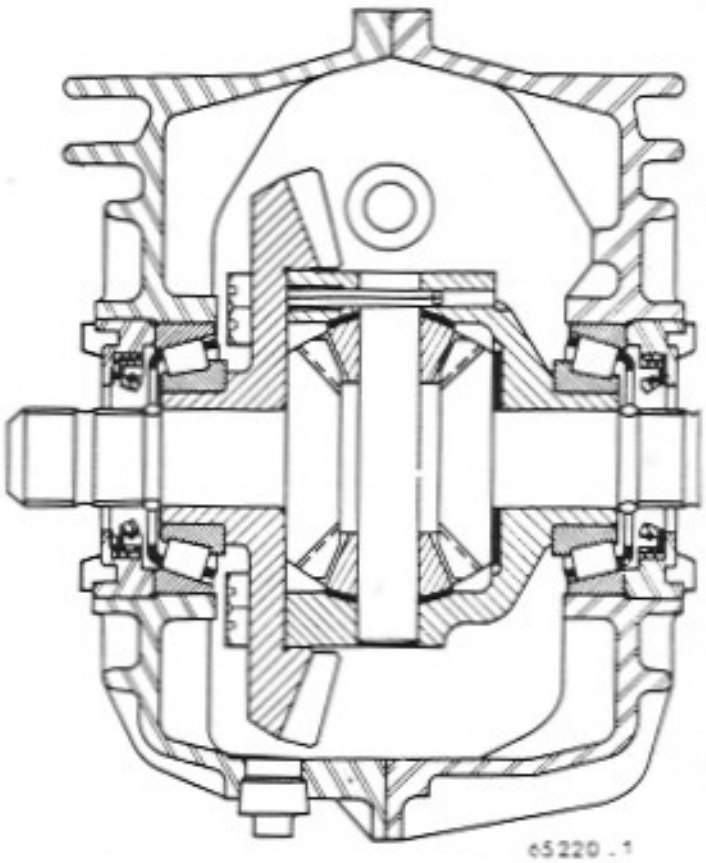
Bearings adjusted by shims.



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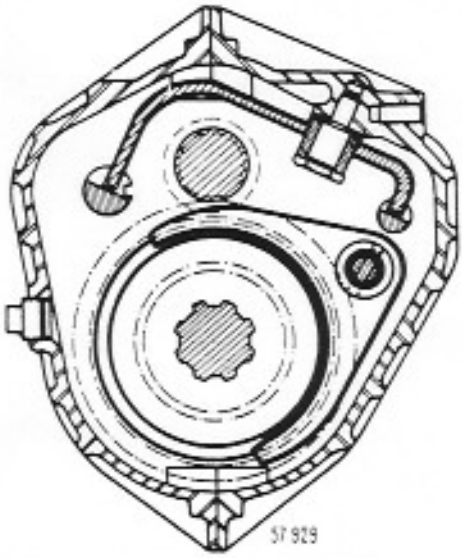
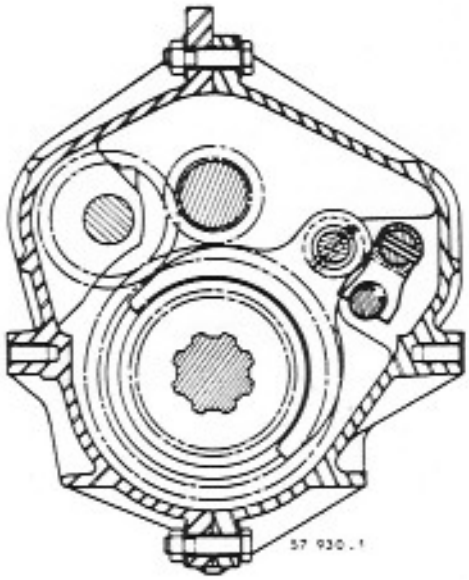
Bearings adjusted by nuts.

VI - SECTION THROUGH THE SHIFT FORKS

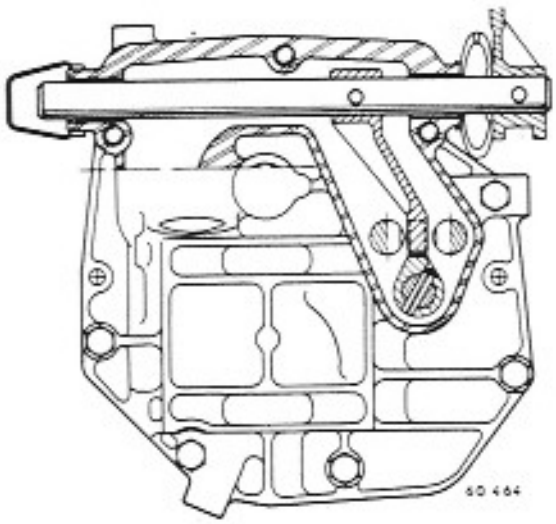


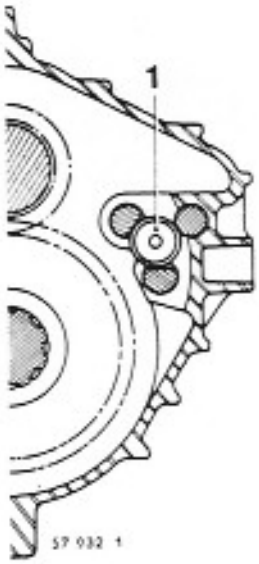


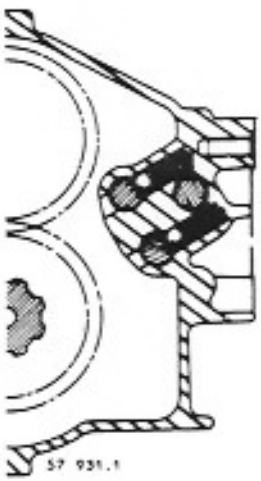
VII - GEAR SHIFT LOCKING SYSTEM

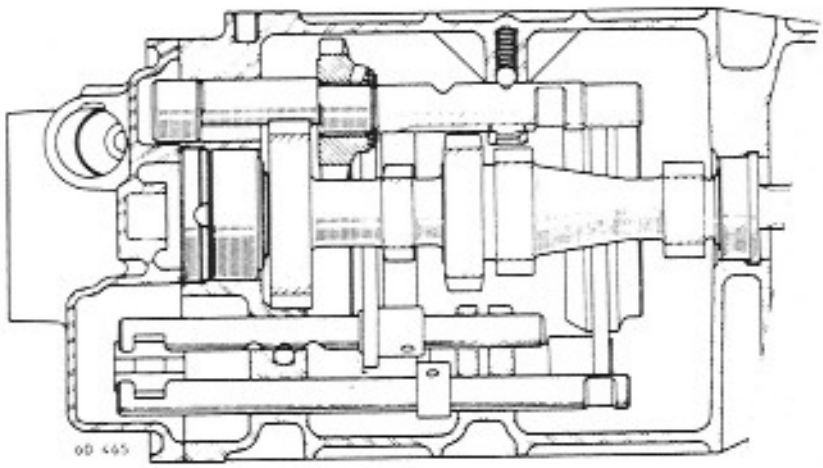
Each of the shift forks is locked, no matter what its position (whether in neutral or with a gear engaged) by a ball and a spring.

Furthermore, the disc (1) locks :
- the 3rd - 4th speed shafts and the reverse shaft when 1st - 2nd gear is engaged.
- the 1st - 2nd speed shafts and reverse shaft when the 3rd-4th gear is engaged.
- the 1st - 2nd and 3rd - 4th speed shafts when the reverse gear is engaged.

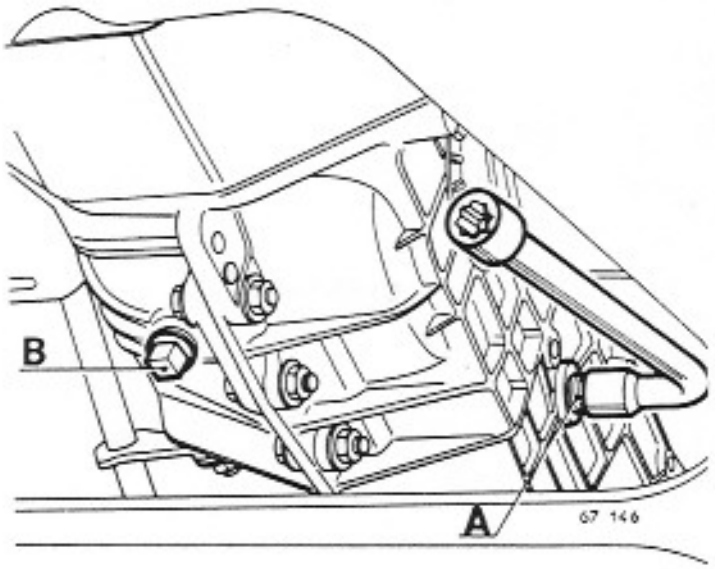








VIII - LUBRICATION



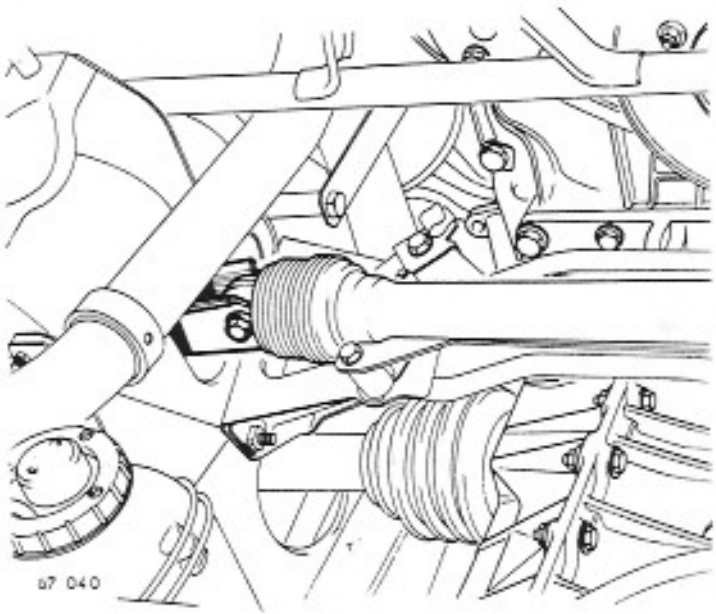
The gears are splash lubricated. The housing is filled with oil at aperture (A) in the side of the housing which also fixes the level.
It is drained through plug (B).
Gearbox capacity : 1.64 litres (3½ pts. U.S. 3 pts. Imp.).
Oil grade : EP 80.

Checking the oil level :

Unscrew plug (A) by means of spanner (wrench) B. Vi.380 : the oil should be flush with the lower edge of the orifice.

IX - REMOVING AND REFITTING THE GEARBOX (TRANSMISSION CASE)

A - REMOVING



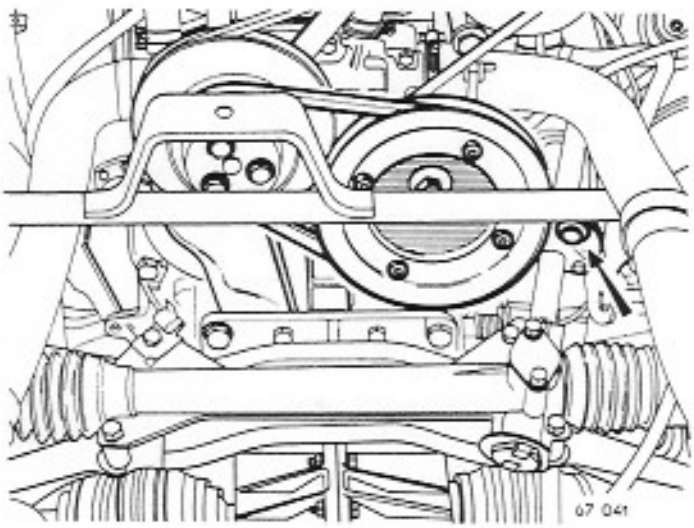
Disconnect the battery.
Drain the gearbox, using tool B.Vi.380.

Remove :
- the spare wheel.
- the fan and its casing.

Disconnect the feed lead at the battery and detach it from its retaining clip on the steering column.

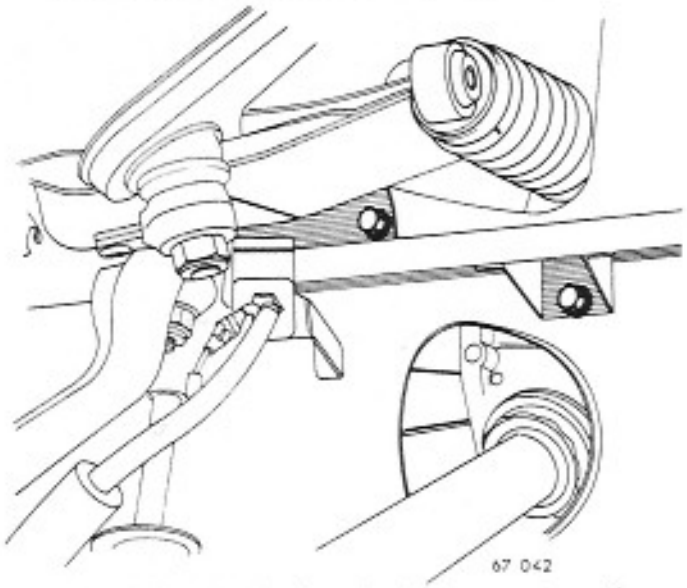
Turn the steering column to the left and disconnect the right-hand steering link from its adjustable end fitting.
Turn the steering column to the right and disconnect the left-hand steering link.

Remove :

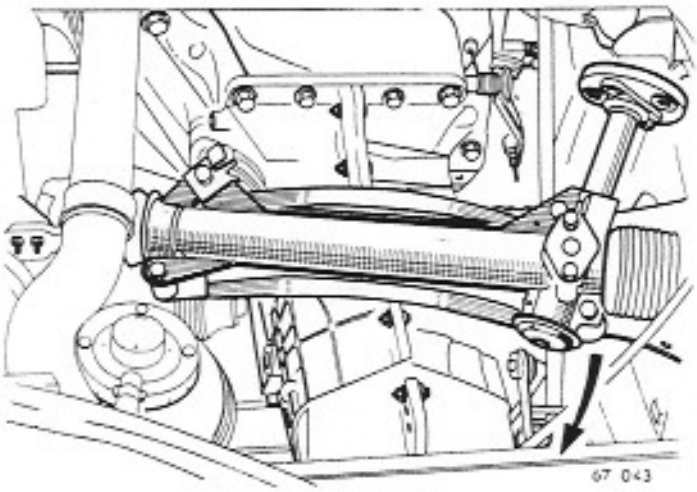


- the outer flange plate from the camshaft pulley.
- the adjusting shims.
- the belt.
- the pulley.

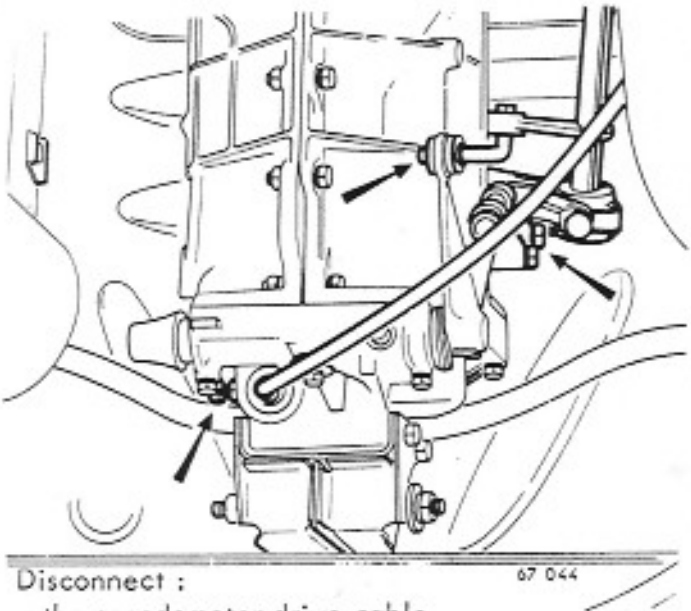
Remove the two bolts which secure the steering flexible coupling to the steering column.



Remove the four bolts which secure the steering mechanism cross member to the cowl sides.

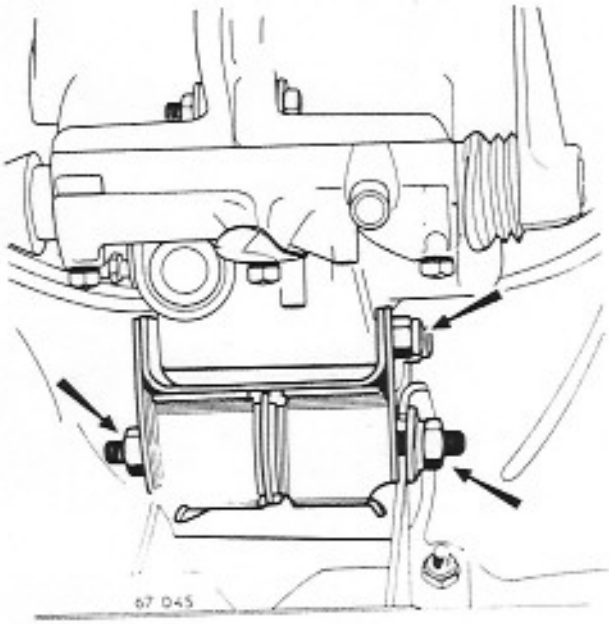


Remove the "Steering - cross member" assembly as follows :
with the steering turned through its full lock in the right-hand direction, pull the left-hand end towards the front and take out the assembly.

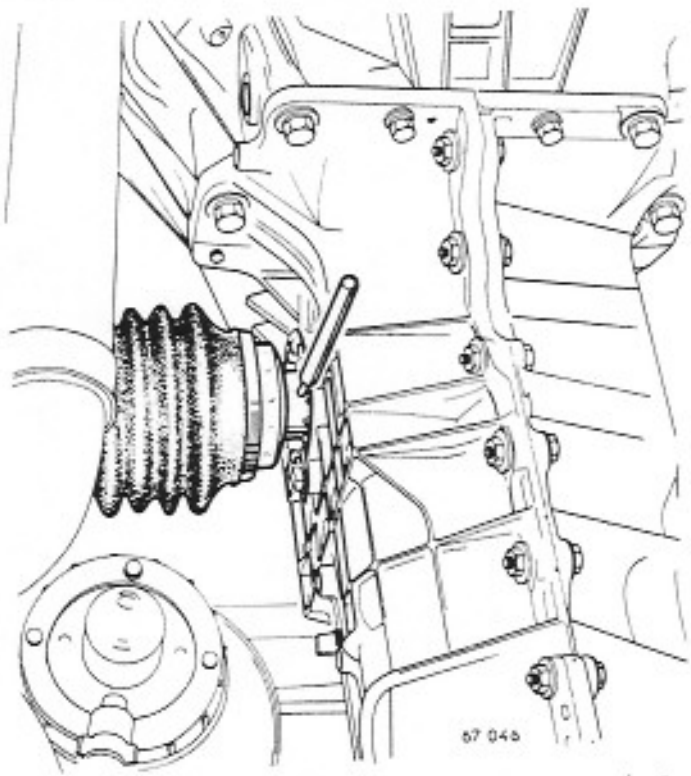


Disconnect :
- the speedometer drive cable.
- the link at the gear shift lever.

Remove the two bolts which secure the gear shift control to the gearbox and pull back the control.
Hook it to the battery support.

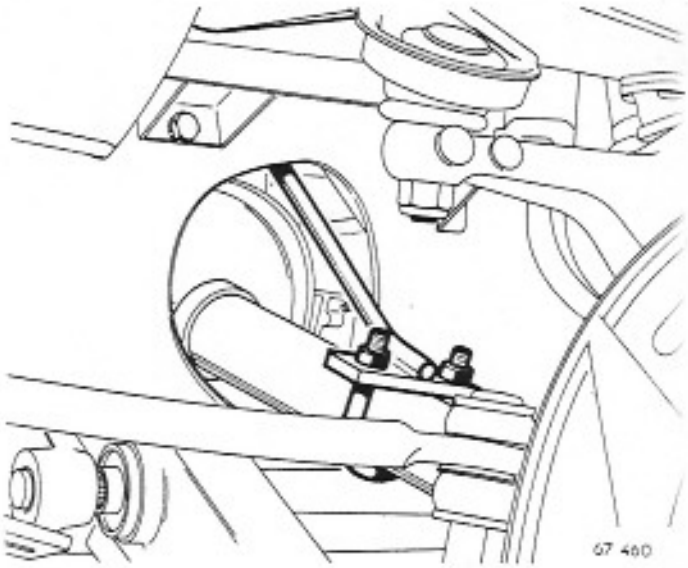


Unscrew the 2 front mounting pad securing nuts in order to be able to remove the two anchor nuts.
Remove the 2 bolts which secure the pad bracket to the front housing.
Remove the pad and its bracket.

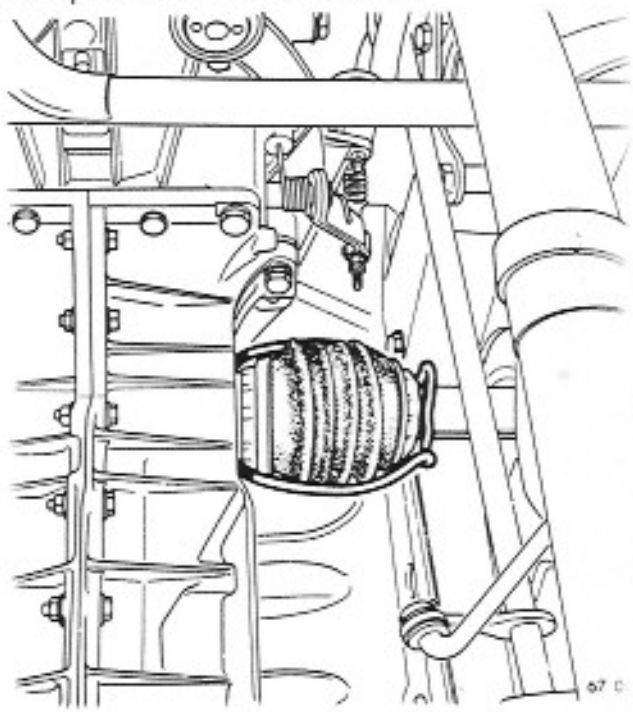


Push out the roll pins from the transmission shafts by means of the drift B.Vi.31 B.

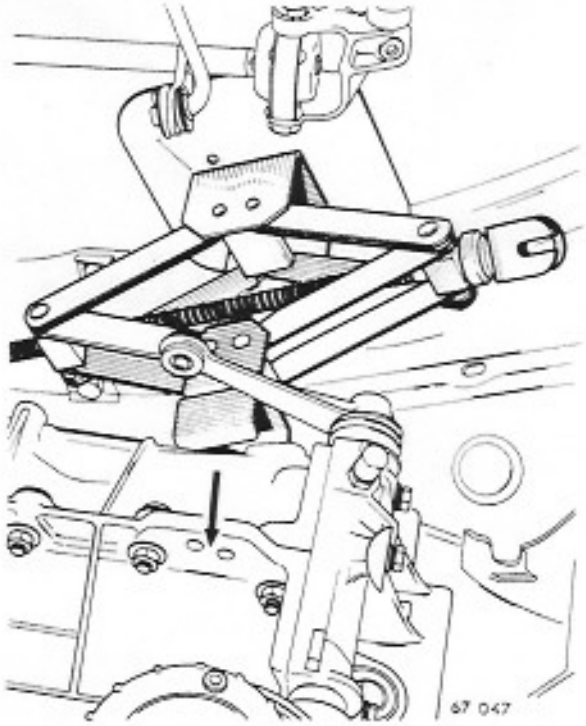
Fit the tools to the transmission shafts to prevent them coming disjointed.



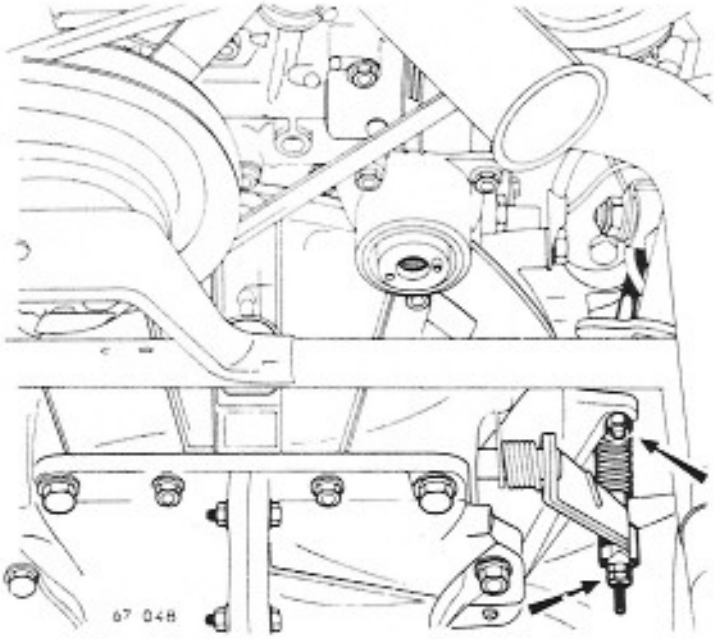
- T.Av.247 for transmission shafts which have Weiss joints with metal casings.



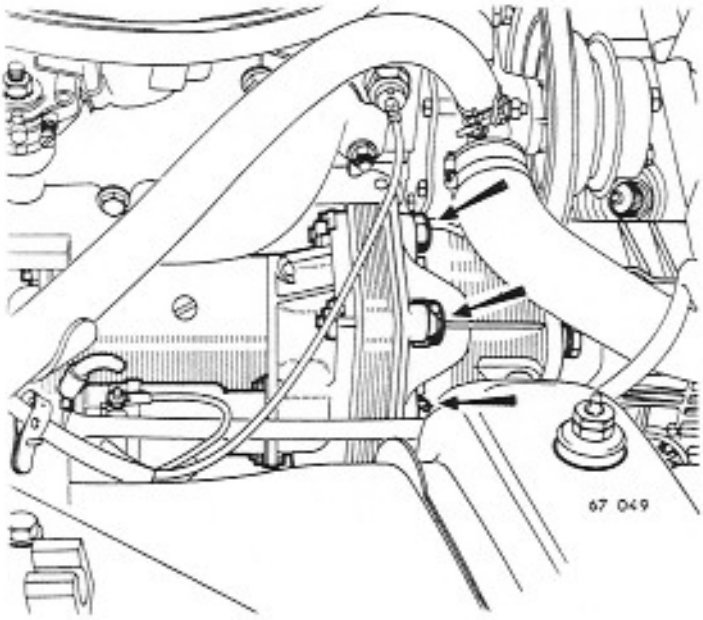
- the special tools supplied with new transmiss shafts for those which have Weiss joints protec by rubber bellows.



Place a jack between the gearbox and the left-hand side member.
Push the box to one side, with the jack, and remove the transmission shaft from the sun-wheel.



Disconnect the clutch cable, and free the dust cover and push the cable end fitting from its clamp.
Unlock and unscrew the two bolts which secure the engine to the gearbox on the left-hand side.



Remove the jack and place it on the right-hand side.
Push the gearbox over and free the transmission shaft from the sun wheel.
Unlock and unscrew the following :
- the bolt which secures the engine to the gearbox on the right-hand side.
- the starter securing bolts : pull it back as far as it will go.

Push the gearbox forward to free the clutch shaft.
Lift the front of the gearbox, taking care not to damage the radiator, and remove it vertically.

B - REFITTING

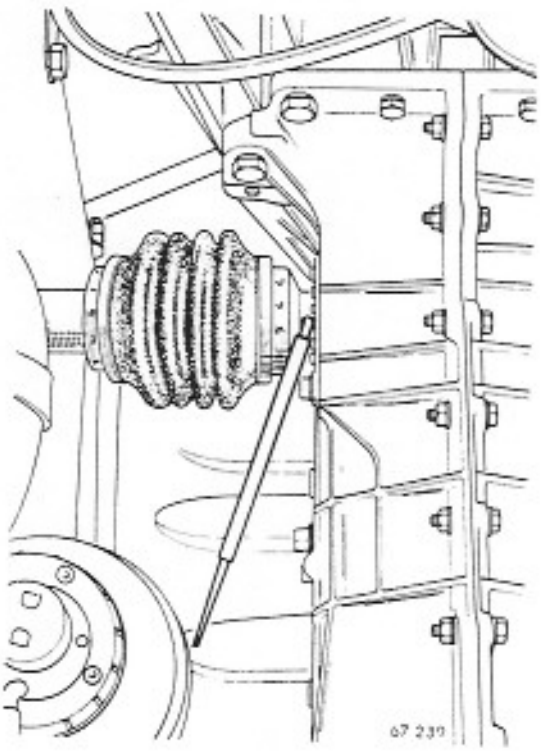
Carry out the removing operations in reverse, paying attention to the following points :

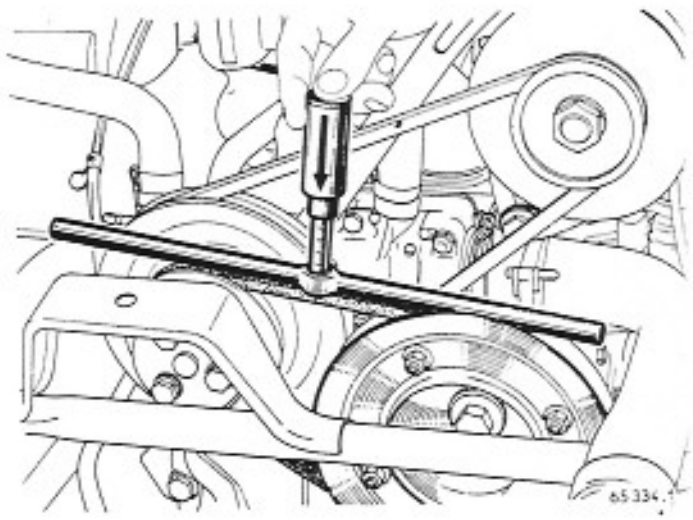
- Lightly grease the splines on the clutch shaft.
- Grease the planet wheel splines with "Spagraph" grease (Ref. 806 149).

- Place one of the pin holes at the bottom of one of the splines in the transmission shaft, in line with the hole on top of one of the sun-wheel splines.

NOTE -
It is forbidden to use the camshaft pulley retaining bolt to turn the engine.

One must therefore :
- lift one side of the car.
- engage 4th gear.
- turn the wheel in the forward drive direction.





- To make it easier to fit the transmission shaft roll pins, use the cranked end of drift B. Vi.31 B.

- When fitting the water pump drive belt, slowly tighten the nuts on the outer flange while turning the engine, in order to avoid damage to the belt.

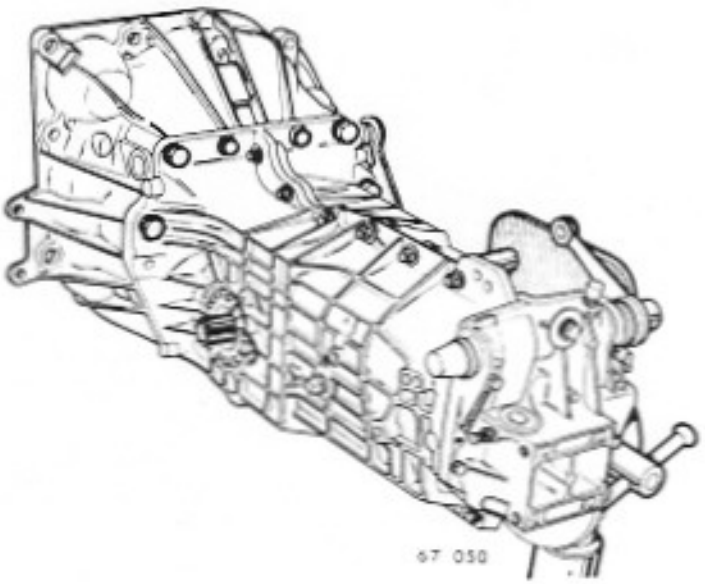
Check the belt deflection by means of tool Ele.346 : it should be : 2.5 to 4 mm (3/32 to 5/32").

- Adjust the clutch clearance. It should be : 2 to 3 mm (5/64 to 1/8") at the end of the lever

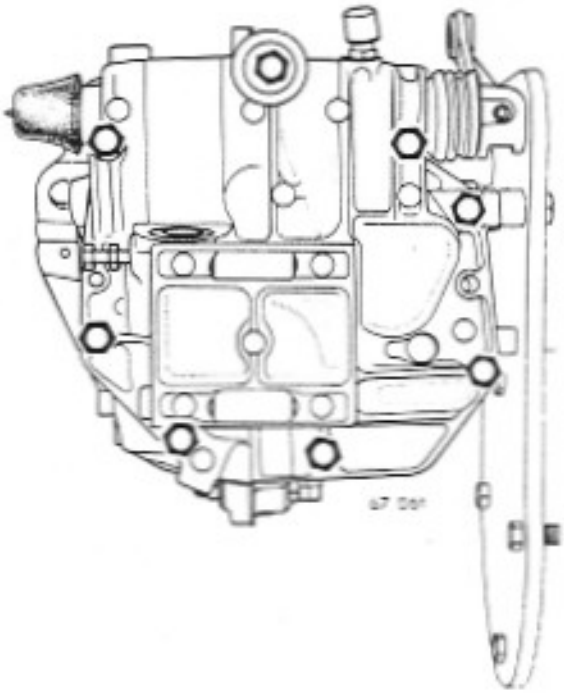
Fill the gearbox with oil : grade EP 80.

X - FULLY OVERHAULING THE GEARBOX (TRANSMISSION CASE)

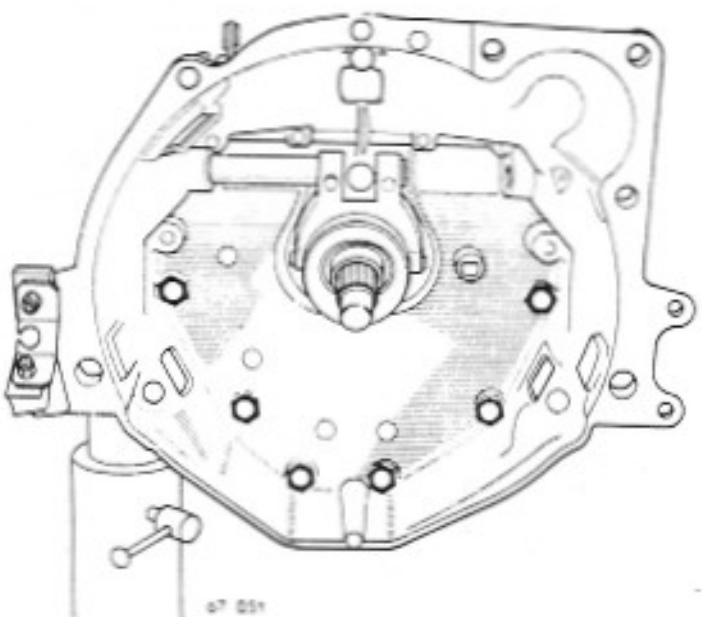
A - DISMANTLING



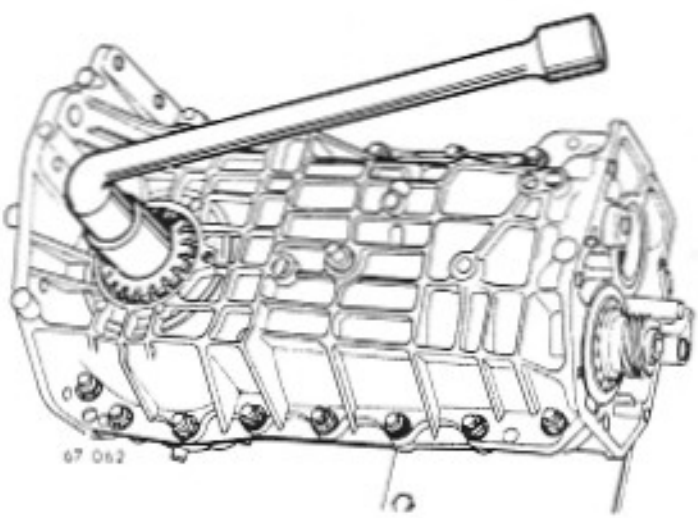
Secure the gearbox to B.Vi.240 which is fitted to the adjustable stand or the bench stand.
Remove the clutch housing securing bolts.



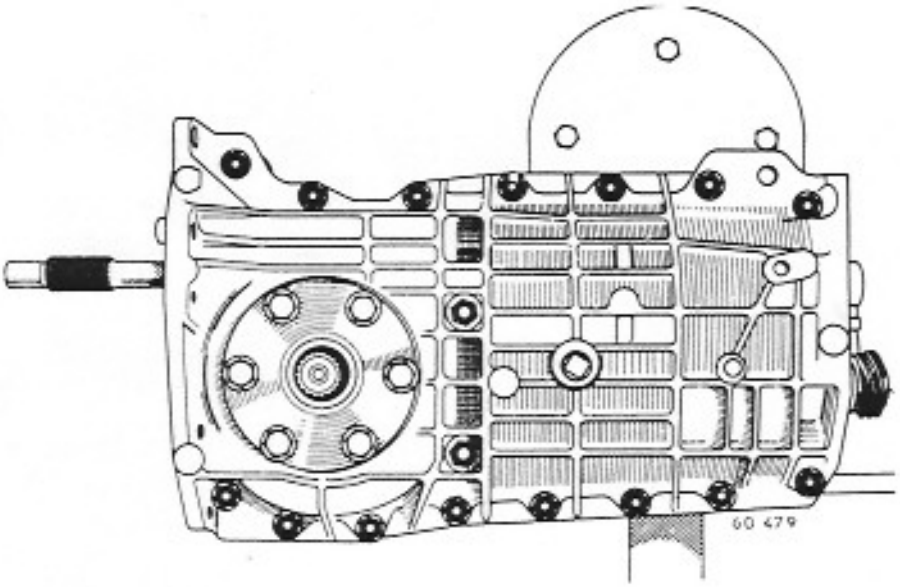
Remove the front housing securing bolts and remove it.



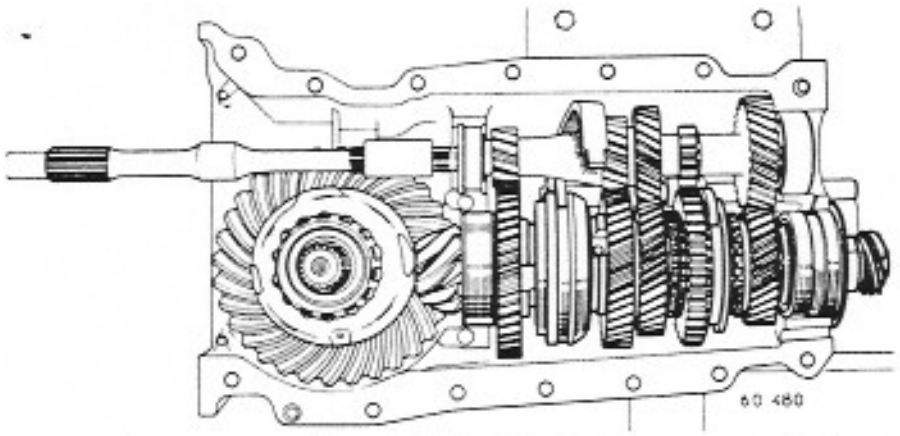
Remove the clutch housing.



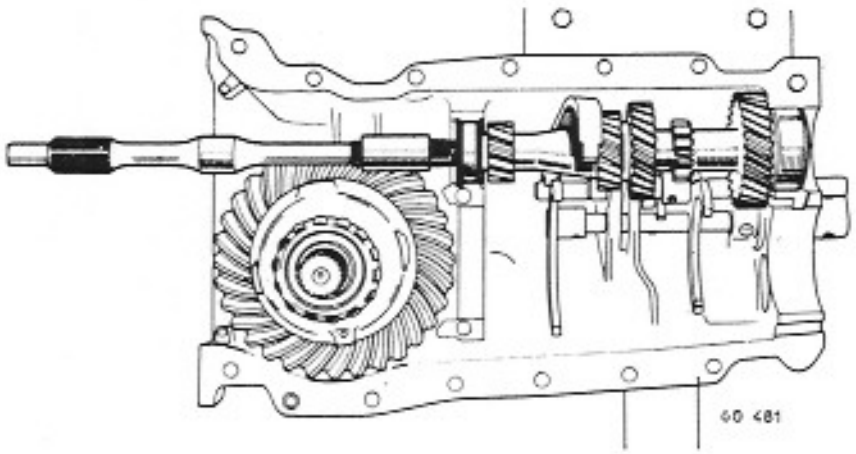
In the case where the differential bearings are adjusted by means of nuts :
- Remove the locking plates from the nuts.
- Loosen and unscrew the nuts by means of spanner (wrench) B.Vi.377.



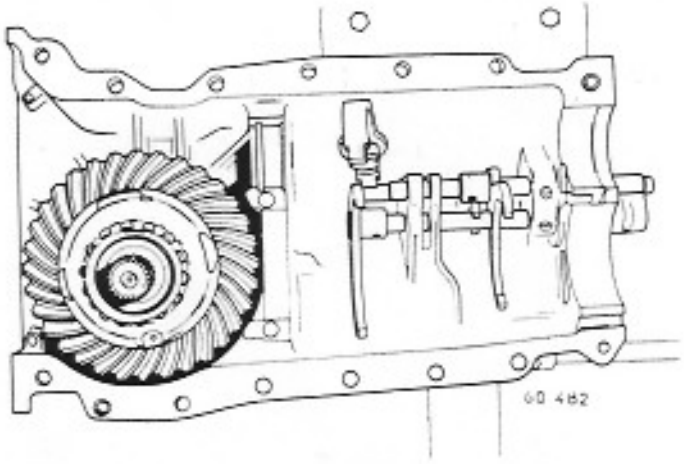
Remove the half housing assembly bolts and separate the half housings.
Remove the spacer and the adjusting shims from the primary shaft bearings.



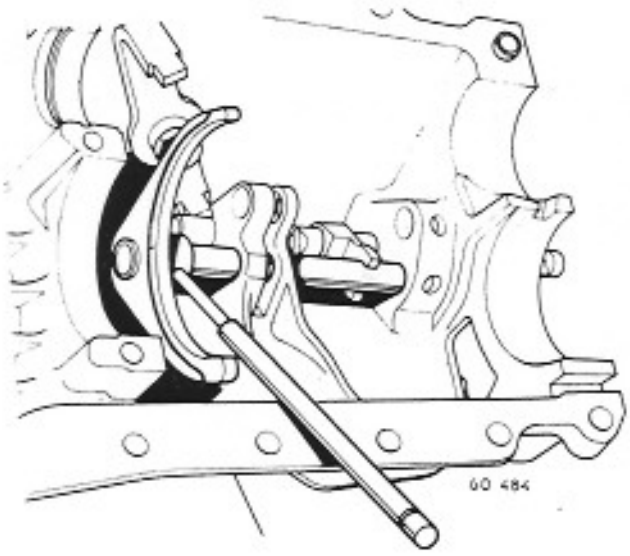
Remove the secondary gear cluster and the stud which locks the outer track ring on the double taper roller bearing.



Remove the primary shaft.

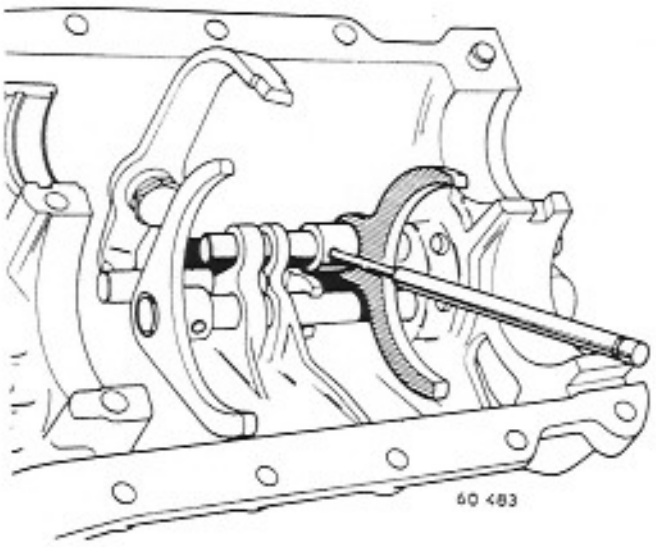


Remove the differential.

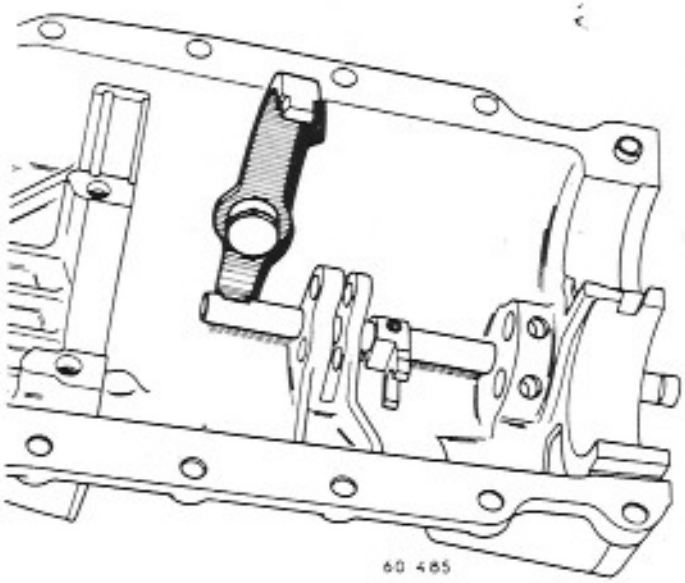


1 - Gearshift control.

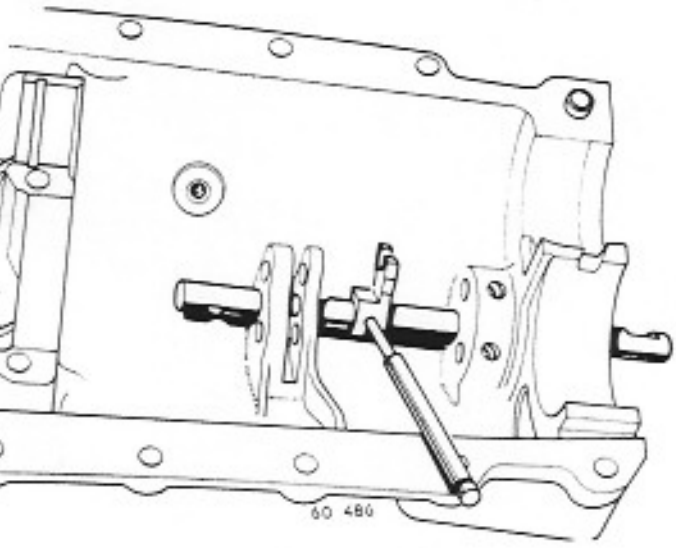
Engage first gear.
Pull back the reverse shaft as far as it will go towards the control end.
Push out the roll pin from the 1st-2nd shift fork using drift B.Vi.31 B.
Remove the shaft and shift fork (put aside the locking ball and spring).



Push out the roll pin from the 3rd-4th shift fork by means of drift B.Vi.31 B.
Remove the shift fork and the shaft (put aside the locking ball and spring).
Remove the locking disc from between the two shafts.

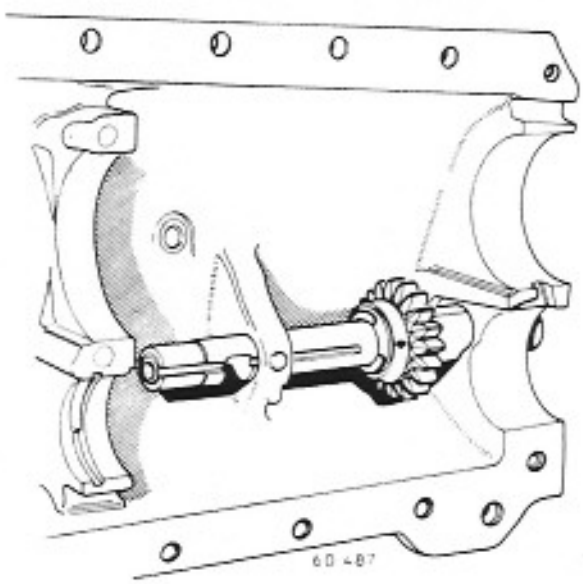


Unscrew the reverse swivel lever pivot pin and take out the swivel lever.



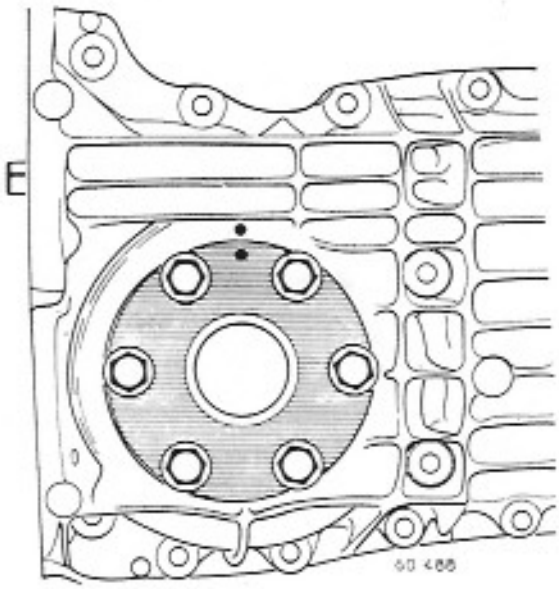
Push out the roll pin from the reverse positioning fork by means of drift B.Vi.31 B, (the pin will make contact with the housing, turn the shaft and free it completely by means of a pair of pliers).
Remove the shaft and the fork.

2 - Reverse gear wheel



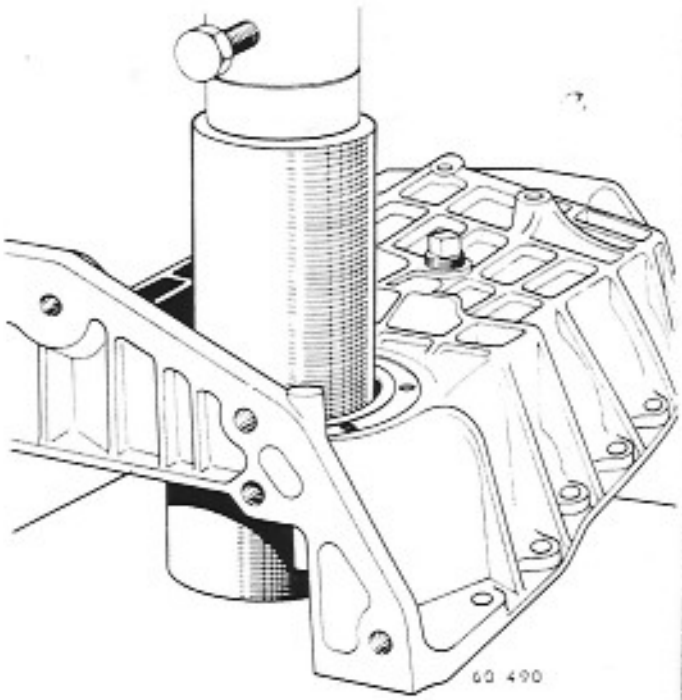
Remove the gear wheel retaining circlip and take out :
- the shaft, gear wheel, friction washer and guide (put aside the locking ball and spring).

3 - Half-housings



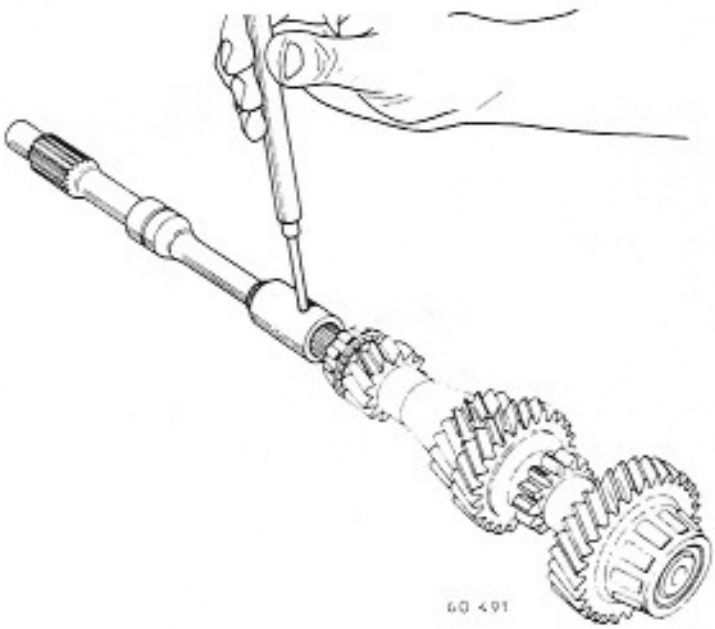
In those cases where the differential bearings are adjusted by means of shims :
- Mark the position of the side cover plates with reference to their corresponding half-housing.
- Remove the side cover plates and the adjusting shims.

Remove the cover plate gasket or the adjusting nuts.

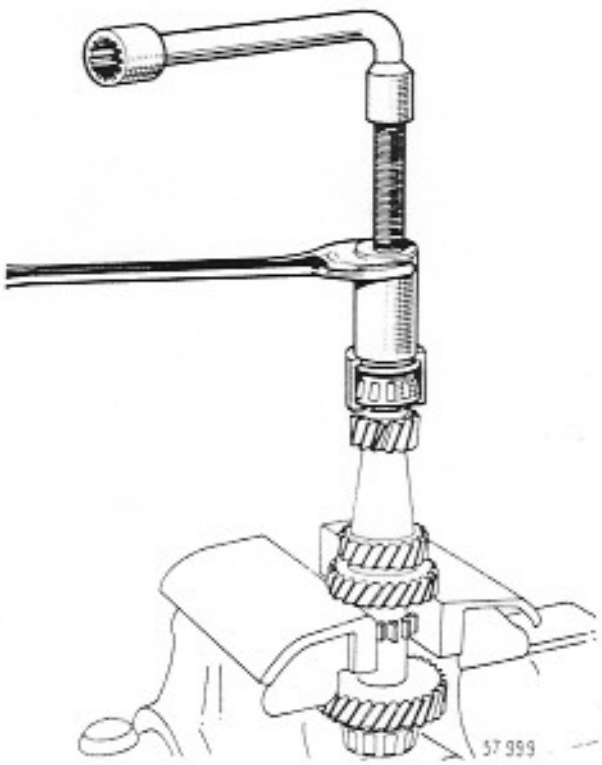


Push out the bearing track-rings.

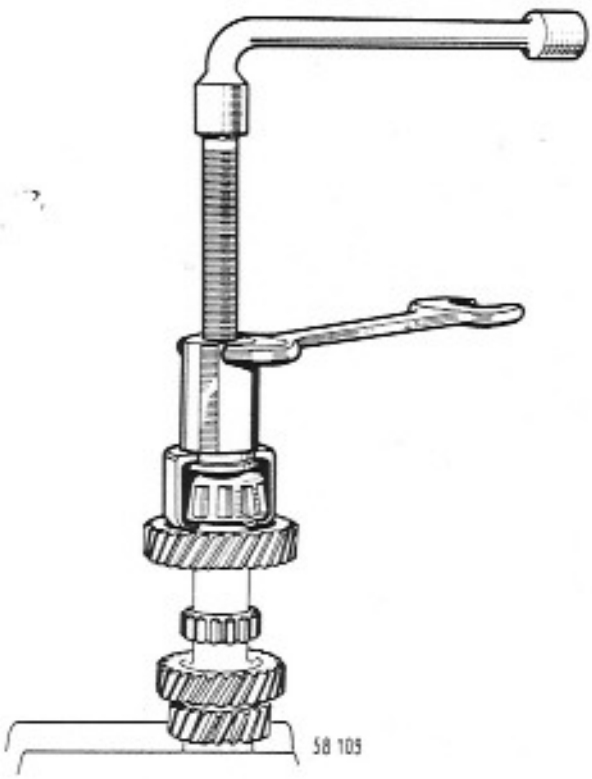
4 - Primary shaft



Remove the bearing track-rings and the adjusting washers.
Separate the clutch shaft from the primary shaft by pushing out the roll pin by means of drift B.Vi.39.



Extract the bearing from the differential end by means of extractor B.Vi.22 fitted with shell B.Vi.41.

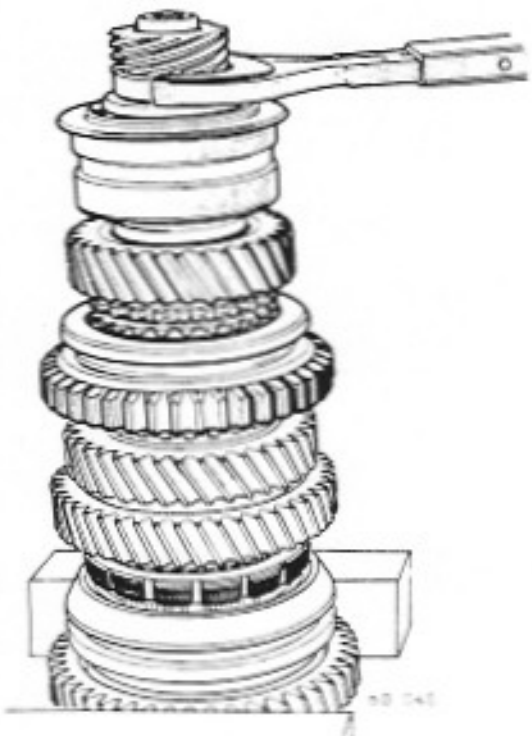


Extract the second bearing by means of extractor B.Vi.22, fitted with shell B.Vi.47.

5 - Secondary shaft

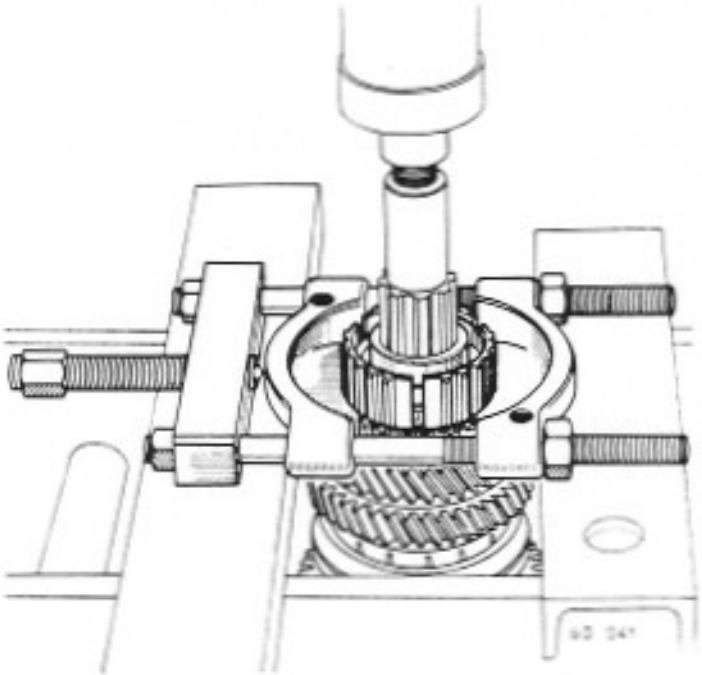
NOTE

Whenever carrying out any operation on the 1st-2nd speed synchroniser hub, one must use an electric oven capable of achieving a temperature of 250 °C (482° F) for reassembling.

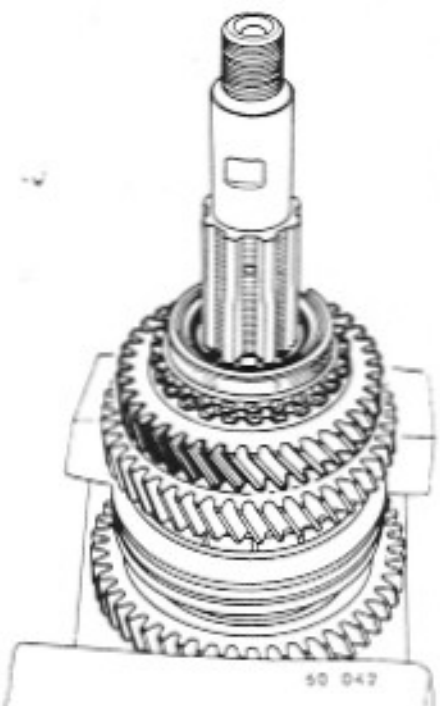


Grip the shaft in a vice on the first speed gear wheel.
Engage 1st speed.
Unlock the speedometer drive worm and unscrew it by means of spanner B.Vi.204.

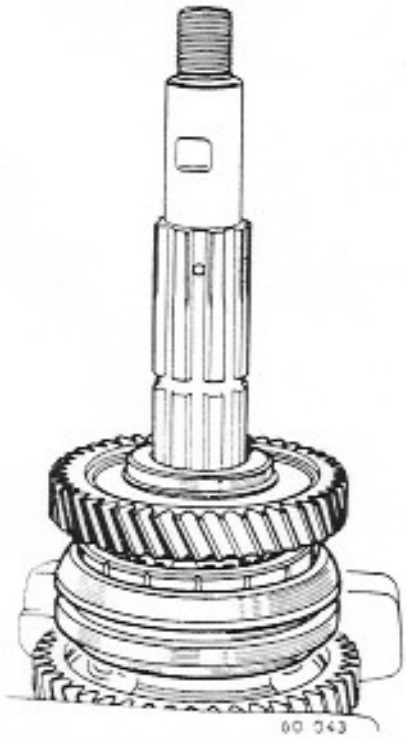
Remove :
- the double taper roller bearing.
- the pinion depth adjusting washer.
- the 4th speed gear wheel and its ring.
- the 3rd-4th speed synchroniser sliding gear wheel and the keys. (Mark the position of the sliding gear wheel with reference to the hub).



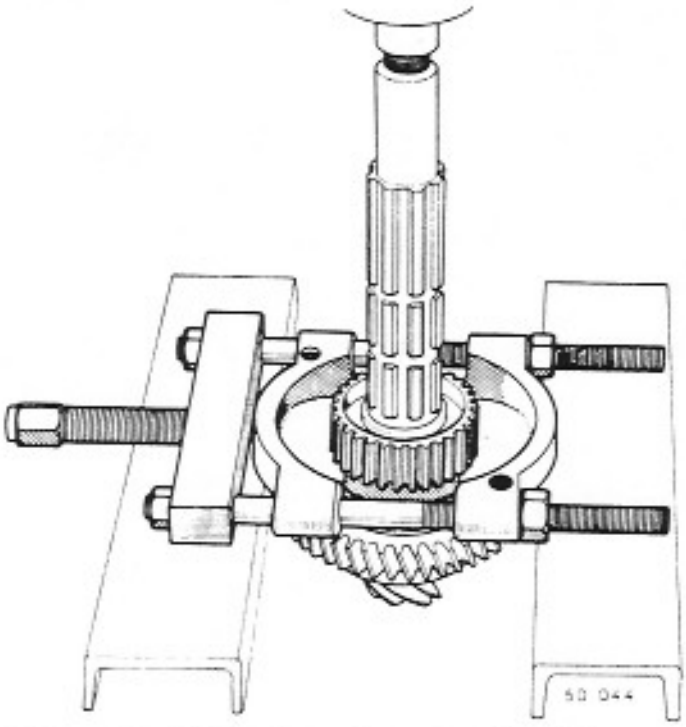
Extract the 3rd-4th speed synchroniser hub on the press by means of extractor T.Ar.65.



Remove :
- the gear wheel stop washer retaining key.
- the 3rd speed gear wheel stop washer.
- the 3rd speed gear wheel and its ring.



- the 2nd speed gear wheel stop washer.
- the 2nd speed gear wheel and its ring.
- the 1st-2nd speed synchroniser sliding gear wheel (mark its position with reference to the hub).
- the 1st-2nd speed synchroniser hub stop washer.

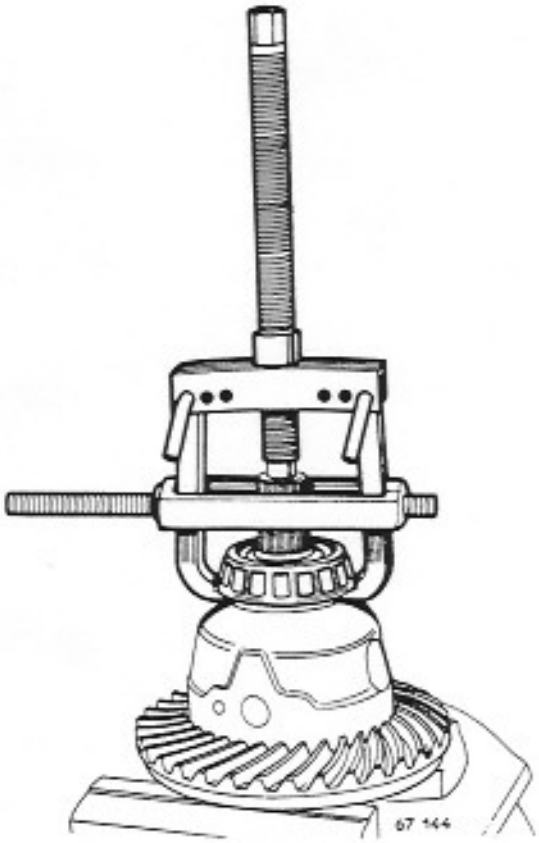


Extract the 1st-2nd speed synchroniser hub on the press by means of extractor T.Ar.65.

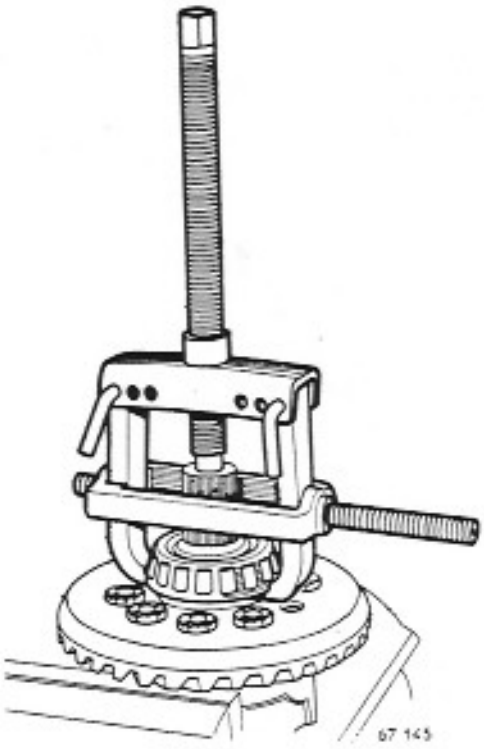
Remove :
- the 1st speed synchroniser.
- the 1st speed gear wheel stop washer.
- the 1st speed gear wheel.

NOTE - As the roller bearing inner track-ring is bonded to the shaft, this bearing cannot be removed.

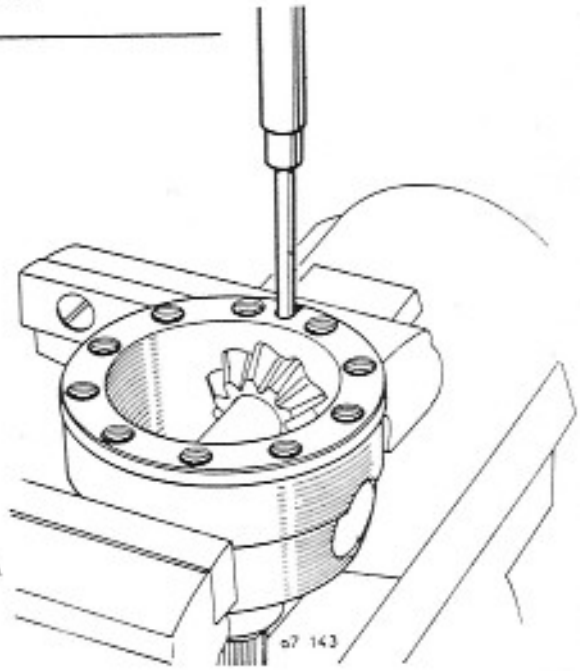
6 - Differential



Remove the bearings by means of tool B.Vi.28 fitted with claws B.Vi.48.

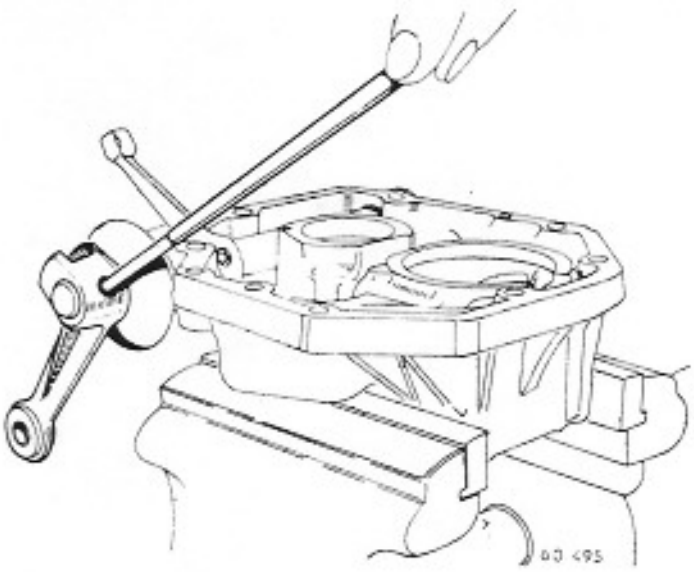


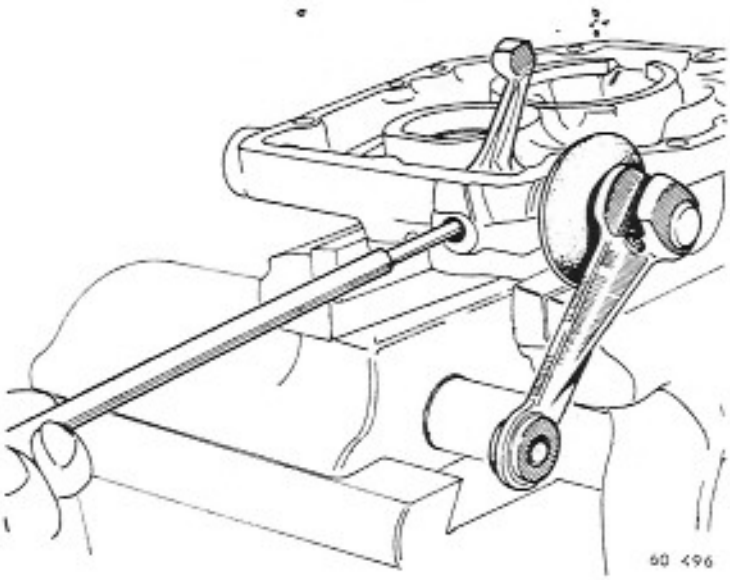
On the crown wheel side, one must remove two of the securing bolts (loosen them with a cold chisel).



Remove the crown wheel securing bolts (these are self locking bolts which cannot be used again).
Push out the planet wheel shaft roll pin by means of drift B.Vi.39.
Separate the various parts.

7 - Front housing.





Remove the pinion, the guide and the "O"ring.
Push out the shift lever roll pin by means of a drift.

Unscrew the breather.
Push out the roll pin from the internal shift lever through the breather hole by means of a drift.
Take out :
- the lever,
- the rubber,
- the shaft,
- the internal lever.

---

8 - Cleaning and checking

Clean and check all the parts.

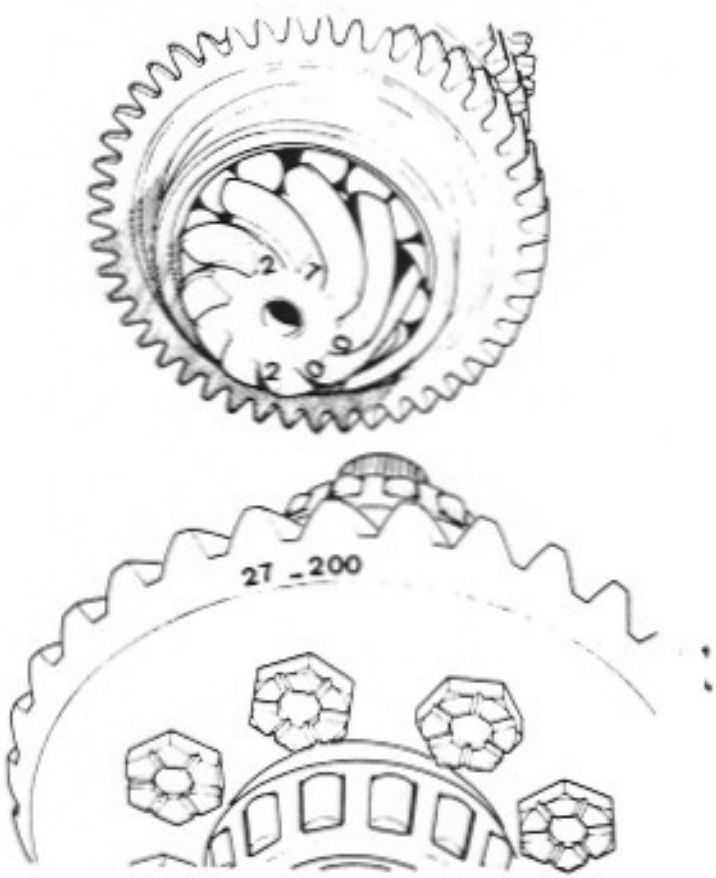
All seals and gaskets, roll pins and self locking bolts are to be replaced by new ones.

B - REASSEMBLING THE SUB-ASSEMBLIES

1 - Secondary shaft.

a) Crown wheel and pinion matching :

The final drive pinion and the crown wheel are lapped together during manufacture.
They therefore cannot be used separately.
Replacing one of these parts automatically involves replacing the other.



65 348

A common marking is inscribed on both the crown wheel and the pinion.
Example : 27-200.

UNDER NO CIRCUMSTANCES MUST ANY NOTICE BE TAKEN OF OTHER MARKINGS ON THE CROWN WHEEL.

b) Final drive pinion-synchroniser hub matching.

The synchroniser hubs are matched with the final drive pinion.

- Checking the parts.

- If the final drive pinion, crown wheel or roller bearing are damaged.
Replace the crown wheel and pinion assembly.
It is supplied with the bearing fitted to the final drive pinion tail shaft.

IMPORTANT ;

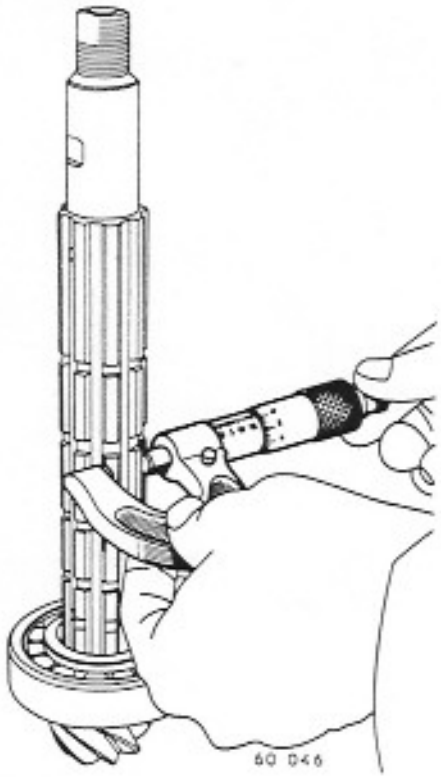
At present, the roller bearing is fitted with a circlip on the outer track ring and this has involved machining a groove in the gearbox housing.
The bearing which is not fitted with a circlip can be used in a housing that has a groove.

However, the bearing which has a circlip cannot be used in a housing which has no groove.

The synchronisers can be used again.
The size of the new final drive pinion to be ordered must be determined to ensure that the synchroniser hubs, which are to be used again, match the final drive pinion shaft.
To do this measure the old final drive pinion.

- If the synchronisers are damaged.
Replace the synchronisers.
The final drive pinion can be used again.
The size of the synchroniser hubs to be ordered must be determined in order to ensure that they match the final drive pinion.
To do this, measure the final drive pinion.

- Measuring the final drive pinion.



Measure the dimension across 2 of the splines on the final drive pinion shaft by means of a micrometer.
Take a number of measurements at different points around the splines at the point where the synchroniser hub fits and find the average.

- Matching dimension chart.

There are 5 different size groups for the final drive pinion shaft which correspond to 5 different synchroniser hub size groups.
They can be identified by a colour code paint mark.
- on the final drive pinion : this mark can be found on the corresponding crown wheel along side the matching reference.
- on the synchronisers : it is to be found on the hub.

final drive pinion dimension	Corresponding final drive pinion and hub colour code
16.55 to 16.57 mm (.6516 to .6523")	White
16.58 to 16.60 mm (.6527 to .6535")	Red
16.61 to 16.63 mm (.6539 to .6547")	Blue
16.64 to 16.66 mm (.6551 to .6559")	Yellow
16.67 to 16.69 mm (.6563 to .6571")	Green

NOTE -
At the present moment, only the blue and yellow colour code are sold as spare parts.

The synchroniser hubs are fitted to the final drive pinion shaft on the press :
- 1st-2nd speed hub : hot, at a temperature of 250° C (482° F).
- 3rd-4th speed hub : cold.

Once the size group has been determined, prepare the synchronisers as follows :

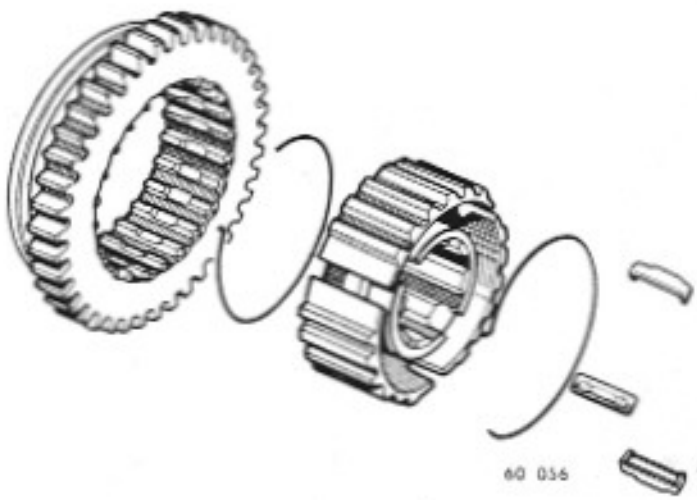
- 1st-2nd speed synchroniser :

As the sliding gear wheel and the hub are matched, mark them before separating them :
- the position mark should be made on the 2nd speed gear wheel side, that is to say the same side as the chamfer, on the sliding gear wheel so that it can be seen after the hub has been fitted.

Place the hub in an electric oven and heat it to 250° C (482° F).
Wait until it has reached full temperature before starting to re-assemble the secondary shaft assembly.


60 047

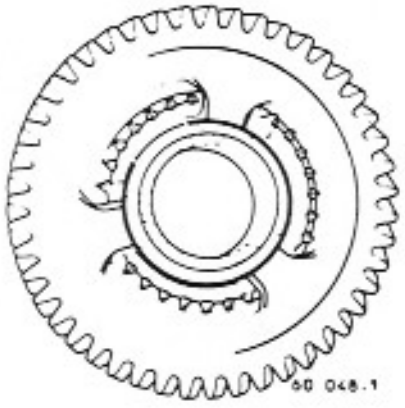
- 3rd-4th speed synchroniser :


60 036

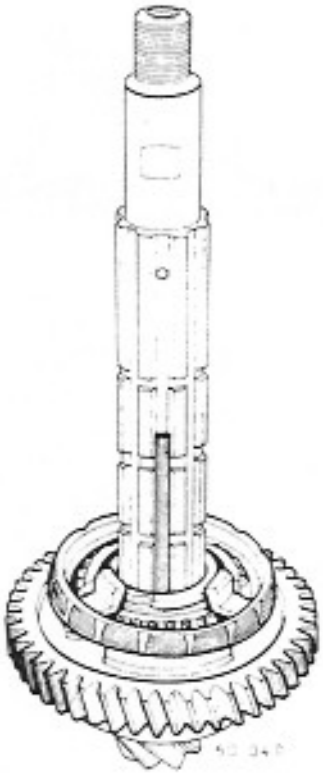
It is not necessary to dismantle this.
If it has been dismantled and can be used again, re-assemble it as follows :
Place the following on the hub.
- the three keys,
- the two springs (insert one end of each of the springs in one of the keys with the free ends on opposite sides of it).
- the sliding gear wheel in the correct position, with the groove in the sliding gear wheel on the opposite side to the two notches in the hub and the reference mark on the sliding gear wheel in line with the mark on the hub. (mark made during dismantling).

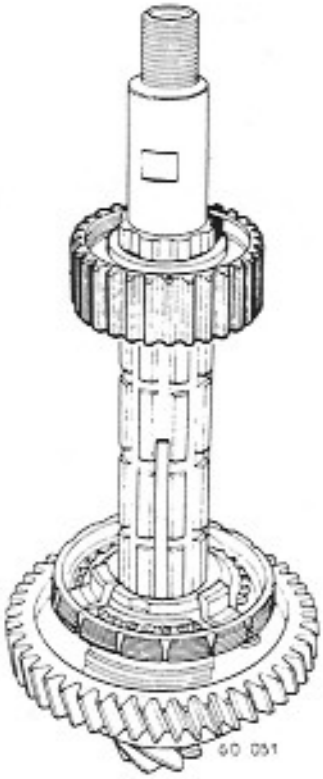

60 037

c) Re-assembling :



Place the synchroniser spring on the 1st speed gear wheel so that it covers the 3 notches.



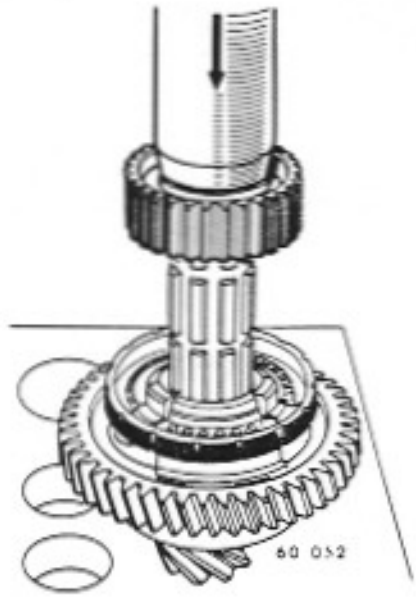


Place the following on the final drive pinion (already fitted with its bearing) :
- the 1st speed gear wheel and its ring.
- the 1st speed gear wheel stop washer. Turn it and locate it by means of a dummy key (this is a washer retaining key one lug of which has been removed).

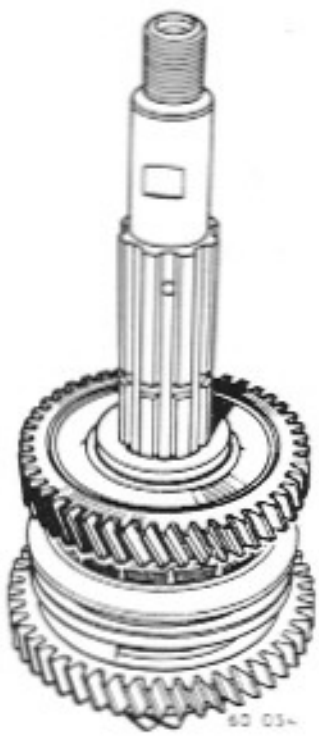
The dummy key is to be placed in one of the keyways which has an oil hole in it.

Take the 1st-2nd speed gear wheel from the oven and place it on the final drive pinion in the correct position.
- the part with the position mark on it for positioning the sliding gear wheel is to face towards the 2nd speed gear wheel.
- one of the unsplined portions is to be in line with the dummy key.

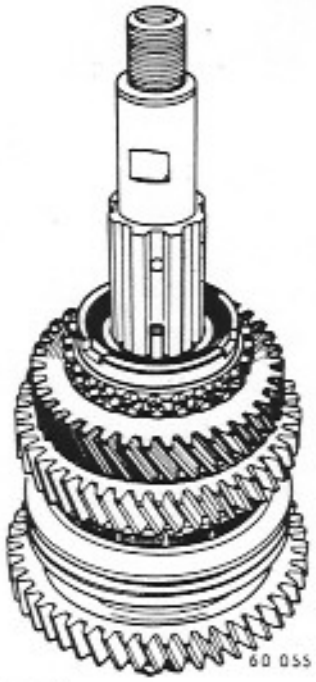
Push on the hub on the press until it makes contact with the stop washer. Hold the synchroniser ring in a central position, with the lugs below the level of the stop washer so as not to damage the spring.
Hold pressure on the press for a time in order to allow the hub to cool down.
(You can assist it cooling with compressed air).
Release pressure.
Remove the dummy key.



Fit the 1st-2nd speed sliding gear wheel :
- with a chamfer on the 2nd speed gear wheel side.
- with the position reference in line with that on the hub.
Fit the hub stop washer (turn it to align its splines with those on the final drive pinion).

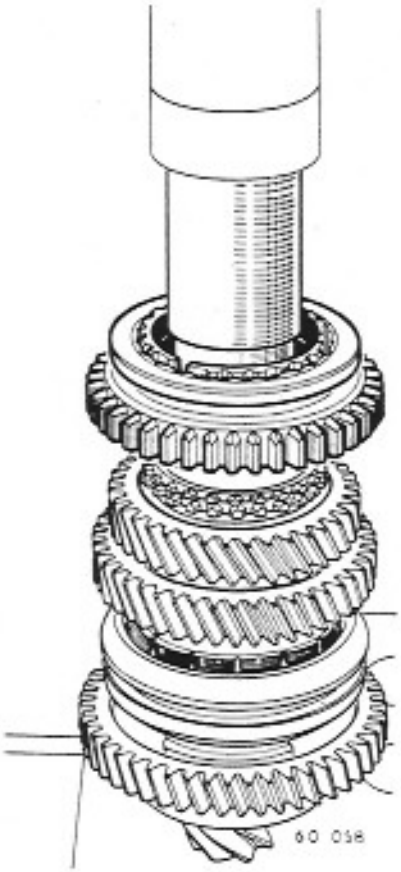


Place the synchroniser spring on the 2nd speed gear wheel (in the same way as on the 1st speed gear wheel).
Position the 2nd speed gear wheel and its ring.
Position the gear wheel stop washer (turn it to align its splines with those on the final drive pinion shaft).



Fit the 3rd speed gear wheel and its ring.
Position the stop washer (turn it to align its splines with those on the final drive pinion shaft).

Fit the gear wheel stop washer retaining key (in one of the keyways that has an oil hole in it).

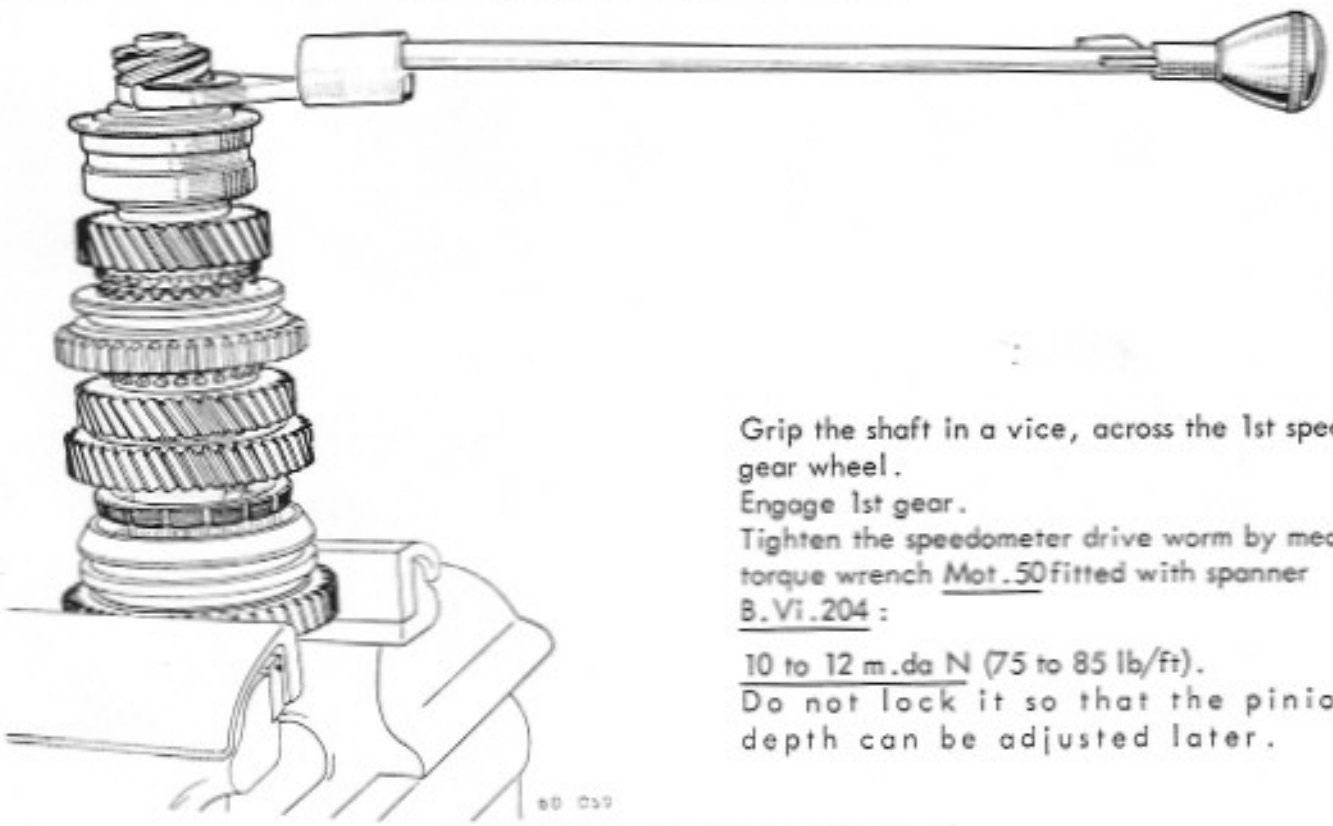


Fit the 3rd-4th speed synchroniser on the press until it makes contact with the 3rd speed gear wheel stop washer :
- with the notches on the hub on the 3rd speed gear wheel side.
- one of the notches in line with the retaining key.

Warning :

Ensure that the 3 notches on the synchroniser hub are in line with the 3 keys.

Fit :
- the 4th speed gear wheel and its ring.
- the pinion depth adjusting washer (that removed during dismantling).
- the double taper roller bearing and the speedometer drive worm.



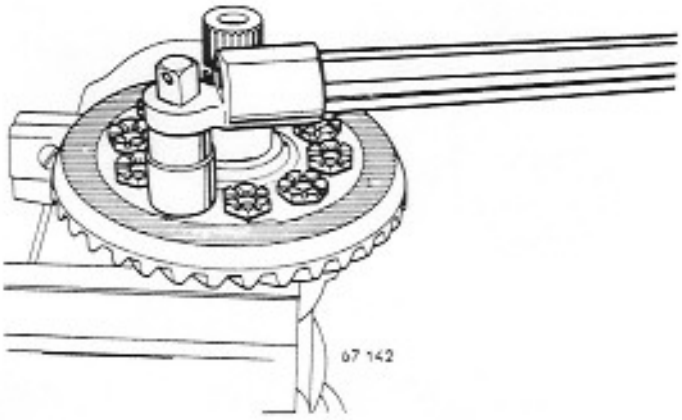
Grip the shaft in a vice, across the 1st speed gear wheel.
Engage 1st gear.
Tighten the speedometer drive worm by means of torque wrench Mot.50 fitted with spanner B.Vi.204 :

10 to 12 m.da N (75 to 85 lb/ft).
Do not lock it so that the pinion depth can be adjusted later.

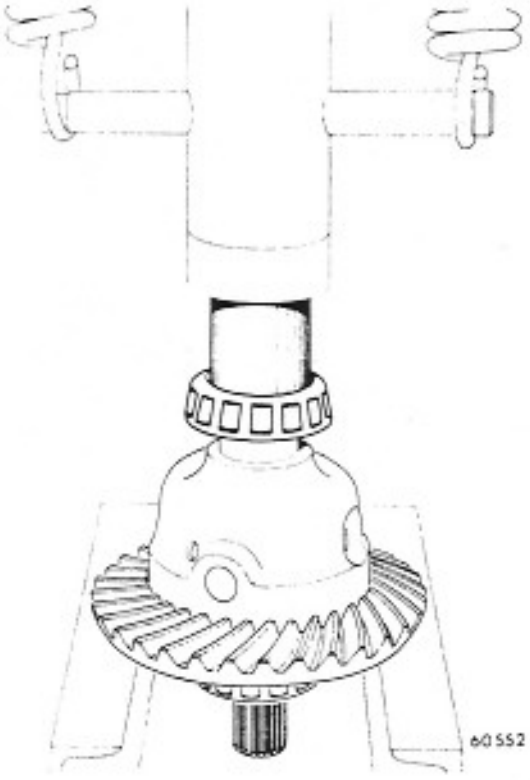
2 - Differential

Fit the following in the housing :
- The bakelite impregnated washer (with the lubrication groove on the sun wheel side).
- one sun wheel (dipped in oil grade EP 80).
- The planet wheels and their friction washers (the locating lug in the hole in the housing).

Insert the planet wheel shaft (align the hole in the shaft with that in the housing) and fit the roll pin.
Dip the second sun wheel in oil grade EP.80 and fit it in the crown wheel.

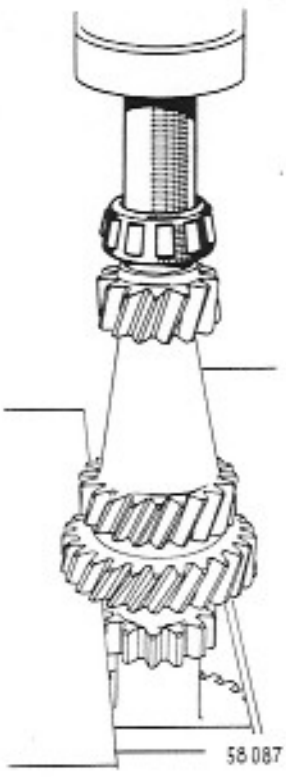


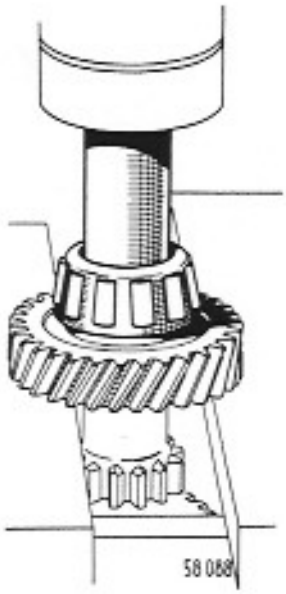
Fasten the crown wheel to the housing by means of new, self locking bolts.
Tighten the bolts to a torque of :
- 6 m.da N (45 lb/ft) using torque wrench Mot.50 for the 10 mm (.394") diameter bolts.
- 9 to 11 m.da N (65 to 80 lb/ft) for the 11 mm (.434") diameter bolts.



Fit the bearings on the press.

3 - Primary shaft





Fit the two bearings on the press.

C - ADJUSTING

Before re-assembling the gearbox mechanism the following adjustments have to be carried out.

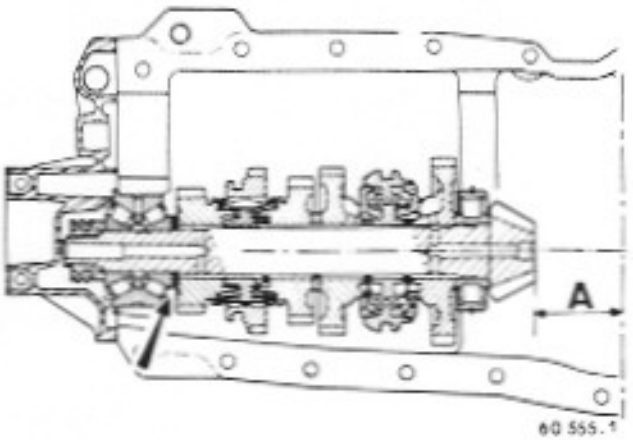
1 - Pinion depth

2 - Fitting the differential bearings without play (when the original bearings are used again) or with preload (in the case of new bearings).

3 - The primary shaft bearing play
The backlash adjustment is to be carried out after the mechanism is assembled.

1 - Adjusting the pinion depth

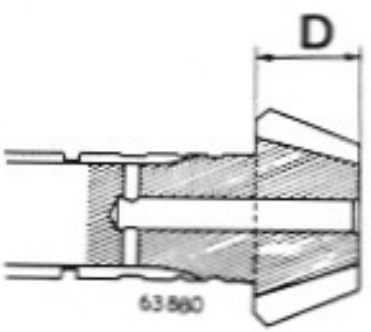
a) - Positioning the final drive pinion.



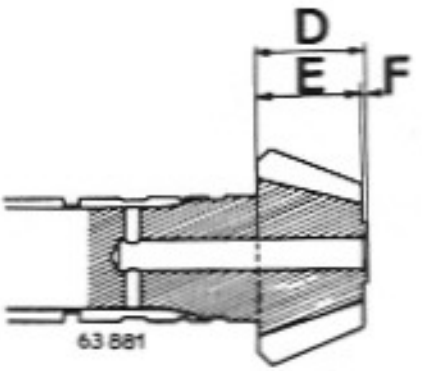
The final drive pinion is in its correct position when its front face is distance A from the crown wheel centre line.
This position is obtained by placing a washer of a suitable thickness between the double taper roller bearing and the shoulder on the secondary shaft.

- 9 x 34 crown wheel and pinion
(the crown wheel is secured to the differential housing by 10 mm (.394") diameter bolts).

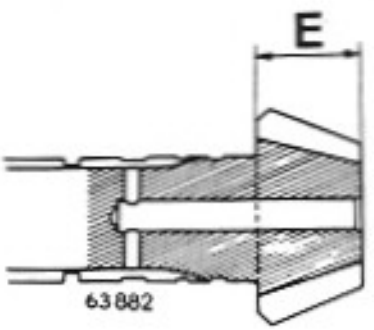
Two different pinion depths have been used :
A = 50.50 mm (1.988") up to type 336-02 gearbox No 5997 inclusive.



There are two different forms of final drive pinion for this pinion depth :
- with a flat front face :
- depth of pinion D = 27.5 mm (1.083")



- Front face with a shoulder on it :
- depth of pinion D = E + F
D = 26.4 + 1.1 = 27.5 mm
(1.040 + .043 = 1.083").



A = 51.60 mm (2.032") from type 336-02 gearbox No 5998 onwards.
- Flat front face on the final drive pinion :
- depth of pinion :
E = 26.4 mm (1.040")

IMPORTANT :

All the 9 x 34 crown wheel and pinion sets supplied as spare parts must be set at a pinion depth of 51.60 mm (2.032"). — SEE NOTES

- 8 x 34 crown wheel and pinion set
(fastening between the crown wheel and the differential housing consisting of 11 mm (.434") diameter bolts.)
A = 53 mm (2.087")

Exceptional case.

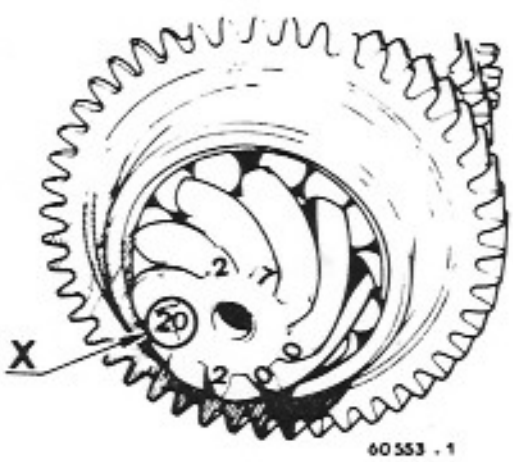
It may be that under exceptional circumstances dimension A is not the pinion depth.

The difference (x) between the actual pinion depth at dimension A is then marked on the front face of the final drive pinion alongside the matching reference.

It is given in hundredths of millimetres for example 20.

The pinion depth is then equal to A + the difference stated.

In the example given below it would be :
51.60 mm + 0.20 mm = 51.80 mm
(2.032 + .008 = 2.040").



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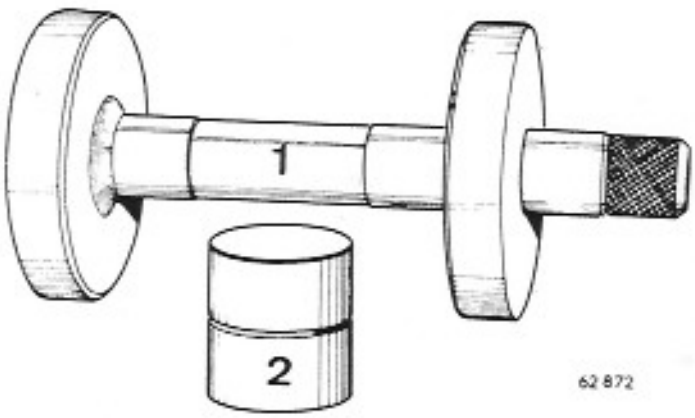
b) Checking the pinion depth.

This operation is carried out with tool B.Vi.239-01 which comprises :
- a mandrel (1) which provides the crown wheel centre .
- a spacer (2) which is 41 mm (1.614") high and which rests against the front face of the final drive pinion.

This spacer can only be used for adjusting the 51.60 mm (2.032") pinion depth.

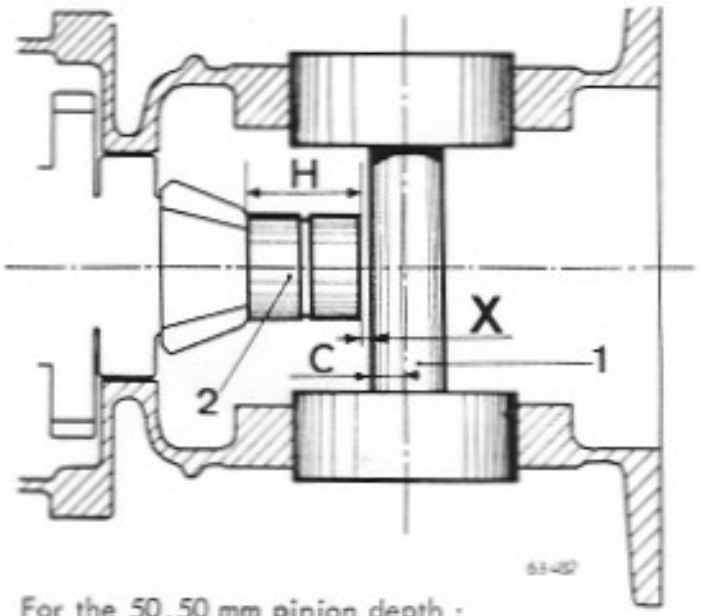
So that this tool can be used for adjusting other pinion depths, spacers are obtainable in different sizes :
-B.Vi.358 : 40 mm high (1.575") for the 50.50 mm (1.988") pinion depth.

- B.Vi.419 : 42.5 mm high (1.673") for the 53 mm (2.087") pinion depth.



Note :

A spacer 41 mm (1.614") high is also obtainable under the reference number B.Vi.359, for use with the first type tools which were supplied under the reference B.Vi.239 (with a spacer 40 mm high).

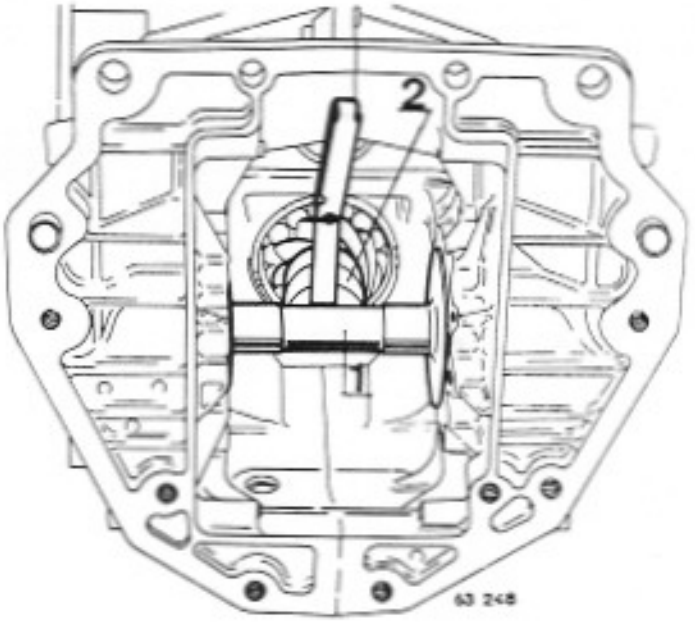


For the 50.50 mm pinion depth :
Height of the spacer (H) (2) which is 40 mm (1.575") plus the radius (C) of the shaft on plug mandrel (1) which is 10 mm (.394") gives a dimension of :
40 mm + 10 mm = 50 mm
(1.575 + .394 = 1.968")
The dimension X to be measured between the spacer and the shaft on the plug mandrel is therefore X = 50.50 mm - 50 mm = 0.50 mm
(1.988 - 1.968 = .020")

For the 51.60 mm pinion depth :
The height (H) of spacer (2) which is 41 mm (1.614") plus the radius (C) of the plug mandrel shaft (1) which is 10 mm (.394 ") equals a dimension of : 41 mm + 10 mm = 51 mm
(1.614 + .394 = 2.008").
The dimension X to be measured between the plug mandrel shaft and the spacer is therefore :
X = 51.60 mm - 51 mm = 0.60 mm
(2.032 - 2.008 = .024")

For the 53 mm pinion depth :
The height (H) of spacer (2) which is 42.5 mm (1 673") plus the radius (C) of the shaft on plug mandrel (1) which is 10 mm (.394") equals a dimension of : 42.5 mm + 10 mm = 52,50 mm
(1.673 + .394 = 2.067")

The dimension X to be measured between the spacer and the shaft on the mandrel is therefore :
X = 53 mm - 52.5 mm = 0.50mm
(2.087 - 2.067 = .020")

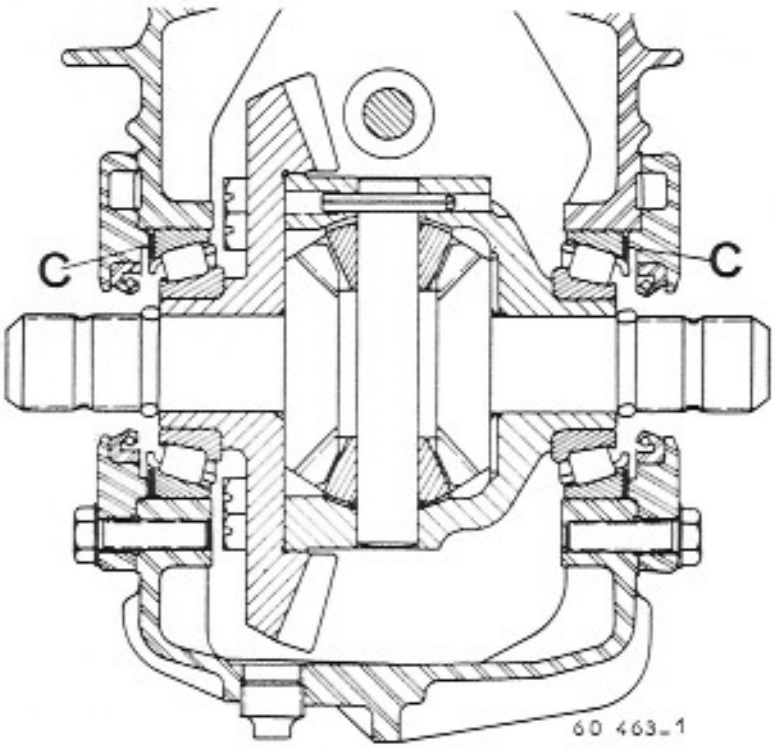


Secure the left hand half-housing to support B.Vi.240.
Fit the secondary shaft.
Fit the right hand half-housing and secure it in place by a number of bolts.(do not tighten them).
Temporarily fit the front housing to hold the double taper roller bearing track ring in position.
Tighten the half-housing securing bolts.
Fit mandrel (1).

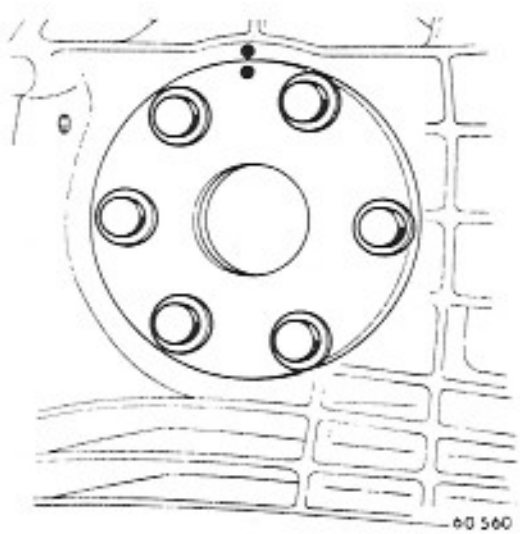
Fit spacer (2) against the front face of the final drive pinion.
Measure, by means of a set of feeler gauges, the dimension X between the spacer and the mandrel.
- If the dimension measured is less than it should be, replace the final drive pinion depth adjusting washer by a thinner one.
- If the dimension measured is greather than it should be, replace the washer by a thicker one.
Washers are obtainable in thicknesses of 3.50 mm to 4.10 mm (.138 to .162") increasing in increments of 5/100 mm (.002").
When the final adjustment has been obtained, remove gauge B.Vi.239-01, the front housing and the right hand half-housing.
Remove the secondary assembly and lock the speedometer drive worm.

2 - Adjusting the differential bearings

a) - Adjusting by means of shims placed under the side cover plates.



The differential bearings are adjusted by placing a shim pack C between the bearing track rings and the side cover plates.

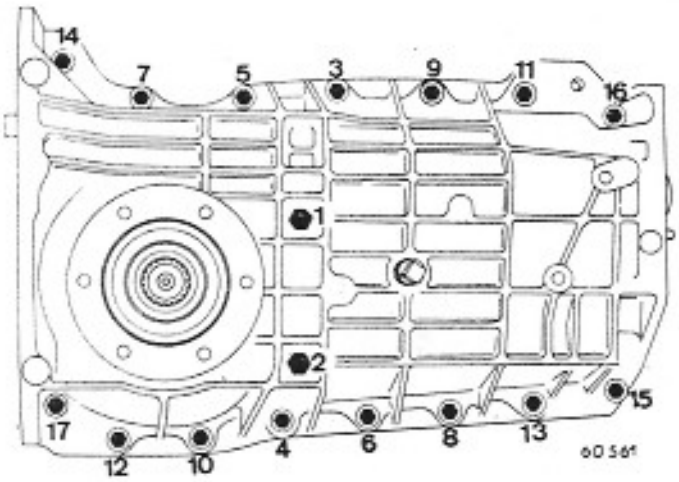


Fit the corresponding bearing track ring to the left hand half housing : do not push it fully in.

Fit :
- the adjusting shims removed on dismantling.
- the paper gasket.
- the corresponding side cover plate.

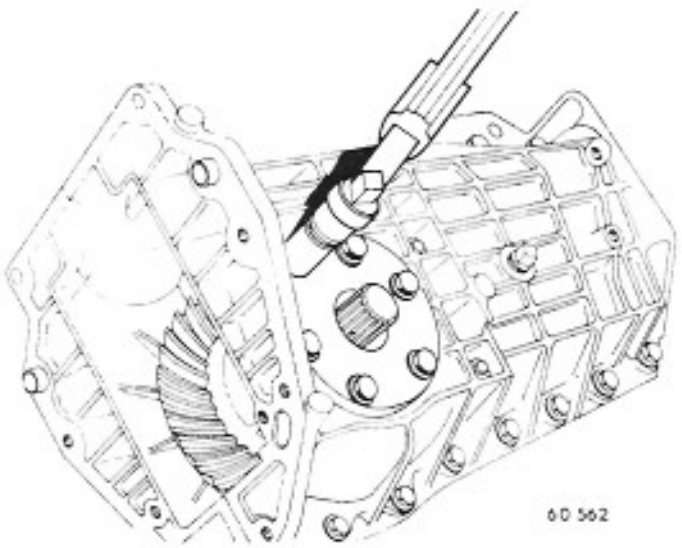
Tighten the side cover plate securing bolts to a torque of 2 m.da N (15 lb/ft). When the bolts are tightened, they force the bearing track ring into position.

Fit the differential, together with its bearings, into the left hand half housing.
Fit the right hand half housing and secure it to the left hand half housing by means of all the bolts.
Tighten the bolts in the order shown to a torque of :
- 7 mm (.276") diameter bolts :
2 m.da N (15 lb/ft).
- 8 mm (.315") diameter bolts :
2.8 m.da N (20 lb/ft).
Fit the bearing track ring to the right hand half housing : do not push it fully in.



Two sets of circumstances may then arise :
- When the bearings are used again.

The differential must turn without play.
Place the shims removed during dismantling under the right hand half housing track ring.
Fit the paper gasket and the side cover plates.



Gradually tighten the cover plate securing bolts to bring the track ring nearer the bearing :

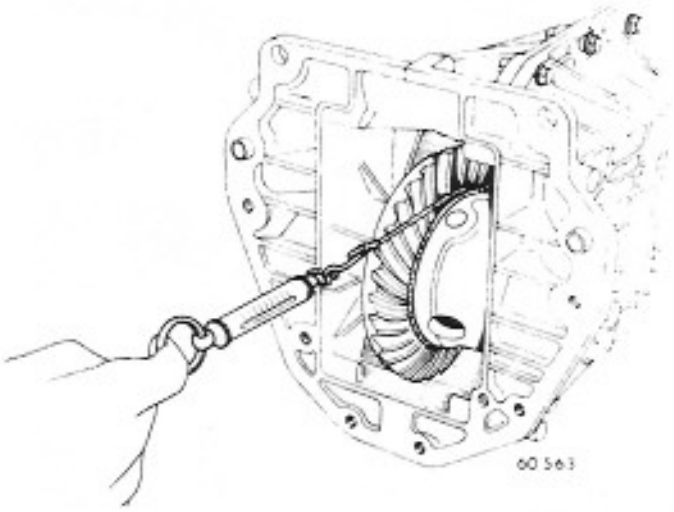
If the differential becomes stiff to rotate before the cover plate bolts are fully pulled down, remove shims.
- If the differential turns too freely after the cover plate bolts are fully pulled down, add shims.
The side cover plate bolt tightening torque is :
2 m.da N (15 lb/ft).
Shims are available in thicknesses of :
0.10 - 0.20 - 0.25 - 0.50 and 1 mm
(.004" - .008" - .010" - .020" - .040").

- New bearings.

New bearings are to be fitted with a certain preload.
The differential is to rotate with a resistance to movement between 0.050 and 0.150 m.da N.
Fit the adjusting shims removed during dismantling under the right hand half-housing track ring.
Fit the paper gasket and the side cover plate.
Gradually tighten the side cover plate securing bolts to bring the track ring nearer the bearing.

After tightening the cover plate securing bolts to a torque of 2 m.da N (15 lb/ft), check the bearing preload.

Checking the preload.

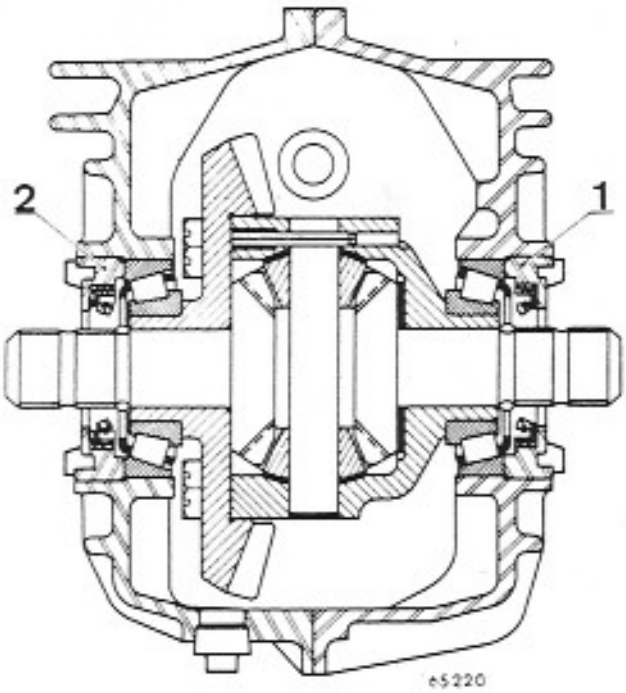


Turn the differential through a number of turns to centralize the bearings.
Wrap a string round the differential housing.

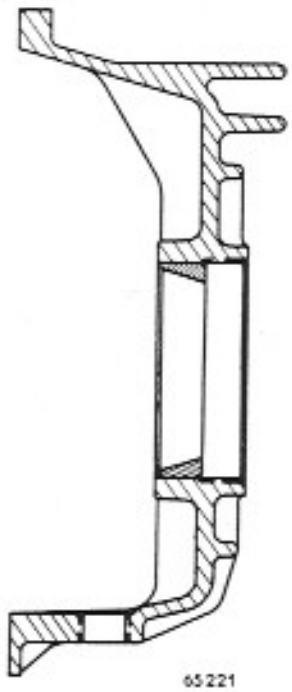
Pull on the string with a spring balance.
The differential should rotate at a load of between 1 and 3 da N (2 to 7 lb).
This is the load necessary to start the differential rotating.
If the adjustment is not correct, increase or reduce the thickness of the shim pack under the right hand half housing cover plate.

When the correct adjustment has been obtained, remove the right hand half housing and the differential.
Take off the side cover plates and remove the shims.

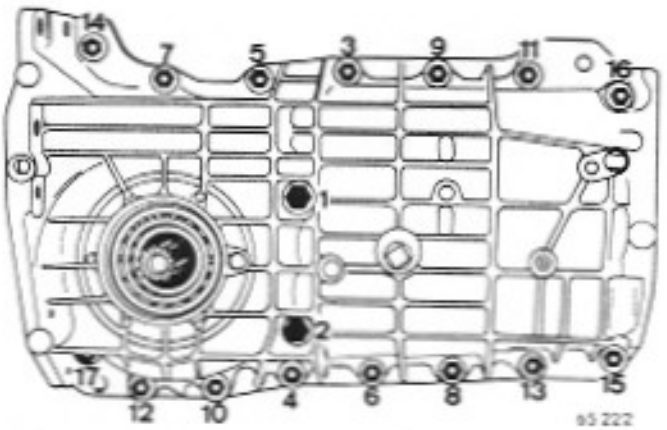
b) - Adjusting by means of nuts :



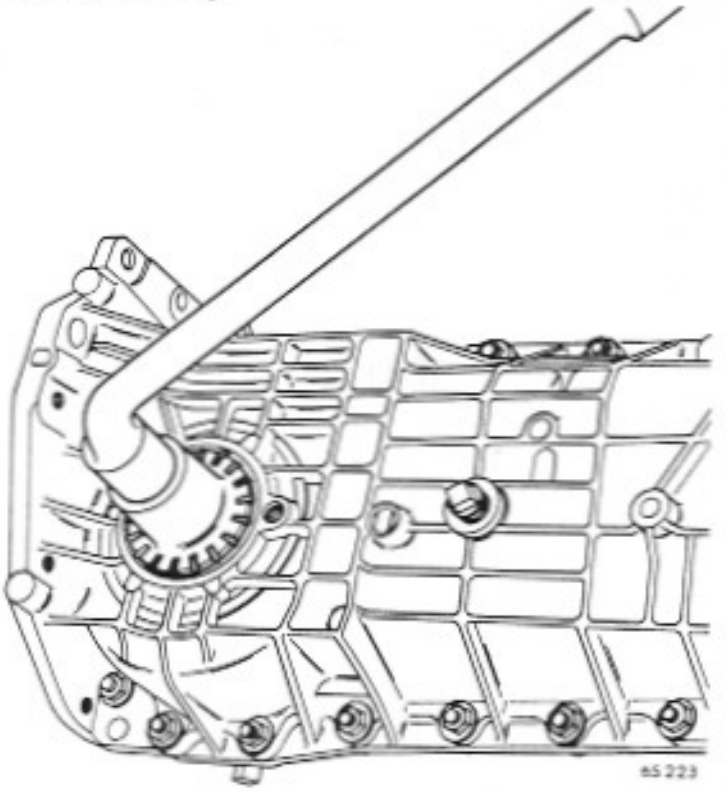
The adjustment is obtained by screwing nuts (1) and (2) in or out.



Fit the corresponding bearing track ring to each half housing in such a way that it is slightly below the inner face of the housing.



Fit the differential, together with its bearings, into the left hand half housing.
Fit the right hand half housing and secure it by means of all its bolts.
Tighten the bolts with a torque spanner in the order shown above :
- 7 mm (.276") diameter bolts :
2 m.da N (15 lb/ft).
- 8 mm (.315") diameter bolts :
2.8 m.da N (20 lb/ft).



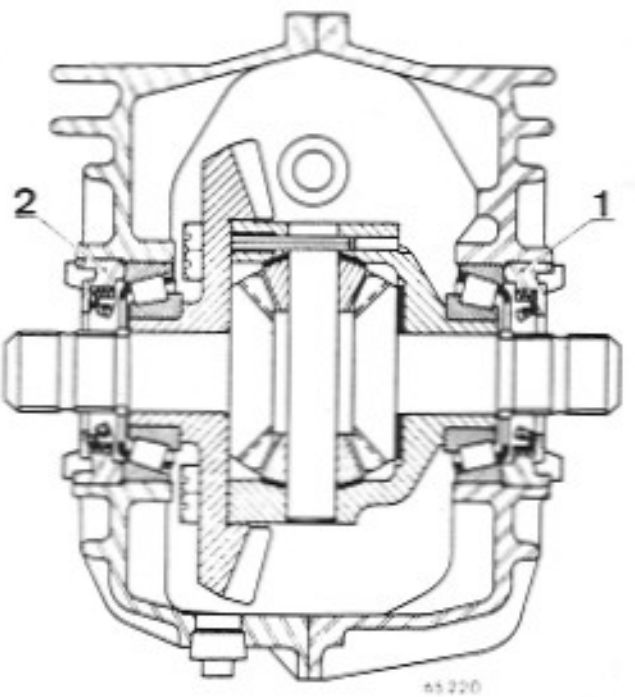
Smear the threads on the nuts and in the housing with "Blue-Stop N" locking compound (ref. 806 666).
Screw the adjusting nut into each half-housing until it makes contact with the bearing track ring :
use wrench B.Vi.377.

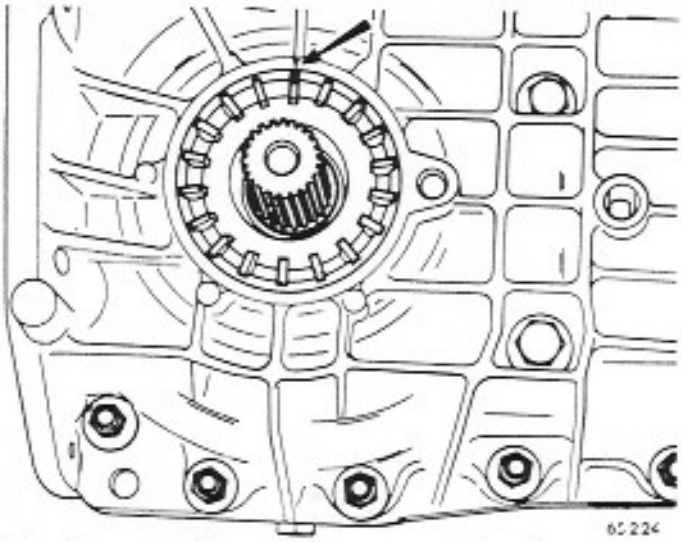
Two sets of circumstances may then arise :

- If the original bearings are being used again.
The differential must turn without play.

Continue to screw in the nuts which push in the bearing track rings.
- Take care to screw in nut (1) on the differential housing side a little more than the one on the other side in order to obtain a crown wheel and pinion back lash which is slightly larger than that required on final assembly.

When the differential can be felt to be turning without play, stop screwing in the nuts.
This is the final adjustment.

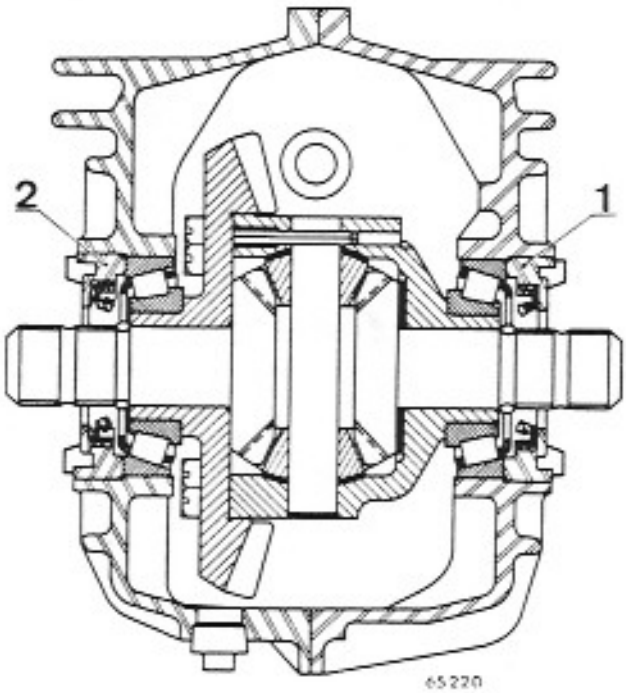




Mark the position of the nuts with reference to the housing (by means of a punch mark).
Remove the right hand housing and the differential.

- When using new bearings.

New bearings must be fitted with a certain preload.
The differential should rotate with a resistance torque of between 0.050 and 0.150 m.da N.
Continue to screw in the nuts.
This pushes the track ring inwards:



- Take care to screw in nut (1) on the differential housing side by little more than the nut on the other side to obtain a back lash of a little more than the required figure on final assembly.

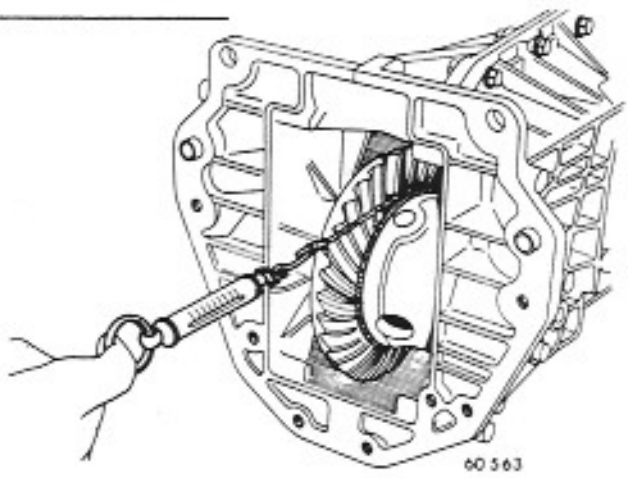
When the differential becomes slightly stiff to rotate, stop screwing in the nut.
Check the preload.

Checking the bearing preload.

Turn the differential a number of times to centralize the bearings.
Wrap a string round the differential housing.
Pull on the string with a spring balance.
The differential should rotate under a load of between 1 and 3 da N (2 to 7 lb).

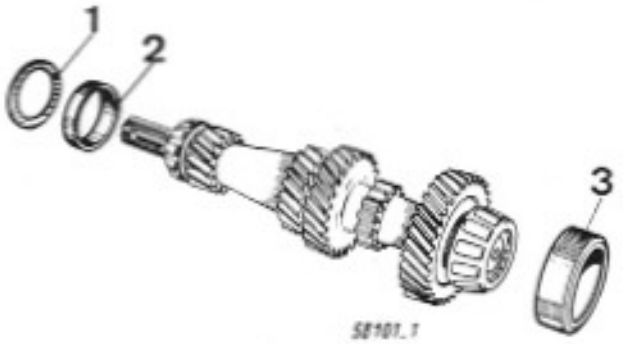
This is the load necessary to cause the differential to rotate.

If the adjustment is not correct, screw the nut on the differential housing side slightly in and check the preload again.



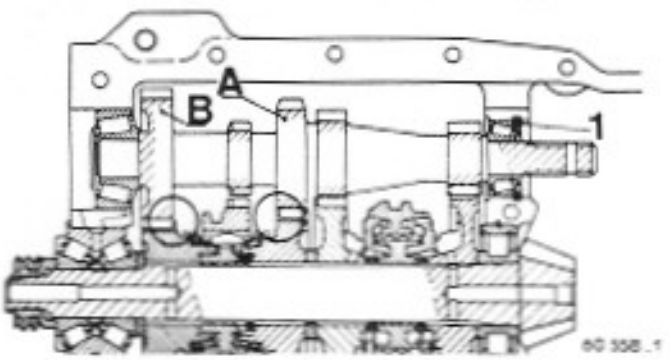
When the correct adjustment has been obtained, mark the position of the nuts with reference to the housing.
Remove the right hand half housing and the differential.

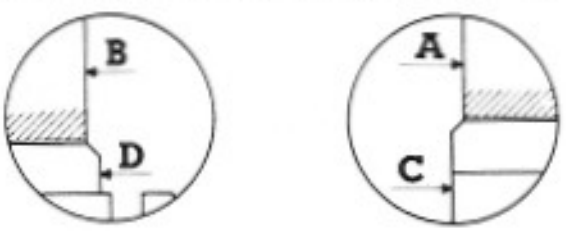
3 - Adjusting the primary shaft bearings



Place the following on the primary shaft :
- the bearing track rings (2) and (3).
- the adjusting washer (1) (removed during dismantling).

a) - Positioning the primary shaft

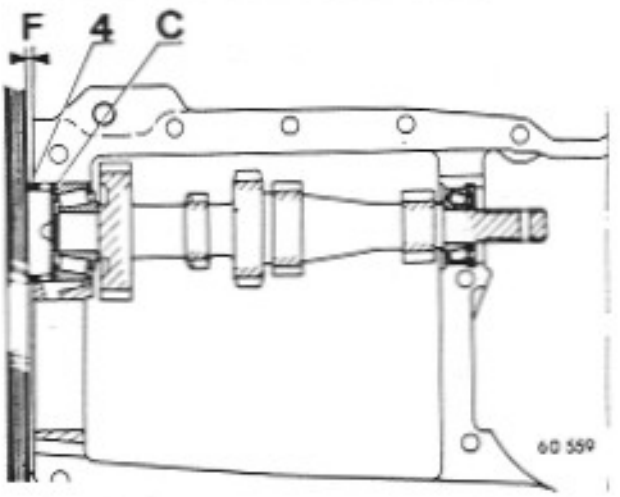




Fit the following into the left-hand half housing :
- the primary shaft,
- the secondary shaft assembly.

The face (A) on the primary 3rd speed gear wheel should be offset with reference to face (C) on the secondary shaft 3rd speed gear wheel by the same amount as face (B) on the primary shaft 4th speed gear wheel is offset with reference to face (D) on the secondary shaft assembly 4th speed gear wheel.
This position is adjusted by means of washer (1) :
washers are obtainable in thicknesses of :
2.50 - 2.75 - 3 - 3.25 - 3.50 - 3.75 and 4 mm. (.079 - .089 - .098 - .108 - .118 - .128 - .138 - .148 - .158").
When the correct adjustment has been obtained, remove the secondary shaft assembly.

b) - Adjusting the bearings

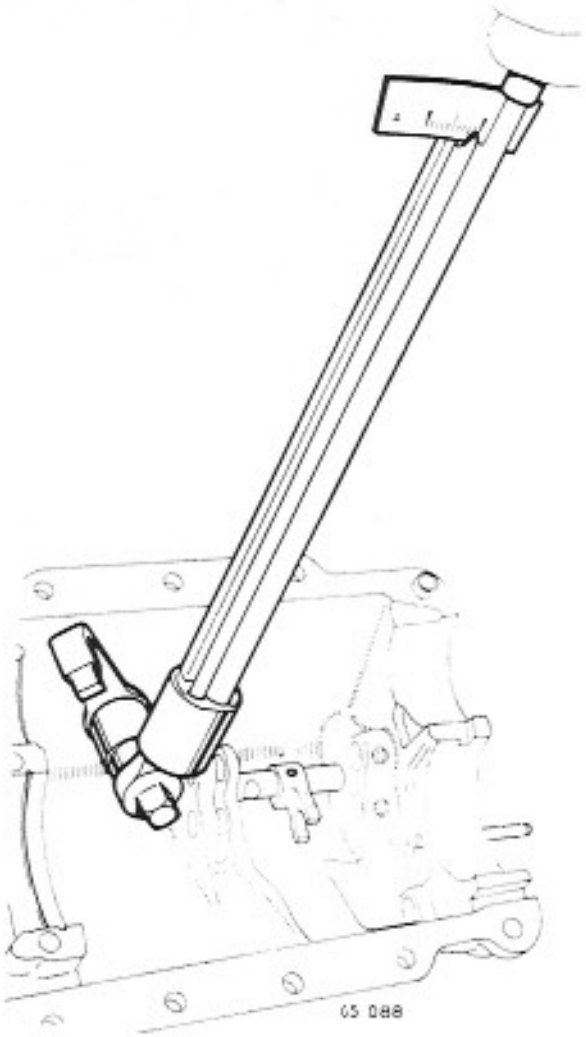


With the primary shaft in position, place the right-hand half housing in position without securing it.
Fit the adjusting shims (C) (removed during dismantling) and the spacer (4).
The shaft should turn freely, without play, and the spacer should project above the housing by 2/10 mm (.008") (the thickness of the paper gasket on the front housing).
Place a rule against the spacer and check the dimension (F) between the rule and the housing by means of a set of feeler gauges.
If the adjustment is not correct, increase or reduce the thickness of the shim pack C : shims are available in thicknesses of : 0.10 - 0.20 - 0.25 - 0.50 and 1 mm (.004 - .008 - .020 - 040").
When the adjustment is complete, remove the right-hand half housing and the primary shaft.
Assemble the clutch shaft to the primary shaft by securing the roll pin.

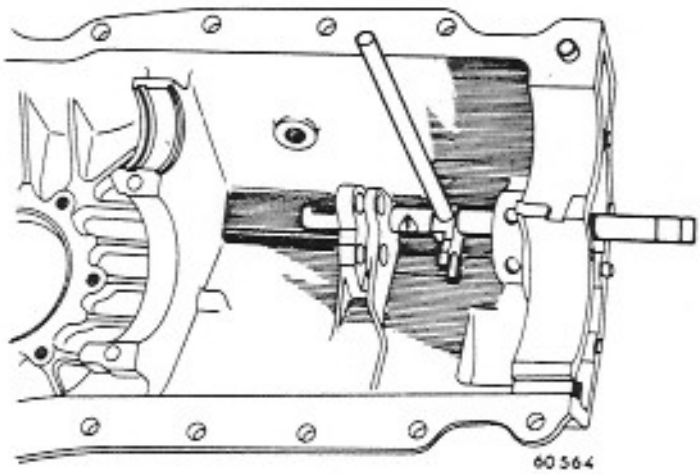
D - REASSEMBLING

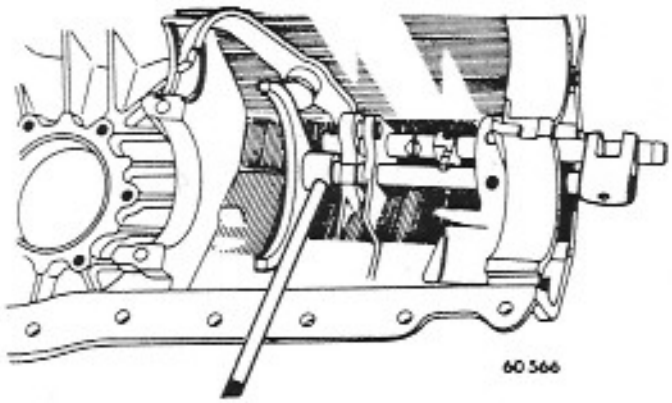
1 - Gear shift control

Engage the reverse shaft and the positioning fork (with its hub towards the differential end). Pin the positioning fork in place by means of drift B.Vi.31 B

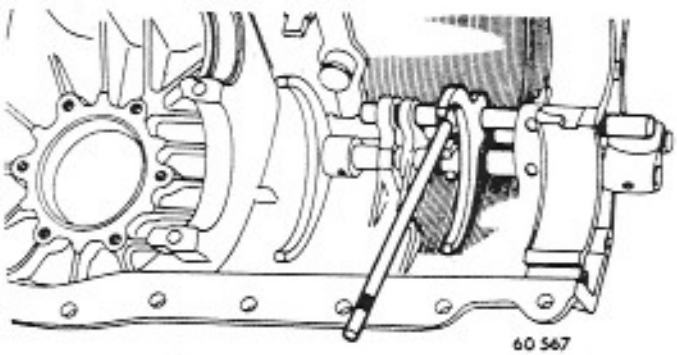


Fit the reverse swivel lever, engaging its end into its slot in the reverse shaft.
Tighten its pivot to a torque of 2.8 m.da N (20 lb/ft) by means of torque wrench Mot.50.





Fit the 1st - 2nd shift shaft locking ball and spring.
Insert the 1st - 2nd shift shaft.
Fit the 1st - 2nd shift fork (with the hub towards the control end) and pin it in place.

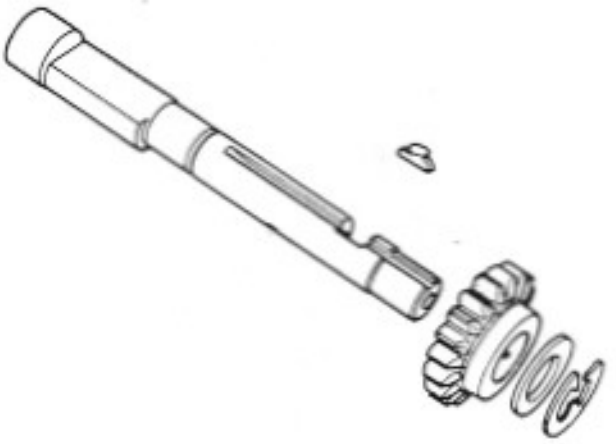


Fit the locking disc between the shafts.
Fit the 3rd-4th shift shaft locking ball and spring.
Insert the shaft and fit the shift fork (with the hub towards the differential end) and pin it in place.

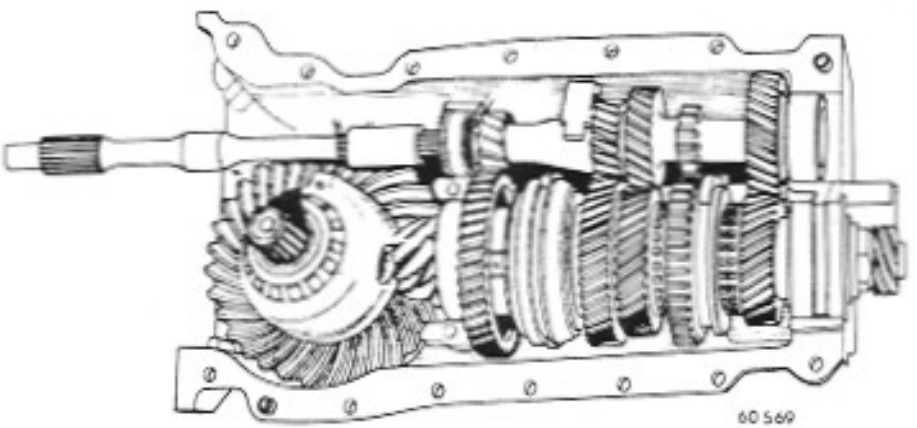
2 - Reverse shaft

Fit the following into the right-hand half housing :
- the locking ball and spring :

there are two springs of different lengths : 19 mm (3/4") and 29 mm (1 5/32").
These are not interchangeable :
the 19 mm (3/4") spring is only to be fitted in housings which have no boss on the spring location.


60 568

- Engage the shaft and fit the gear wheel (with the hub towards the differential end) followed by the friction washer (with the bronze face towards the gear wheel).
- Insert the guide from inside the bore and push the shaft fully in.
- Fit the gear wheel retaining circlips.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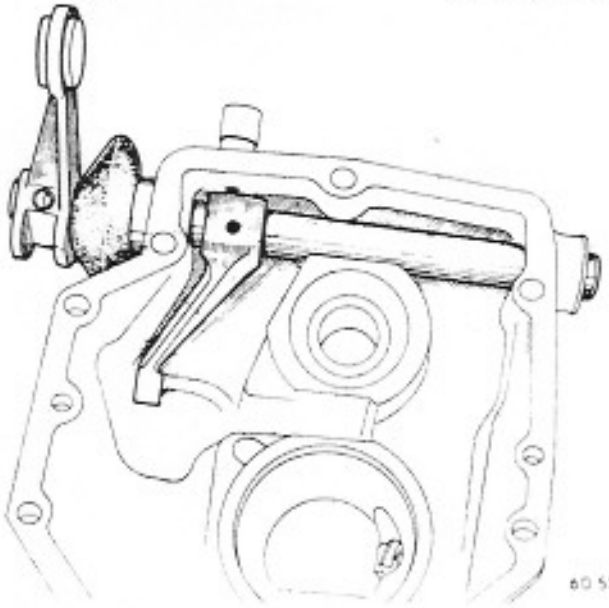
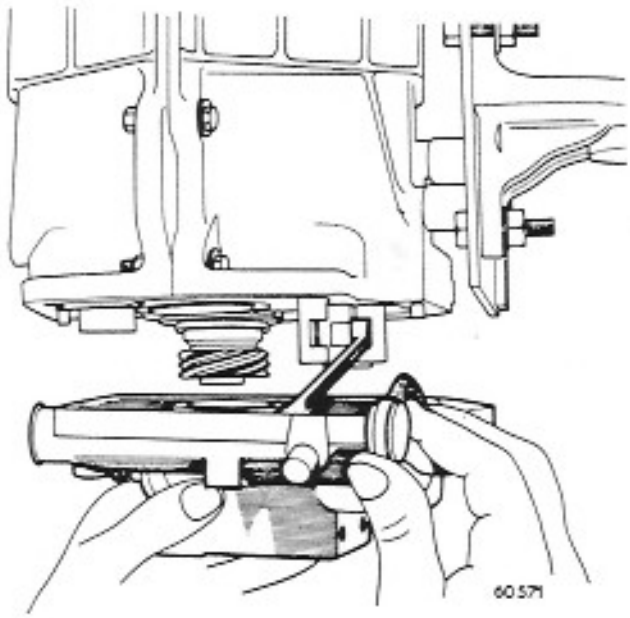
Fit the following to the left-hand half housing :
- the differential,
- the primary shaft,
- the secondary shaft assembly.

Smear the half housing assembly faces with "Perfect-Seal" jointing compound (Ref. 805 463).

Fit the right-hand half housing : make sure that the end of the reverse swivel lever is in the slot of the reverse gear wheel shaft.
Insert the half housing securing bolts: but do not tighten them.





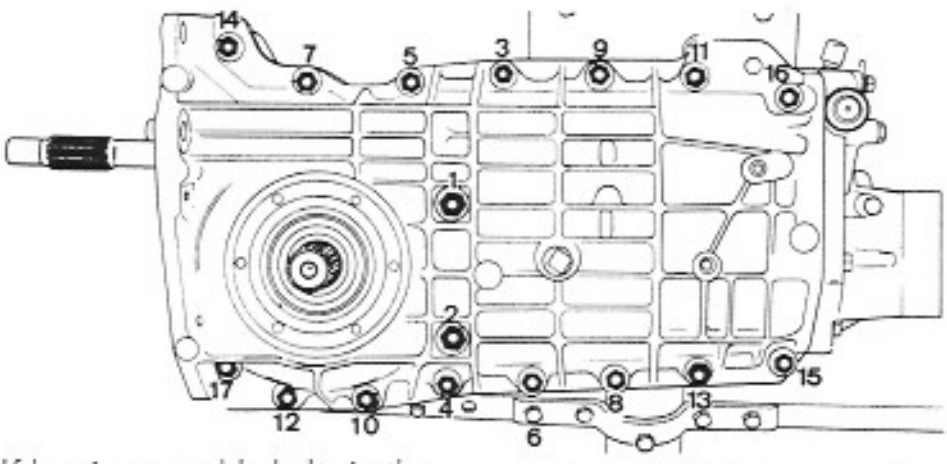
Fit the following to the front housing :
- the internal shift lever.
- the shaft.
- the sealing rubber.
- the lever.

Pin the internal and external levers:
- the slit in the pins must be square with the centre line of the shaft.

Fit a second pin inside the first :
- with the slit square with the slit in the first roll pin.

Screw in the breather.
Fit the speedometer drive wheel and its guide, fitted with an "O" ring seal.

Fit the primary shaft bearing adjusting shims and the spacer.
Fit the front housing paper gasket after first smearing it with "Perfect Seal" jointing compound (Ref. 805 463).
Position the front housing, engaging the shift lever in the slot of the shift fork shafts.
Secure the housing in place without tightening down the bolts.

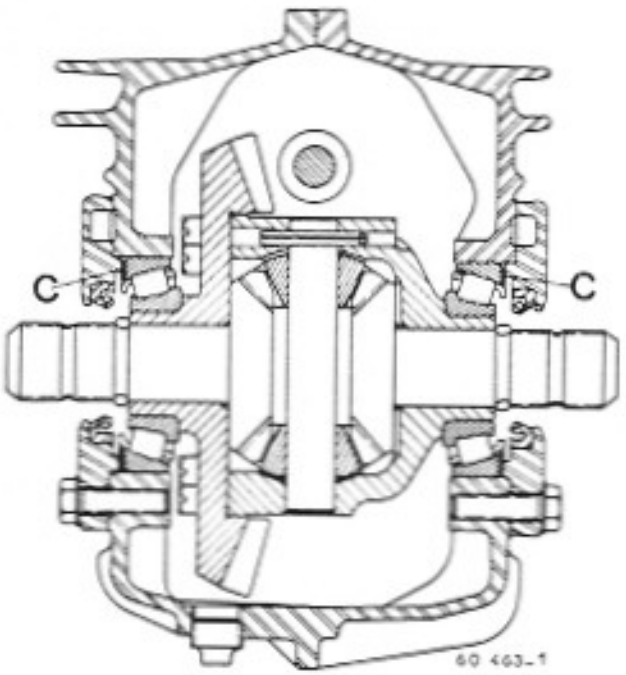


Tighten the half housing assembly bolts in the order shown on the illustration :
7 mm (.276") diameter bolts :
2 m.da N (15 lb/ft).

- 8 mm (.315") diameter bolts :
2.8 m.da N (20 lb/ft).
Finally tighten the front housing securing bolts.

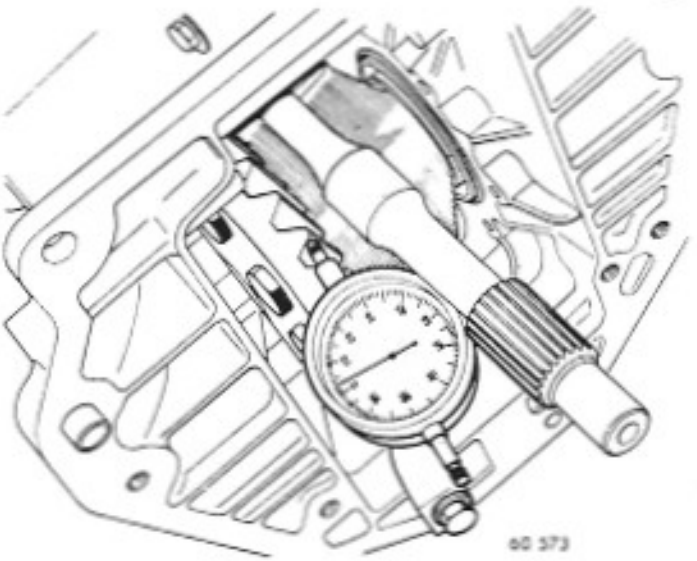
E - ADJUSTING THE CROWN WHEEL AND PINION BACKLASH

1 - Adjusting by means of shims under the side cover plates.



The backlash is obtained by distributing the shim pack C, determined when adjusting the differential bearings, in the side cover plate.
Fit the seal in each of the side cover plates.

Fit the side cover plate on the differential housing side with its paper gasket and its corresponding shims.
Secure it in place and tighten the bolts to a torque of 2m.da N (15 lb/ft).

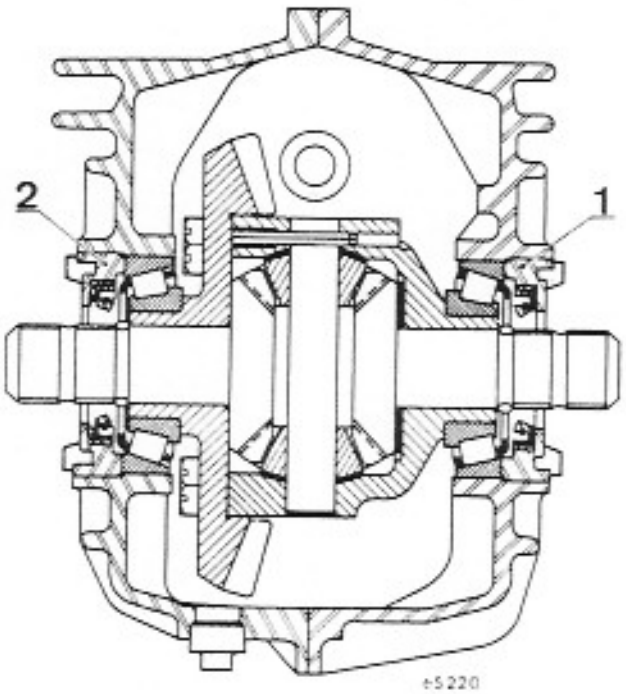


Mount a dial indicator on the housing, with its plunger square with its flank on one of the crown wheel teeth.
Fit the side cover plate on the crown wheel side with its paper gasket and corresponding shims.
Slowly tighten the securing bolts while checking the backlash :
it should be between 0.12 and 0.25 mm (.005 to .010").

- If the correct backlash has been obtained before the bolts are fully tightened, the thickness of the shim pack in this cover plate is too great :
remove the shims from the differential housing side cover plate, and place them on the crown wheel side.
- If the correct backlash has not been obtained after the bolts are tightened down, the thickness of the shim pack in this cover plate is insufficient :
remove the shims from the differential housing side cover plate and place them on the crown wheel side.

When the correct backlash has been obtained :
- remove the side cover plates.
- smear the paper gaskets with "Perfect Seal" jointing compound (Ref. 805 463).
- refit the cover plates and tighten the bolts to a torque of 2 m.da N (15 lb/ft).

2 - Adjusting by means of nuts.

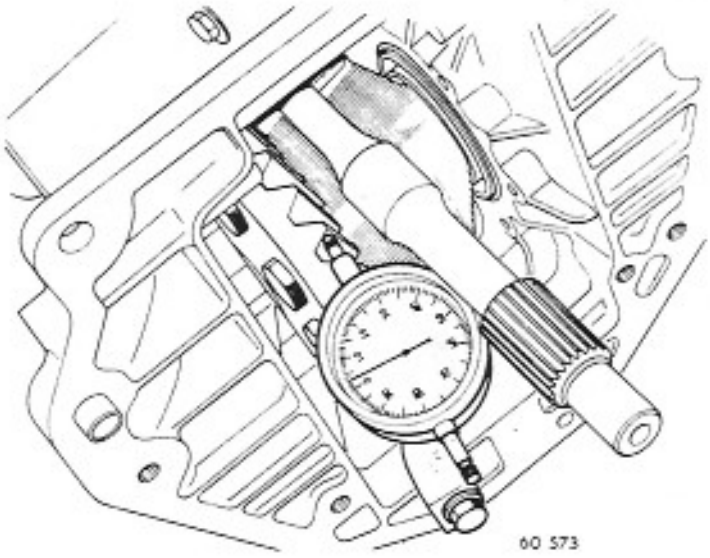


65220

The back.lash is obtained by screwing nut (1) on the differential housing side in or out and screwing nut (2) on the opposite side in or out by the same amount.

Feel the back lash by hand

If it is clearly too large unscrew nut (1) on the differential housing side and screw in nut (2) on the crown wheel side to obtain a smaller back lash before checking it with a dial indicator.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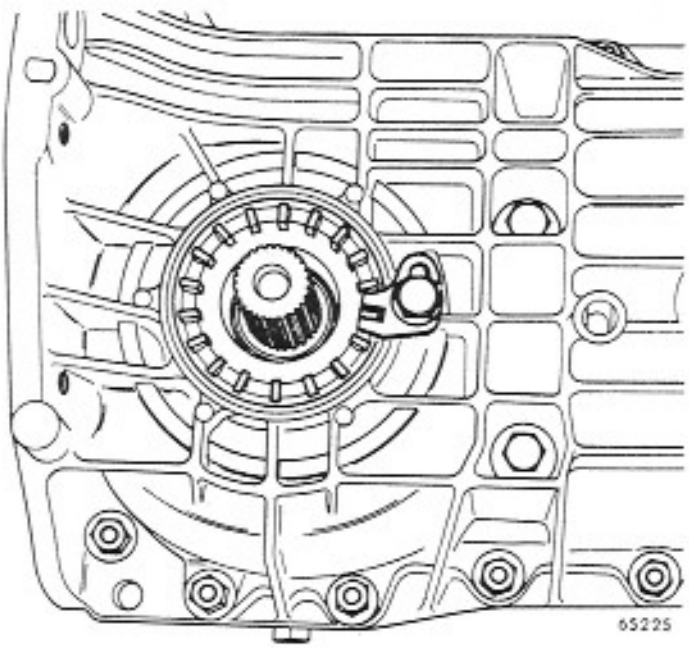
At this point, mount a dial indicator on the housing with its plunger square with the flank of one of the crown wheel teeth.
Check the back lash : It should be between 0.12 and 0.25 mm (.005 to .010").
If it is excessive, unscrew nut (1) on the differential housing side and screw in nut (2) on the crown wheel side by the same amount.
If there is insufficient backlash, unscrew nut (2) on the crown wheel side and screw in nut (1) on the differential housing side by the same amount.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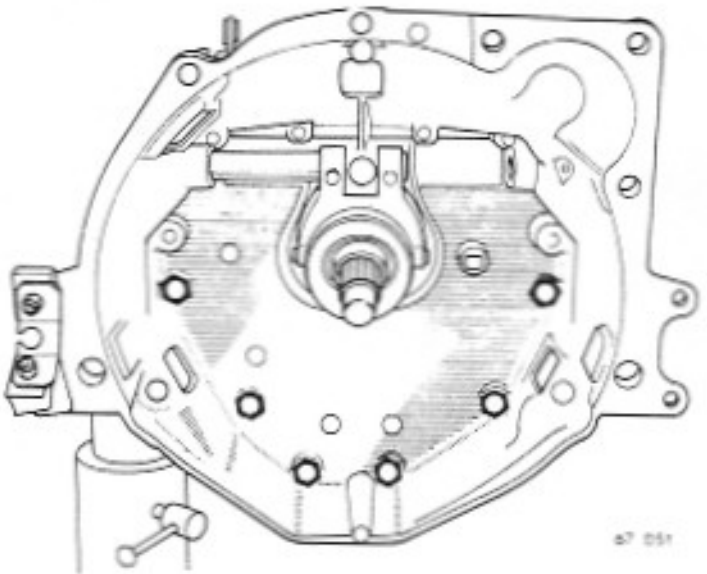
When the correct back lash has been obtained, lock the nuts by means of the locking plates.

Smear the clutch housing paper gasket with Perfect Seal jointing compound (Ref.805 463).
Fit the clutch housing, paying attention not to damage the lip on the oil seal as it passes over the shaft splines.
To do this wrap adhesive plastic round the splines.
Tighten the housing securing bolts.

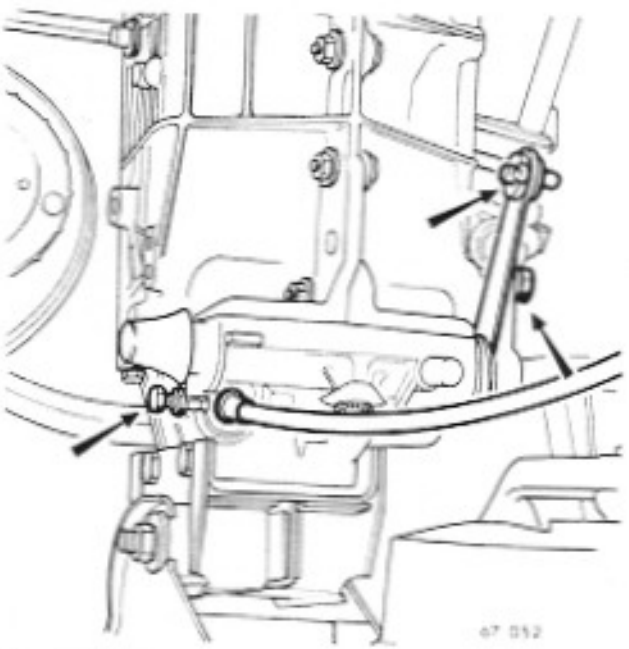
NOTE - The gearbox is to be filled with oil after it is refitted to the vehicle.



XI - REMOVING AND REFITTING THE FRONT HOUSING

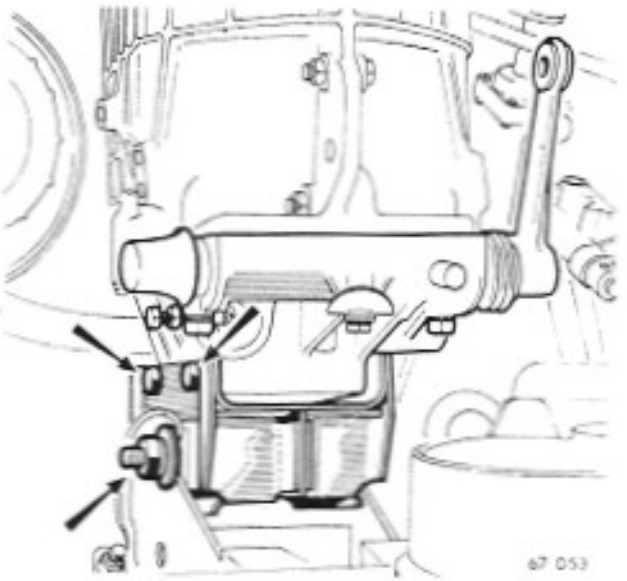
Removing

Disconnect the battery.
Remove the spare wheel.
Drain the gearbox using spanner (wrench) B.Vi. 380.



Disconnect :
- the speedometer drive cable.
- the link at the gearshift lever.

Remove the two bolts which secure the gear shift control to the housing and pull back the control.



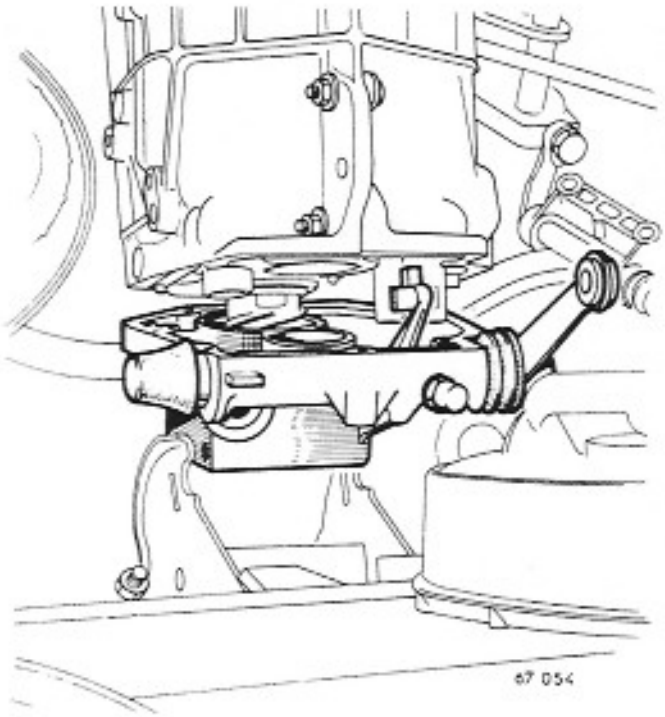
Unscrew the 2 nuts which secure the front mounting pad in order to free the two retaining washers.
Remove the 2 bolts which secure the pad bracket to the front housing.
Remove the pad and its bracket.
Lift the front of the gearbox (transmission case) placing a spacer under it.
Remove the front housing securing bolts and remove it.
Remove the gasket.
Clean the gasket face.

Refitting

Fit the paper gasket smeared with Perfect Seal jointing compound (Ref 805 463).
Fit the housing, engaging the internal shift lever in the slot in the shift fork shaft.

Fit the housing securing bolts and tighten them.
Remove the chock from under the gearbox.

Fit the front mounting pad and its bracket.
Tighten the securing bolts.
Secure the shift control.
Connect up the link (lightly fold down the end of the clip so that it cannot come out of place) and the speedometer drive cable.
Top up the gearbox oil.
Refit the spare wheel.
Connect up the battery.

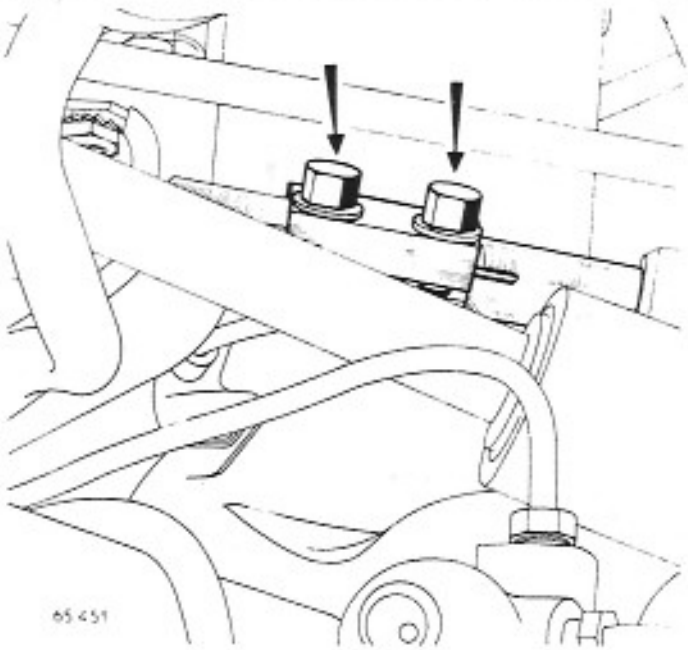


XII - ADJUSTING THE GEAR SHIFT CONTROL

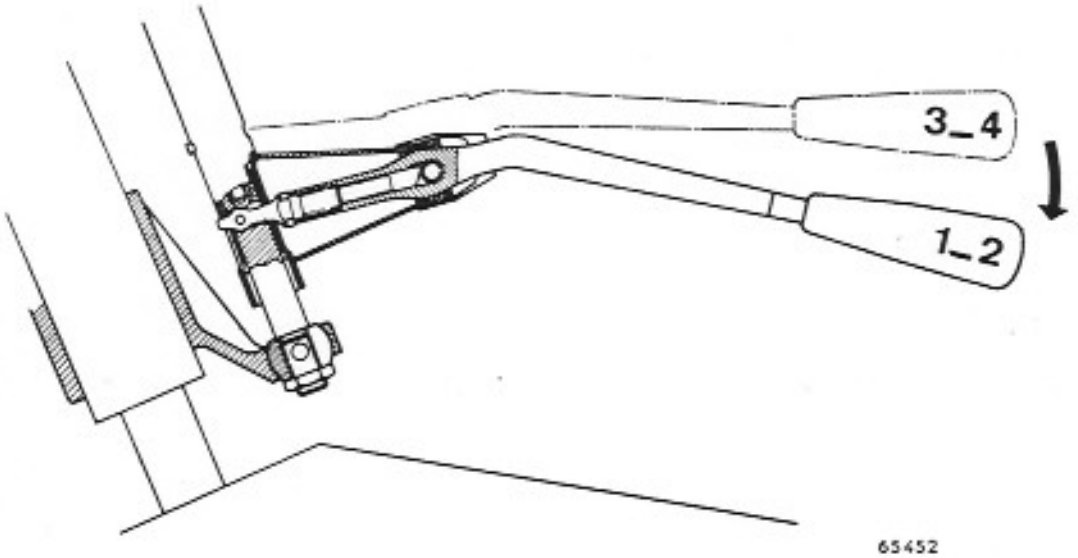
Engage 2nd gear, by moving the steering column shift lever :
The lever on the gearbox (transmission case) must also be in the 2nd speed position.
Loosen the two bolts on the clamp which secures the two parts of the gear shift tube together.

Operate the steering column lever a number of times in order to fully free the two parts of the tube.

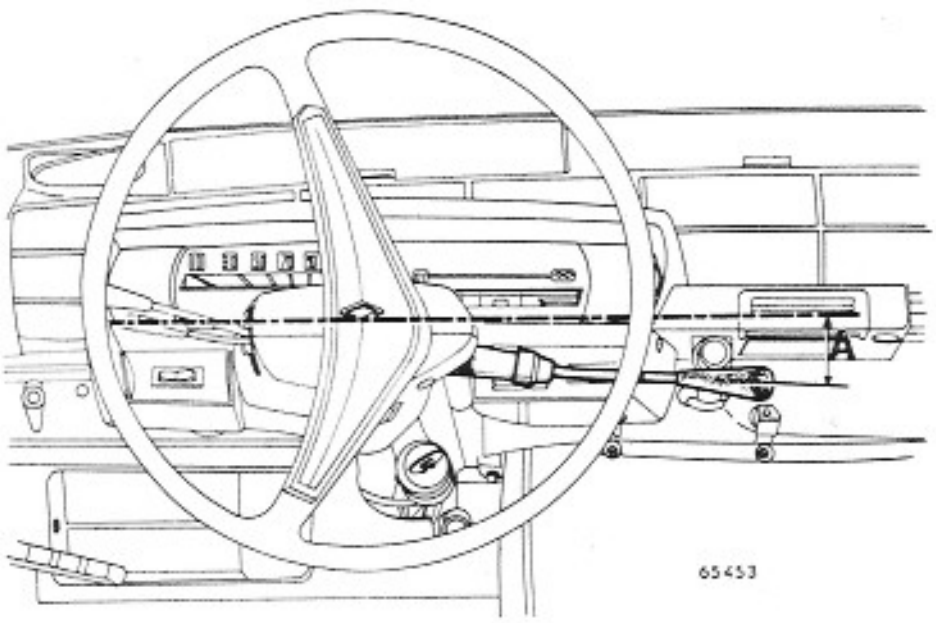
Ensure that the lever on the gearbox (transmission case) is still in the 2nd speed position, if it is not, return it to its correct position.



Place the steering column lever in position as follows :



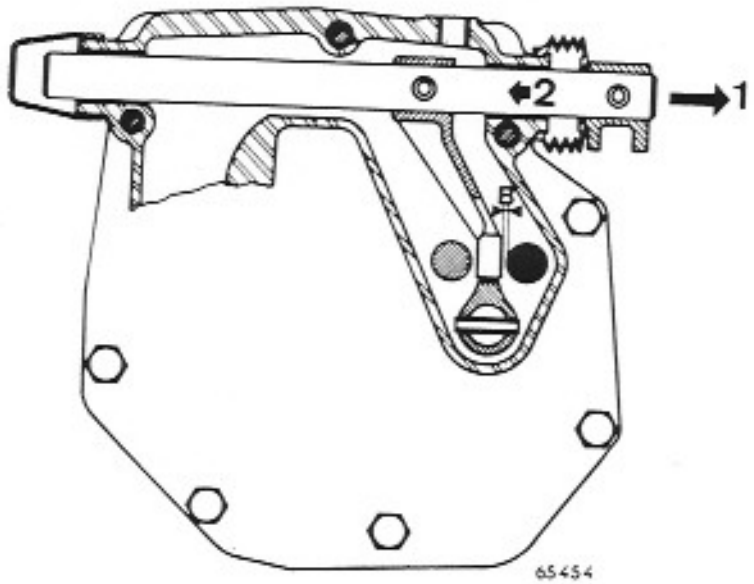
- Move it towards the rear in order to bring it to the 1st-2nd speed position against the reverse detent.



- Move it vertically so that its end is :

A = 30 ± 10 mm (51/64 to 1 19/32"), from a horizontal line passing through the centre of the steering wheel.

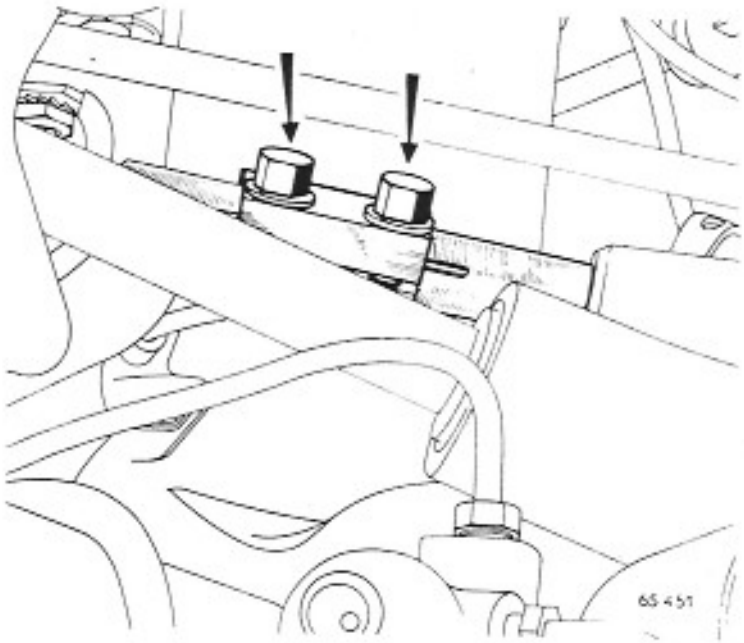
Hold the lever in this position.



Move the shift fork control lever shaft on the gearbox in the direction shown by arrow 1. The lever will come into contact with the reverse shaft.

Then return it into the opposite direction (in the direction shown by the arrow (2) in order to obtain a clearance (B) between the lever and the reverse shaft equal to :
B = 0.5 to 1 mm (1/32 to 3/64")

Hold the shaft in this position.

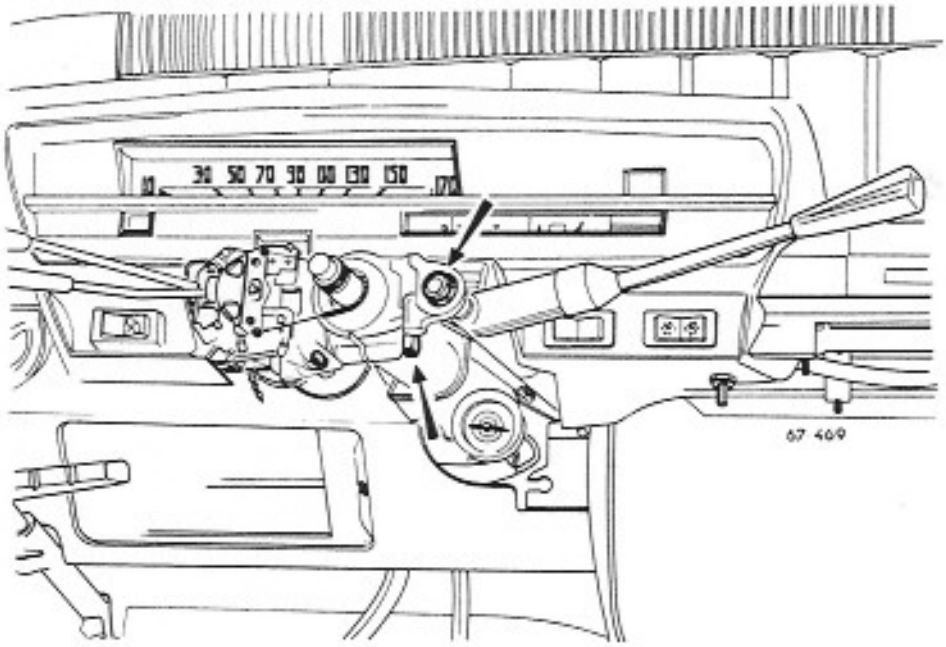


When the lever on the steering column and the lever on the gearbox (transmission case) are both in the correct position, tighten the two bolts on the gear shift clamp.

Check that the gears select and engage correctly

XIII - REMOVING, OVERHAULING AND REFITTING THE GEAR SHIFT CONTROL

A - REMOVING

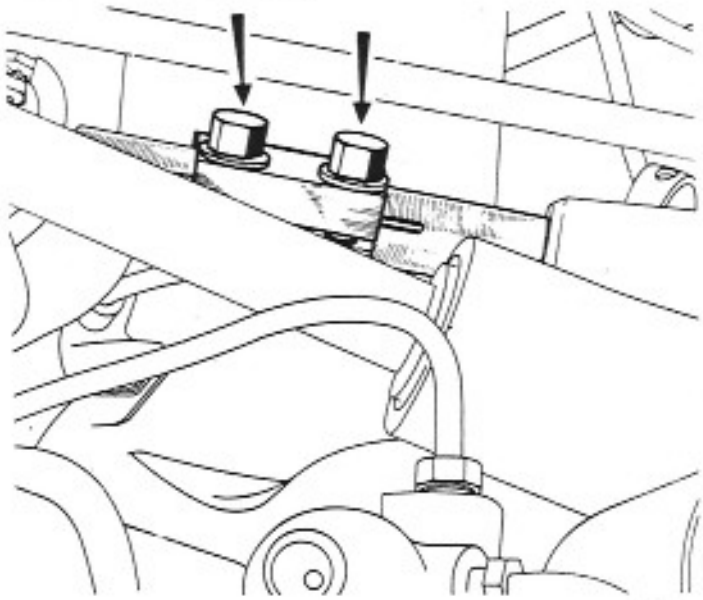


Disconnect the battery.
Remove the steering wheel embellisher and take off the steering wheel by means of extractor Dir.372.
Remove the horn and lighting switch housings.

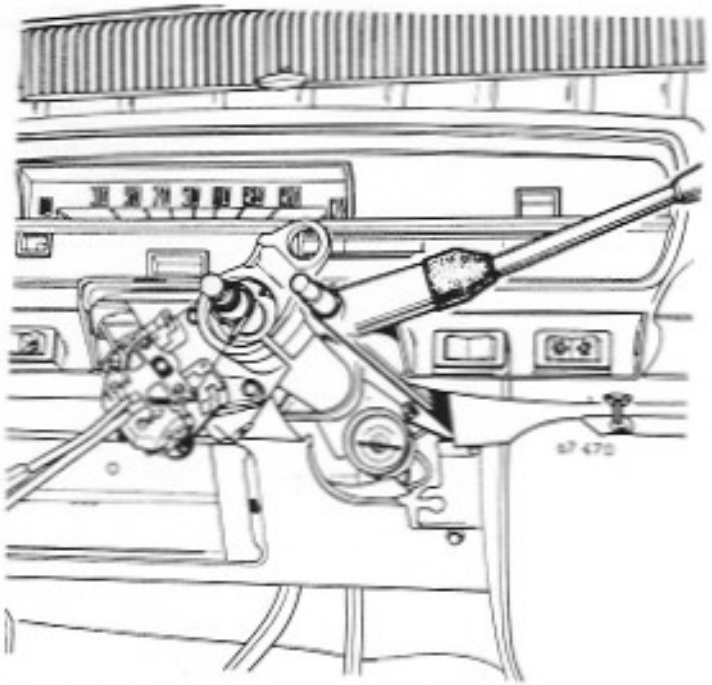
Mark the position of the horn and lighting switch bracket with reference to the steering column.

Remove the bracket securing bolt.
Remove the lock nut on the gear shift lever ball joint.

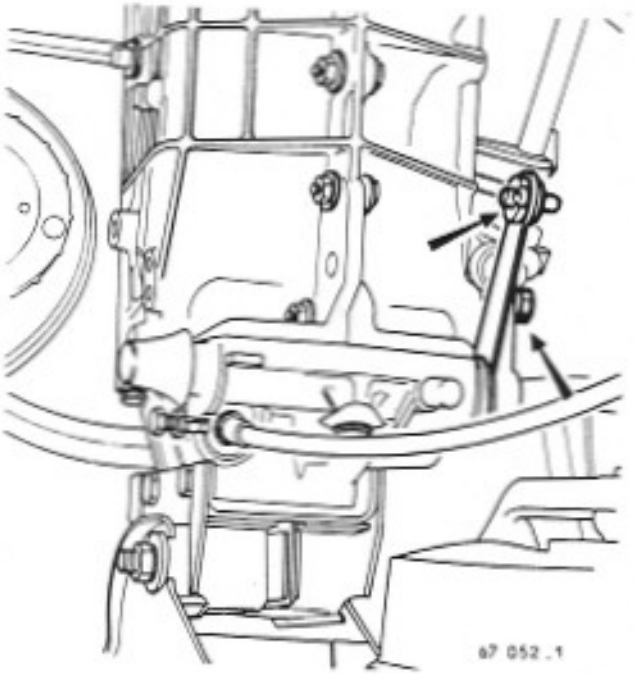
Loosen and unscrew the ball joint by means of spanner (wrench) B.Vi.315, gradually pulling back the horn and lighting switch bracket.



Loosen and unscrew the two bolts on the clamp which secures the two halfs of the gear shift tube together.



Pull back the horn and lighting switch bracket to free the shift lever, then swing it round the centre of the steering column tube.
Remove the tube-lever assembly by freeing it at the clamp.



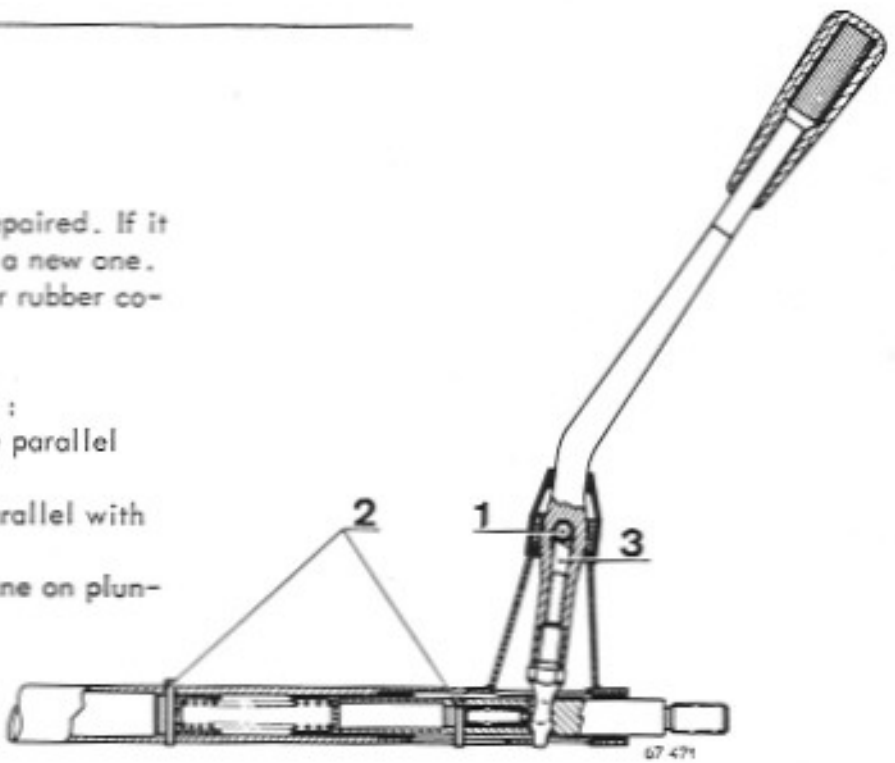
Remove the clip which secures the link to the lever.
Remove the two bolts which secure the shift control to the housing.
Remove the shift control assembly.

B - OVERHAULING

1/ Tube-lever assembly

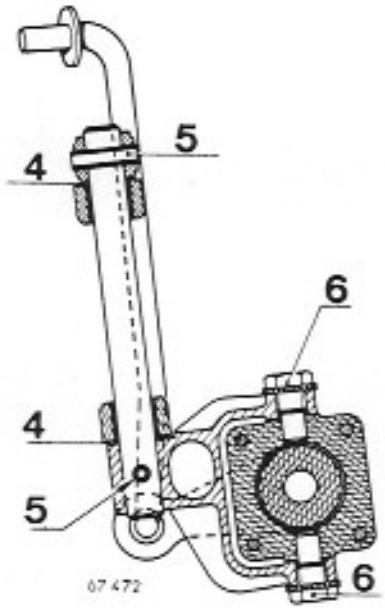
This part of the control cannot be repaired. If it is damaged replace the assembly by a new one. However, the roll pins and the lever rubber cover can be replaced.

Ensure that they are correctly fitted :
- the slit in the roll pin (1) is to be parallel with the shift lever centre line.
- the slits in roll pins (2) must be parallel with the steering column centre line.
- correctly position the inclined plane on plunger (3).

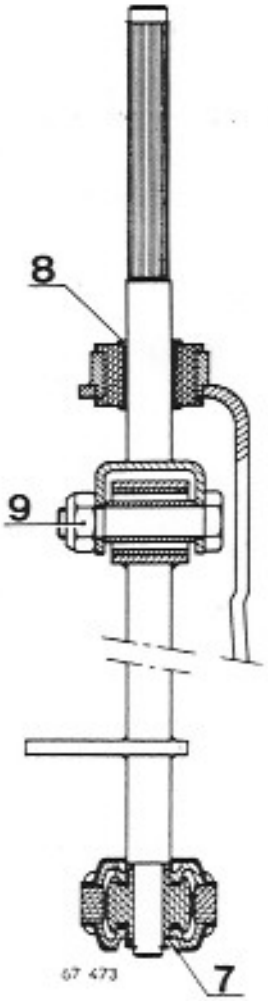


2/ - Shift control at the box end

Dismantle the shift control components.
On re-assembling, pay attention to the following points.



- Fit an adjusting washer at point (4) so that there is no end play on the shaft. Washers are obtainable in thicknesses of 0.10 - 0.15 and 0.20 mm (.004 - .006 - .008").
- Smear the washers with grade SI 33 grease (Ref.806 520).
- Correctly position roll pins (5) with the slits square with the pivot pin longitudinal centre line.
- Tighten bolts (6) to a torque of 1.5 m.da N (10 lb/ft).



- Fit an adjusting washer at point (7) so that there is no end play in the hinge. Washers are available in thicknesses of 0.10 and 0.20 mm (.004 - .008").
- Smear the washer with grade SI 33 grease (Ref.806 520).
- Do not grease the bearing bushes (8).
- Do not tighten pivot bolt (9) until the shift control assembly is refitted.

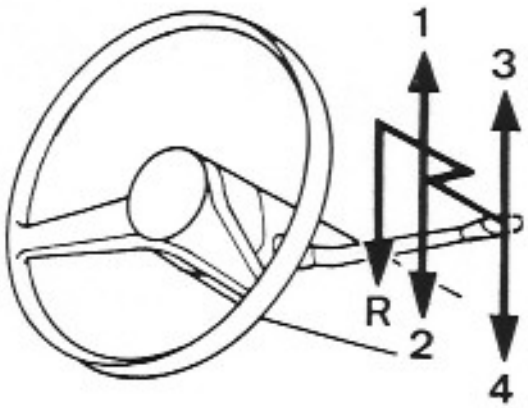
C - REFITTING

Carry out the removing operations in reverse, paying attention to the following points :
- Correctly position the horn and lighting switch bracket as marked before removing.

- Tighten the ball joint by means of spanner (wrench) B.Vi.315 until it moves in its housing, without play, then tighten the lock nut.
- Tighten nut (9) on the pivot pin to 2.5 m.daN (20 lb/ft).
- Adjust the shift control.

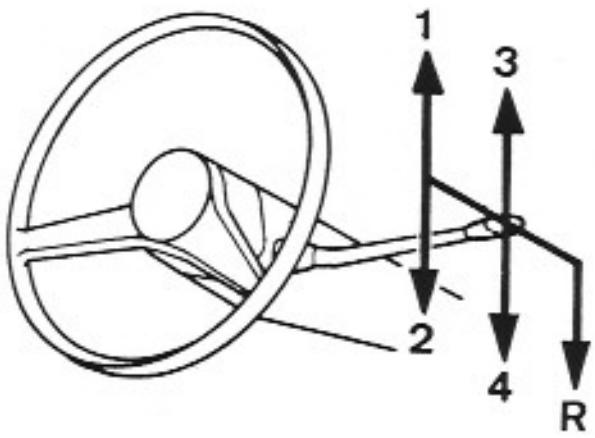
XIV - SPECIAL FEATURES OF THE 1968 MODEL

1968 model vehicles are fitted with a gear shift control which has a new reverse speed position.

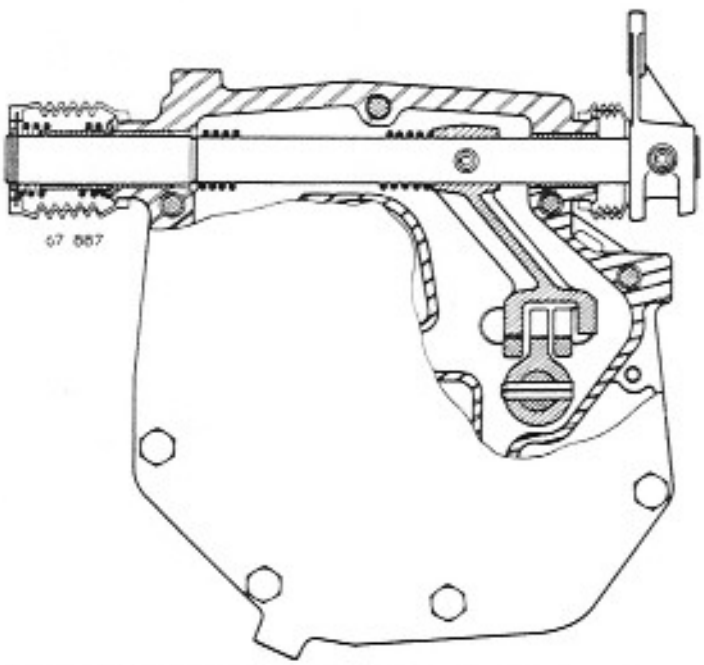


68 207

Old model



New model



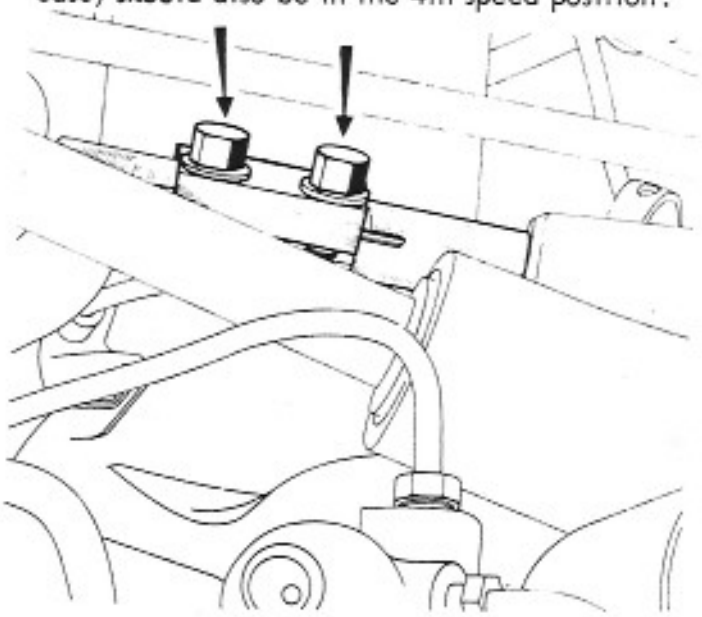
67 887

This new reverse speed position has involved modification to :

- the gearbox front cover housing,
- the shift fork control lever,
- the shift fork shafts.

The method of adjusting the gear shift has also been modified. It should be adjusted as follows :

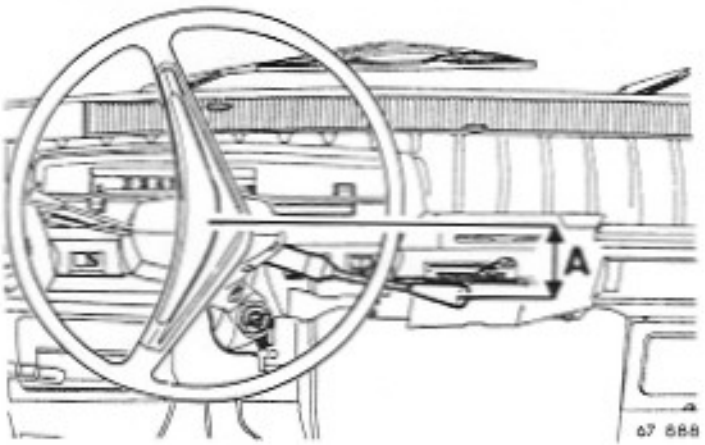
Engage 4th speed by moving the steering column lever. The lever on the gearbox (transmission case) should also be in the 4th speed position.



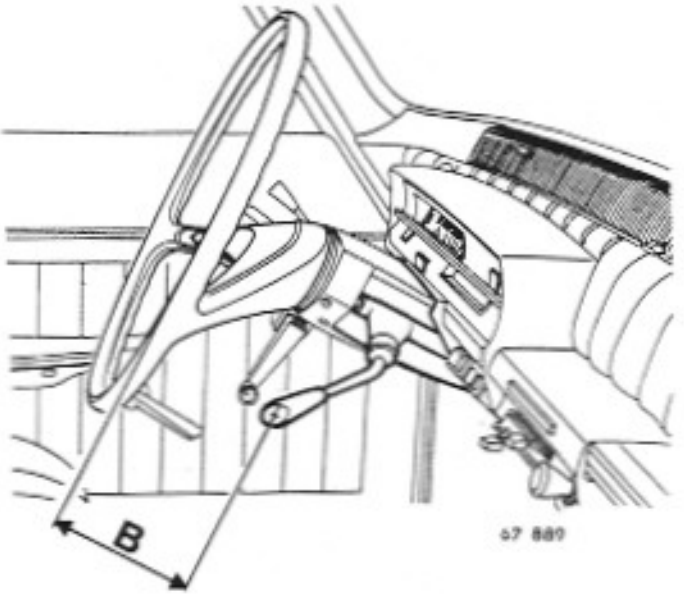
65 451

Loosen the two bolts on the clamp which fastens the two halves of the shift control tube together. Operate the shift lever on the steering column a number of times in order to free the two halves of the tube and ensure that the lever on the gearbox (transmission case) is still in the 4th speed position. If it is not, return it to this position.

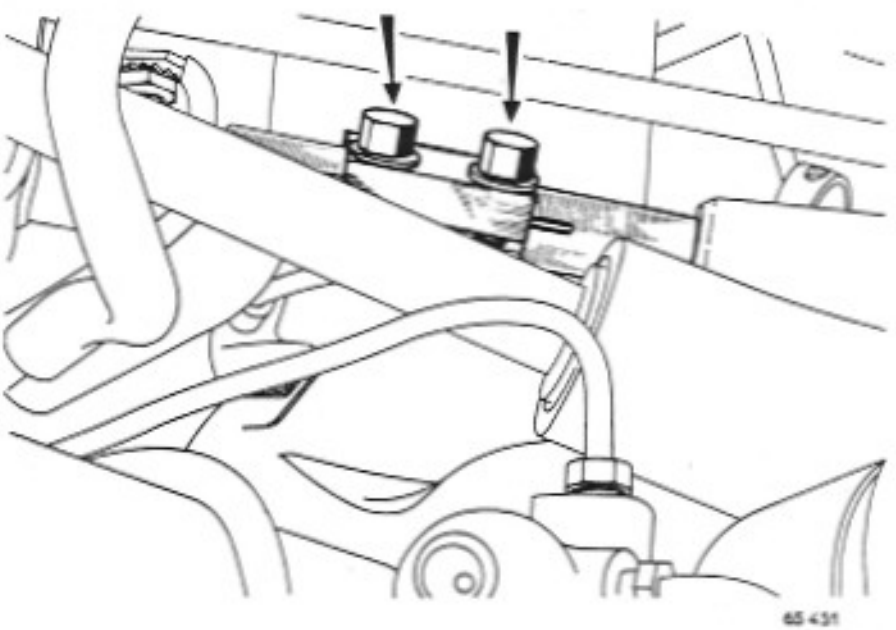
Place the steering column lever in position as follows :



1) - Move it vertically so that its end is a distance A = 46 ± 10 mm (1 7/16 to 2 7/32") from a horizontal line passing through the centre of the steering column.



2) - Move it along the steering column centre line so that its end is a distance :
B = 94 mm (3 23/32") from the top edge of the steering wheel.
Hold the lever in this position.



When the lever on the gearbox (transmission case) and the lever on the steering column are both in the correct position, tighten the two bolts on the clamp.
Check that the gear selects and engages correctly.