GROUP 34

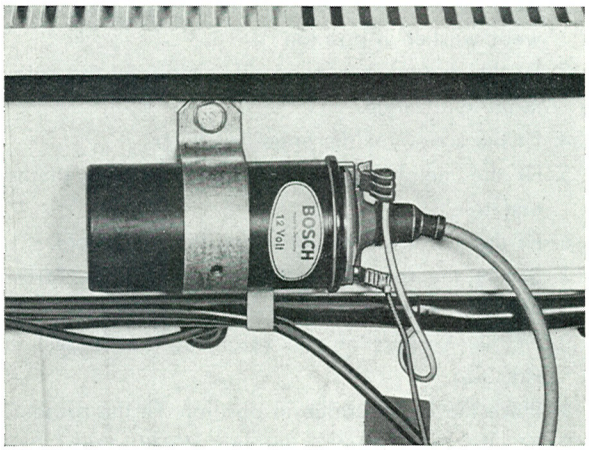
# IGNITION SYSTEM

## DESCRIPTION

The ignition system is of the battery ignition type. It consists of the following main parts: Ignition coil, distributor, ignition lead and spark plugs.

### IGNITION COIL

The ignition coil is fitted on the firewall, see Fig. 3-47. The function of the ignition coil is to transform the battery voltage to high tension voltage for the spark plugs. It consists of a core of laminated metal around which is a winding of heavy copper wire, the primary winding, and a winding of fine copper wire, the secondary winding. The primary winding operates at battery voltage from the distributor contact breakers. The other winding, the high-tension winding, is connected to the center terminal on the distributor cap, from where the high-tension current is distributed to the engine spark plugs.



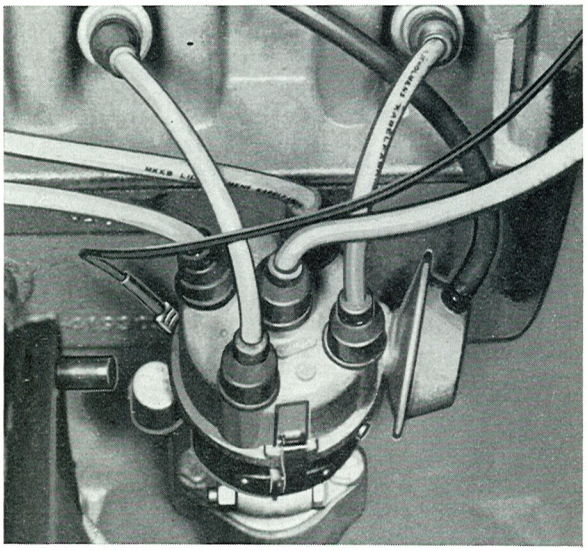

VOLVO 103 699

**Fig. 3-47. Ignition coil fitted**

### DISTRIBUTOR

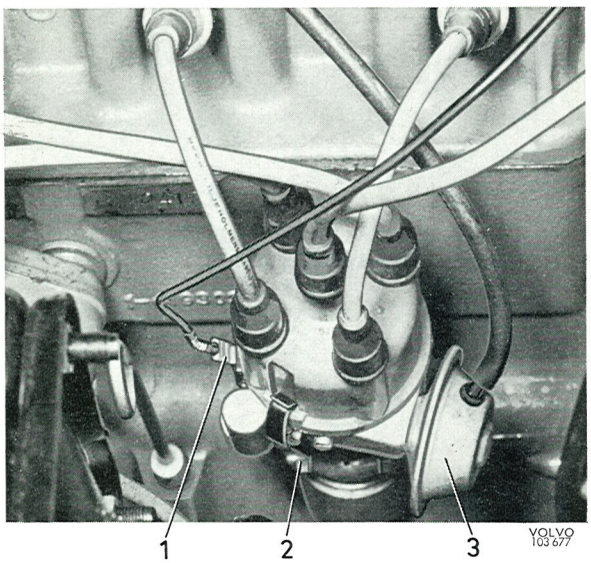
The distributor, Figs. 3-48 and 3-49, is fitted on the left-hand side of the engine and is driven from the camshaft. The adjustment of the distributor in relation to engine speed is regulated by a centrifugal governor fitted under the breaker plate. The adjustment in relation to loading is controlled by a vacuum regulator.

The vacuum regulator on the B 20 A engine raises the firing when the load on the engine reduces. On the B 20 B engine the vacuum regulator lowers the firing below the basic setting during idling and engine braking. Reducing the firing is part of exhaust emission control and prevents the engine from emitting excessive, noxious exhaust gases at idling and engine braking.



VOLVO 103 722

**Fig. 3-48. Distributor B 20 A fitted**




VOLVO 103 677

**Fig. 3-49. Distributor B 20 B fitted**

1. Primary connection 2. Attaching screw 3. Vacuum regulator

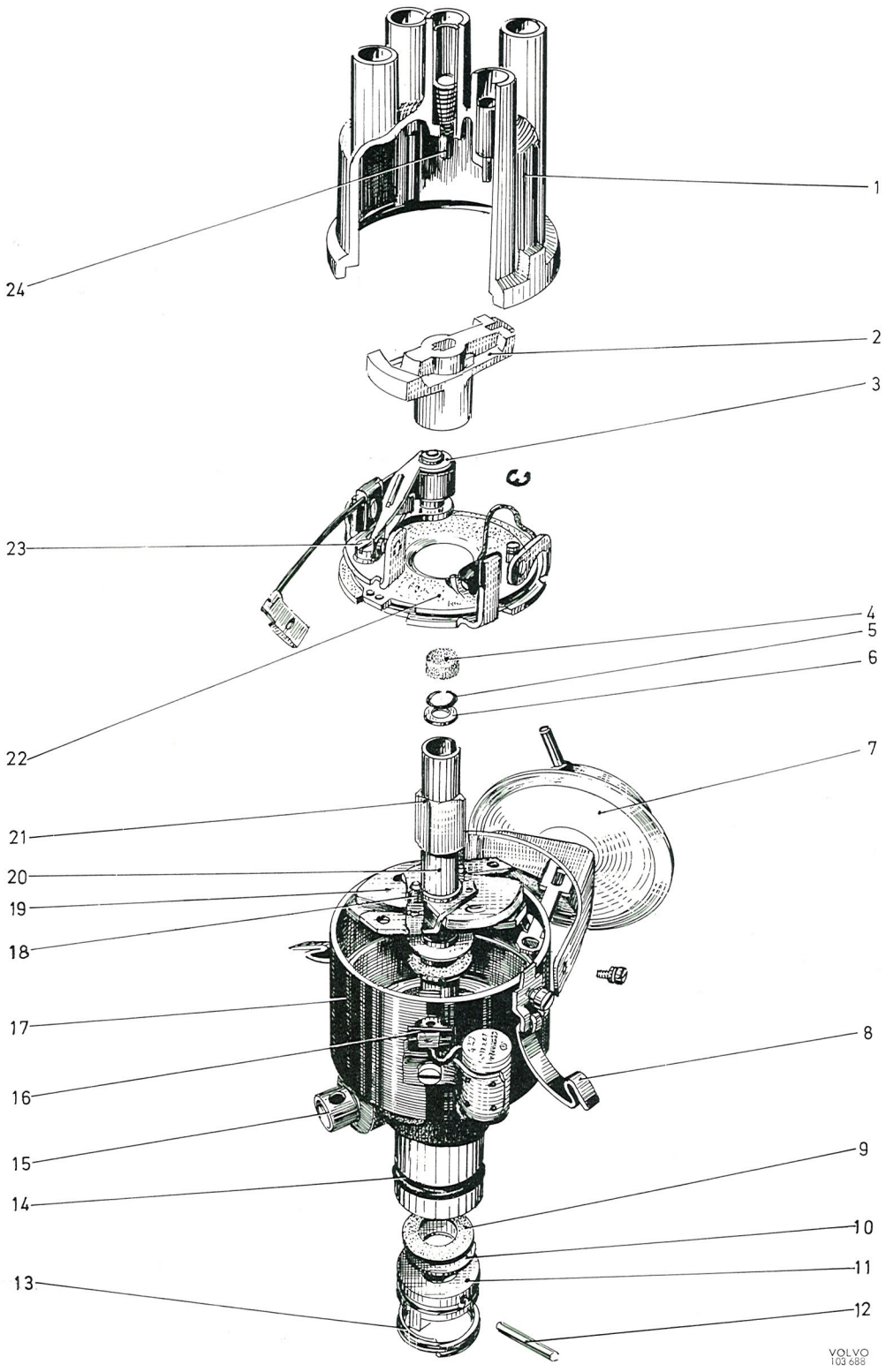



**Fig. 3-50. Distributor, B 20 B**

1. Distributor cap
2. Distributor arm
3. Contact breaker
4. Lubricating felt
5. Circlip
6. Washer
7. Vacuum regulator
8. Cap clasp
9. Fibre washer
10. Steel washer
11. Flange
12. Lock pin
13. Resilient ring
14. Rubber seal
15. Lubricator
16. Primary connection
17. Distributor housing
18. Centrifugal governor spring
19. Centrifugal weight
20. Breaker arm
21. Breaker cam
22. Breaker plate
23. Lock screw for breaker contacts
24. Rod brush (carbon)

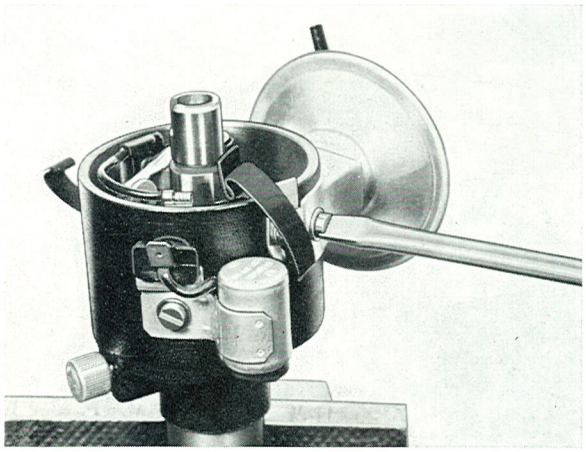
## DISTRIBUTOR

### REMOVING

1. Release the lock clasps for the distributor cap and lift off the cap.
2. Remove the primary lead from the primary connection, 1 Fig. 3-49.
3. Remove the vacuum hose from the vacuum regulator. (When removing the hose from the bakelite connection, observe great care not to break the connection).
4. Slacken the screw (2, Fig. 3-49) and pull up the distributor.


VOLVO 103720

**Fig. 3-52. Removing the primary connection**

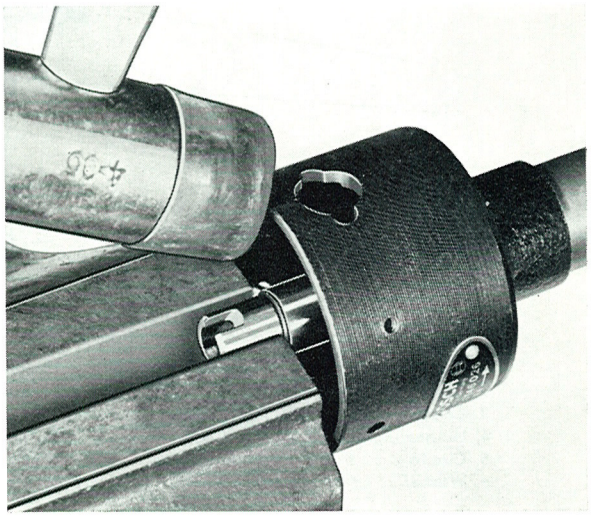


VOLVO 103717

**Fig. 3-51. Removing the vacuum regulator**

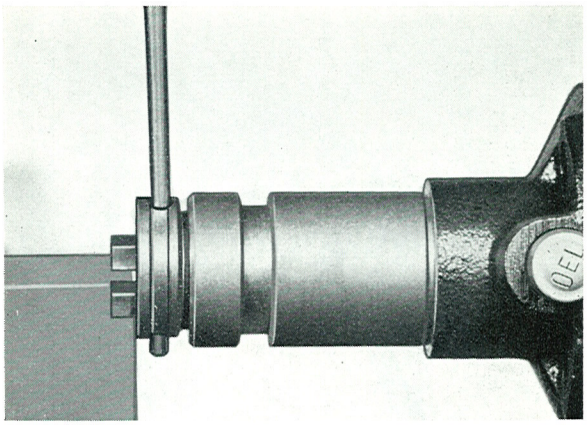
### DISMANTLING

1. Pull off the distributor arm.
   Remove the circlip for the pull rod from the vacuum regulator.
   Remove the vacuum regulator according to Fig. 3-51.
2. Mark up how the lock clasps for the cap are located and remove them.
   Disconnect the lead from the breaker contacts and remove the primary connection, Fig. 3-52.
   Lift up the breaker plate.
3. Disconnect the springs for the centrifugal governor and mark up how the breaker cam is located in relation to the distributor shaft. Secure the breaker cam in a vice with soft jaws. Carefully knock on the distributor housing with a plastic mallet (Fig. 3-53) until the circlip (5, Fig. 3-50) has released.
4. Remove the resilient ring (13, Fig. 3-50) and mark up how the driving collar (11, Fig. 3-50) is located in relation to the distributor shaft.



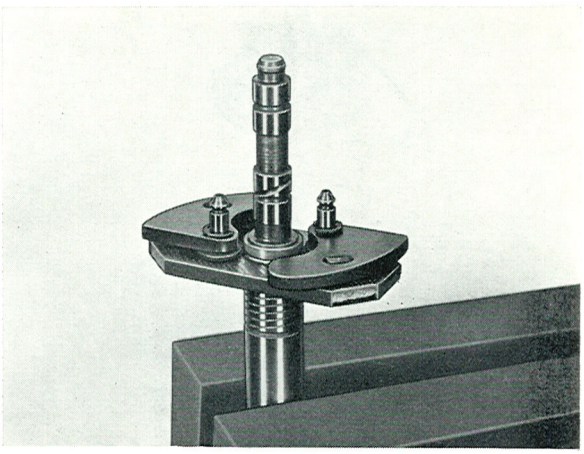
VOLVO 102979

**Fig. 3-53. Removing the circlip**



VOLVO
103697

Fig. 3-54. Removing the driving collar



VOLVO
103718

Fig. 3-55. Distributor shaft with centrifugal weights

Tap out the pin (Fig. 3-54), lift off the driving collar and pull up the distributor shaft.
Check that no washers have been lost.

5. Remove the lock springs for the centrifugal weights and lift up the weights.

## INSPECTING

### Distributor plate

The surface of the contact breaker points should be flat and smooth. The colour of the contacts should be grey. Oxidized or burnt contacts must be replaced. After a long period of use, the contact lip can be worn and the spring fatigued, so that the contacts should be replaced if the distributor for any reason is disassembled.

The contact plate must not be loose, worn or have burr on.

### Distributor shaft

The play between the distributor shaft and the breaker camshaft must not exceed 0.1 mm (0.004").

The cams on the breaker camshaft must not be scored or worn down so that the dwell angle is altered.

The holes in the centrifugal weights must not be oval or deformed in any other way.

The centrifugal weight springs must not be deformed or damaged.

### Distributor housing

The play between the distributor housing and the shaft should not exceed 0.2 mm (0.008"). If the play is excessive, replace the bushes and, if this is insufficient, also the shaft.

## ASSEMBLING

1. Lubricate the distributor parts according to the instructions given in Fig. 3-56.
2. Fit the centrifugal weights and also the lock springs on to the weights. Fit the breaker camshaft on to the distributor shaft. Hook on the springs for the centrifugal governor. Fit the washer and circlip for the breaker camshaft. The circlip is placed into position by means of a suitable sleeve. Fit the lubricating felt.
3. Fit the distributor shaft in the distributor housing and install the driving collar on the distributor shaft. Make sure that the fibre washers come against the distributor housing. Fit the pin in the collar and check the axial clearance on the distributor shaft. The clearance should be 0.1—0.25 mm (0.004—0.010"). Any adjustment can be done by altering the number of adjusting washers on the distributor shaft.
   Fit the resilient ring on the driving collar.
4. Fit the breaker plate. Fit the lock clasps for the cap. Fit the primary connection and connect the lead from the breaker contacts.
5. Fit the vacuum regulator and connect the pull rod to the breaker plate.
6. Check that the breaker contacts are mounted correctly both horizontally and vertically. Adjustment should be made with a suitable tool, (for example, Bosch EFAW 57 A), but only the fixed contact may be bent. Wash the contacts with trichloroethylene or chemically pure gasoline.

Run the distributor on a test bench and check according to the "Specifications".

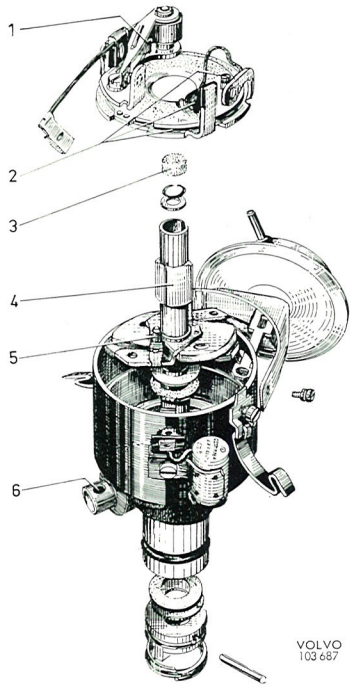



**Fig. 3-56. Lubricating scheme for distributor**

Use Bosch lubricant (or equivalent) according to below.
1. Ft 1 v 4. Place a little grease on the contact lip
2. Ft 1 v 26. Grease
3. Ol 1 v 13. Lubricate
4. Ft 1 V 4. A very light layer of grease
5. Ft 1 v 26. Grease
6. Ol 1 v 13. Fill with oil

## REPLACING THE CONTACT BREAKER

The contact breaker can be replaced with the distributor fitted, but it **should** be done with the distributor dismantled.

1. Remove the distributor rotor arm.
2. Disconnect the electric lead at the primary connection.
3. Remove the screw for the contact breaker and lift up the old contacts.
4. Lubricate the distributor according to the instructions given in Fig. 3-56.
5. Fit the new contact breaker.
6. Connect the electric cable at the primary connection.
7. Check that the contact breaker is located correctly both vertically and horizontally.
   Adjustment should be made with a suitable tool, (for example, Bosch EFAW 57 A), but only the fixed contact may be bent. Wash the breaker contacts with trichloroethylene or chemically pure gasoline.

Run the distributor on a test bench and check according to the "Specifications".

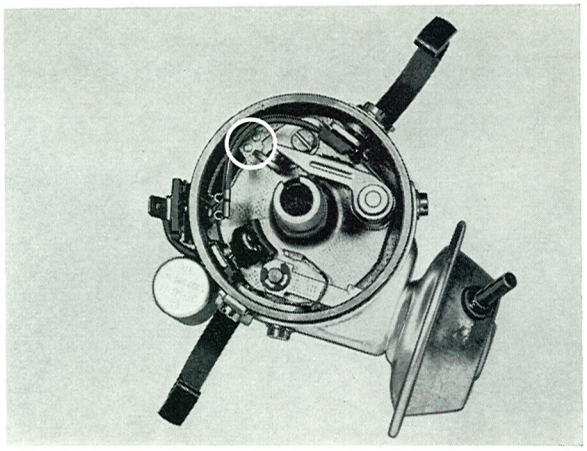



**Fig. 3-57. Recess for adjusting the contact breaker**

## TESTING THE DISTRIBUTOR IN TEST BENCH

1. Run the distributor at 500 r.p.m. in its ordinary direction of rotation (anti-clockwise) and adjust the contact breaker dwell angle according to the "Specifications".
2. Adjustment is made by slackening a little the screw for the breaker contacts and then inserting a screwdriver in the recess, Fig. 3-57, and turning the screwdriver until the dwell angle is the correct one.
   Then tighten the screw for the contact breaker.
3. Run the distributor and set the protractor on the test bench so that a marking comes opposite 0° at such a low speed (below 300 distributor r.p.m.) that the centrifugal governor does not function. Increase the speed slowly and read off the values at the prescribed graduations. A newly lubricated distributor should first be run up to maximum speed several times. Permissible tolerance for the centrifugal regulator is ± 1°.
4. Run the distributor at low speed and adjust the protractor so that marking is obtained at 0°. Connect the vacuum hose from the test bench to the vacuum regulator. Increase the vacuum gradually and read off the values at the prescribed graduations.

## FITTING

1. Place the distributor in position.
2. Press the distributor downwards while turning the distributor arm at the same time. When the distributor goes down about 5 mm (3/16") and it is no longer possible to turn the distributor arm, the driving collar of the distributor is then in the slot on the distributor drive.

3. Turn the distributor housing so that it takes up the same position it had before removal.
4. Connect the primary lead. Fit on the distributor cap.
5. Start the engine and set the ignition. (If the engine does not start, turn the distributor housing until it does so).

## IGNITION SETTING

Ignition setting should always be carried out while the engine is running and with the help of a Stroboscope.

1. Clean the flywheel damper so that the graduation marks are visible, see Fig. 3-58.
2. Remove the hoses from the vacuum regulator. (On the B 20 B the hose for the intake manifold should be shut off by, for example, bending it or by sealing it with a suitable plug, so that the engine does not draw in unwanted air).
3. Connect the Stroboscope to No. 1 cylinder spark plug and to the battery.
4. Start the engine and run it at the r.p.m. given in the "Specifications". Use a tachometer for this purpose. Slacken the distributor (3, Fig. 3-49) and turn it until the firing position agress with that given in the "Specifications". Tighten securely the distributor and check that the firing position and speed have not been altered.
5. Remove the Stroboscope and refit the hose on the vacuum regulator.

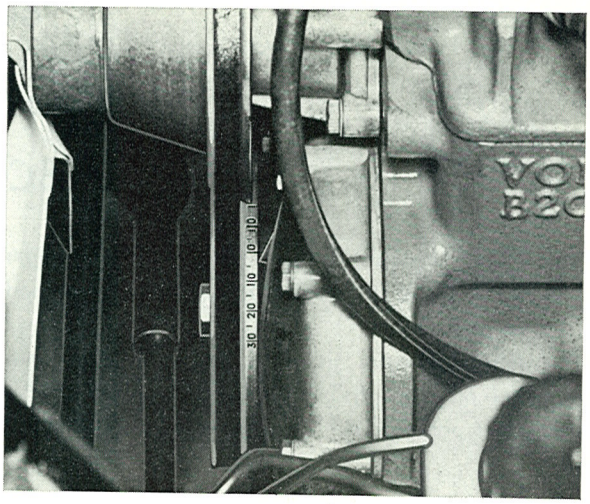



**Fig. 3-58. Graduation for ignition setting**

GROUP 35

# LIGHTING

## DESCRIPTION

The lighting consists of two full- and dipped-beam headlights, Fig. 3-59, parking lamps, rear lamps and number plate light.

The headlights are fitted in the grille. They are switched on and off by the lighting switch on the instrument panel. Switching between full- and dipped-beam positions is done by moving the directional indicator lever switch towards the steering wheel. The relay (2, Fig. 3-77) then connects up the lighting.

The rear lights have separate bulbs for rear lights, stop lights, reverse lights and directional indicators.

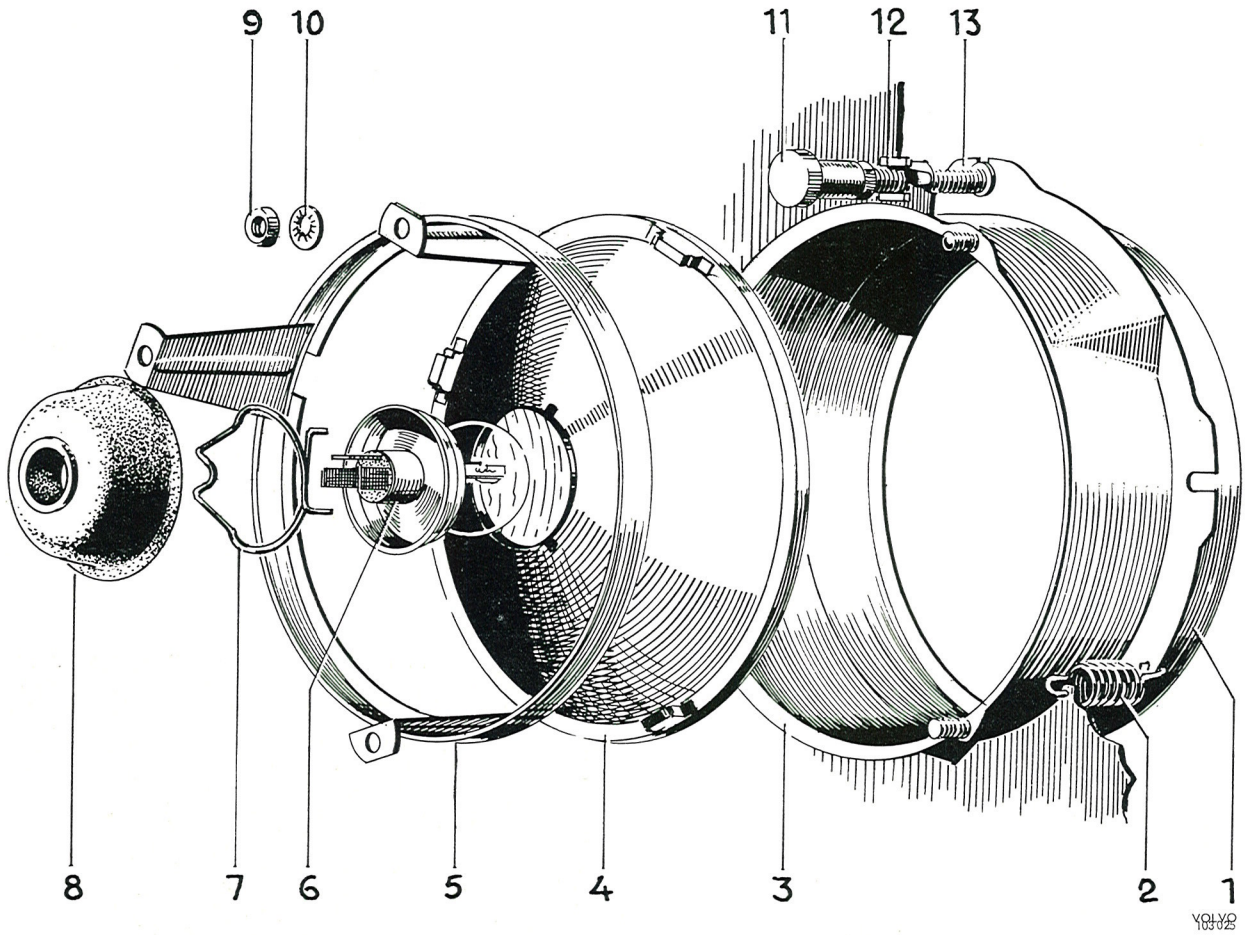
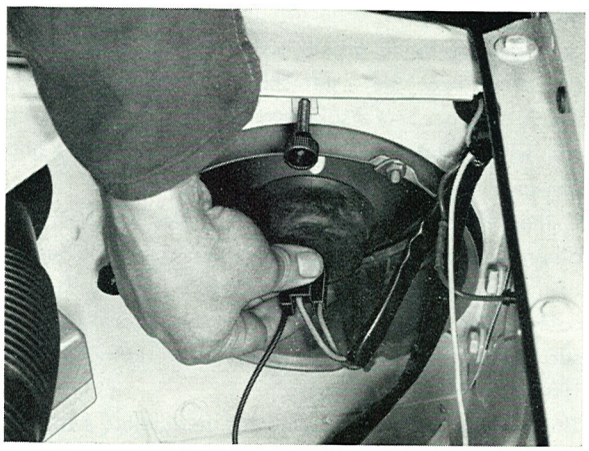


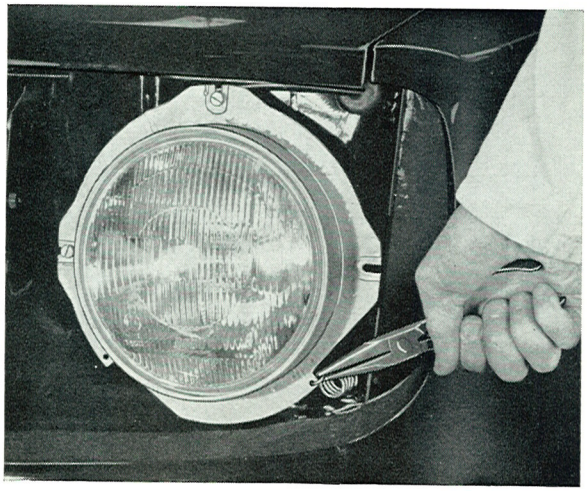

**Fig. 3-59. Headlight**

1. Ring
2. Spring
3. Retainer
4. Insert
5. Ring
6. Bulb holder
7. Bulb holder spring
8. Rubber cover
9. Nut
10. Tab washer
11. Adjusting nut
12. Nut
13. Screw



VOLVO
103727

Fig. 3-60. Removing the connecting contact



VOLVO
102006

Fig. 3-62. Removing the spring

## HEADLIGHTS

### REMOVING

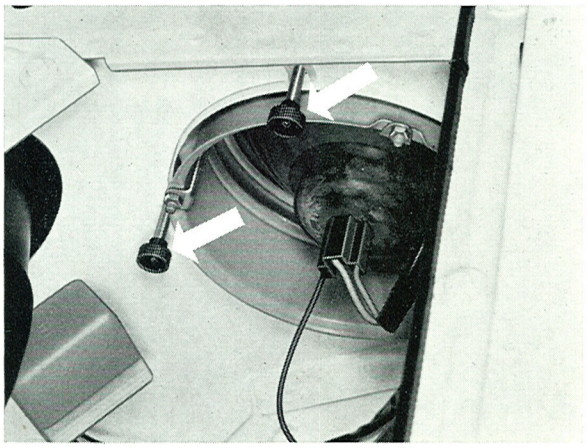
1. Remove the grille. Disconnect the connecting contact for the cables by pulling it straight back. See Fig. 3-60. Remove the two adjusting buttons by pulling them straight back, see Fig. 3-61. Unhook the spring on the lower side of the headlight. See Fig. 3-62.
2. Unscrew the two long screws and lift out the insert with the bowl. The insert is released from the bowl by removing the three nuts securing the inner ring to the bowl. The plastic nut can be removed by pressing the tabs together with pliers and taking them out through the hole in the grille.

### FITTING

1. Fix the insert in the bowl with the help of the inner ring and screw on the three nuts. Fit the headlight with the two screws and hook on the spring underneath the headlight.
2. Fit the cables and the grille. Screw on the adjusting nuts and adjust the headlights.

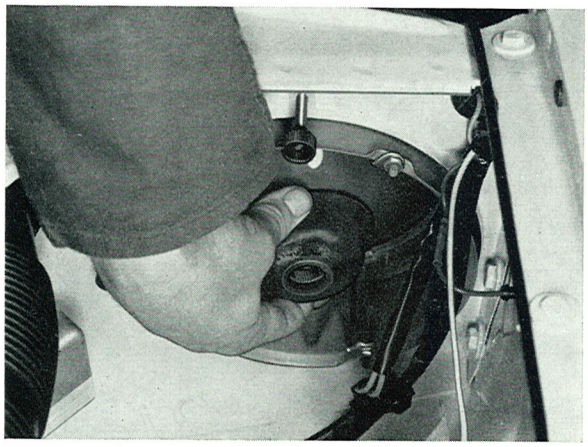
## REPLACING THE HEADLIGHT INSERT INSIDE THE ENGINE COMPARTMENT

1. Disconnect the cables by pulling the connecting contact back. (When replacing the left headlight insert, first remove the battery. For removal of the



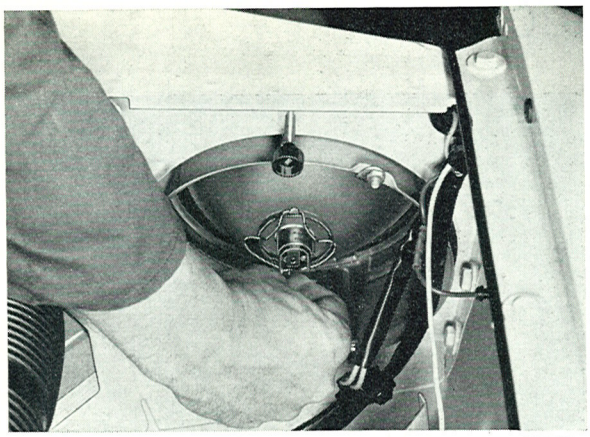
VOLVO
103723

Fig. 3-61. Adjusting button



VOLVO
103726

Fig. 3-63. Removing the rubber cover



VOLVO 103728

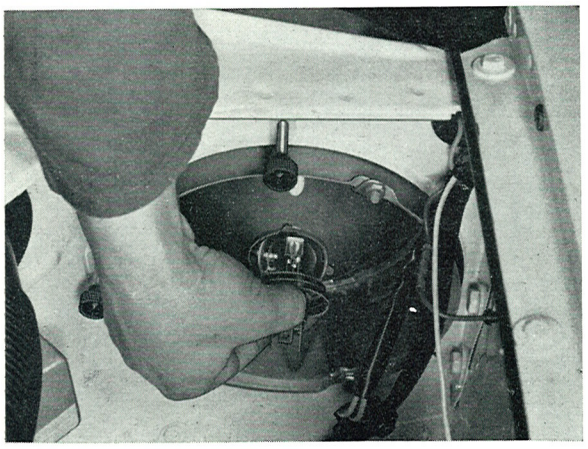
**Fig. 3-64. Removing the lock spring**

right headlight insert, take off the windshield washer).

2. Remove the three nuts (9, Fig. 3-59) and lift out the inner ring. Remove the insert bulb.
3. Fitting is in reverse order to removal.

## REPLACING THE HEADLIGHT BULB

1. Disconnect the leads by drawing the connecting contact back. Pry off the rubber protection, see Fig. 3-63. Clamp together and remove the spring retaining the bulb to the insert. Fig. 3-64.
2. Remove the bulb, Fig. 3-65. When refitting the bulb, make sure that it is placed correctly in the insert. The small tabs on the collar of the bulb should correspond to the jacket in the insert.



VOLVO 103724

**Fig. 3-65. Removing the bulb**

## CHECKING AND ADJUSTING

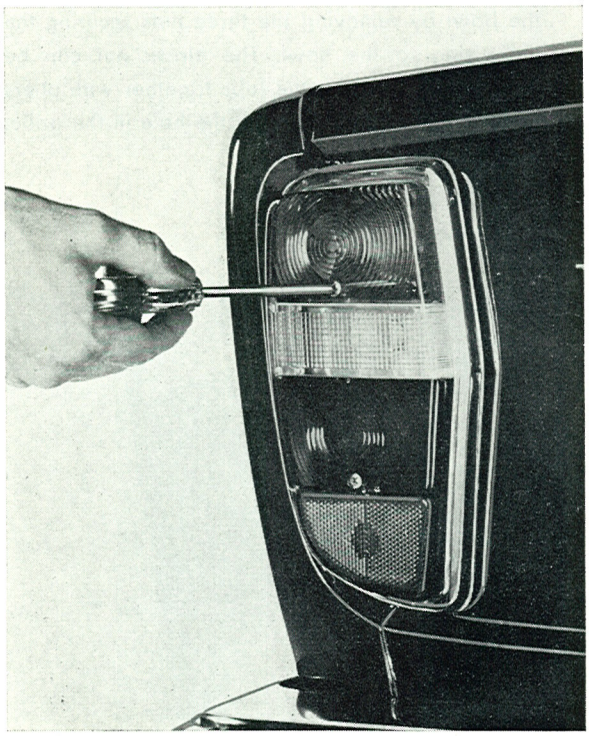
The headlights should be examined to check the condition of the glass, reflector and bulb. If the glass is damaged by flying gravel or cracked or defective in any other way, the insert should be replaced. Glass which has become "sand-blasted" by stone impact, etc. will considerably reduce the lighting effect and can give rise to dazzling, irregular beams, etc.

If the reflector is dull, buckled or damaged in any other way, the insert should be replaced. The inside of the bulb must not be oxidized to a black or brown colour. The lighting effect normally deteriorates to such an extent that the bulbs should be replaced after 100—200 hours of operation.

The voltage at the bulb with the headlights switched on and the engine running, att charging speed, should be at least 12.5 volts if sufficient lighting strength is to be produced.

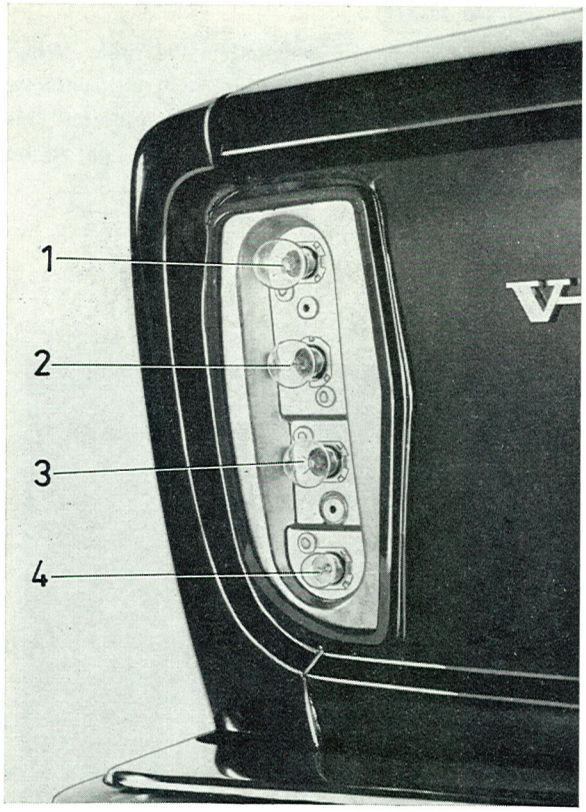
The headlights should be adjusted in accordance with current legislation. Approved equipment should be used.

Adjustment is made by varying the two adjusting screws behind the headlight, see Fig. 3-61. The upper screw adjusts the headlight vertically and the screw at the side adjusts the headlights laterally.



VOLVO 102014

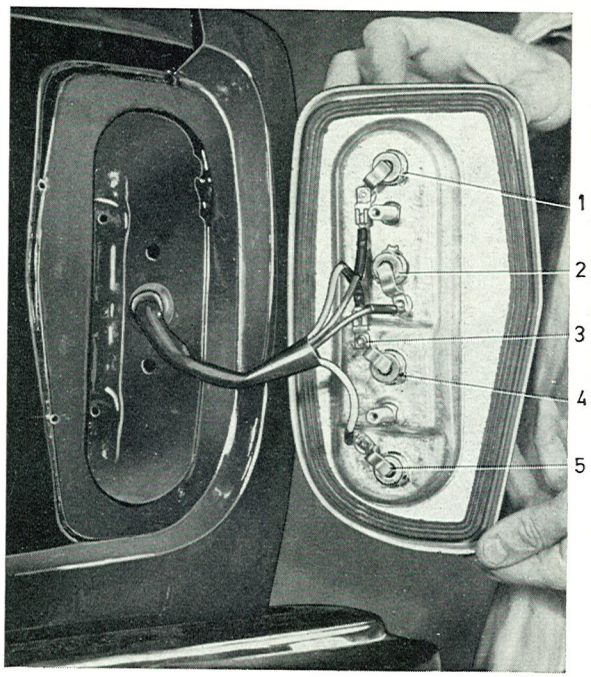
**Fig. 3-66. Removing the light glass**




VOLVO
102015

**Fig. 3-67. Bulb location**

1. Directional indicator
2. Reversing light
3. Brake light
4. Rear light




VOLVO
102016

**Fig. 3-68. Cable connections**

1. Directional indicator light
2. Reversing light
3. Brake light connection
4. Brake light
5. Rear light

## REAR LIGHTS

### REMOVING

The rear light is removed as a complete unit by unscrewing the two screws retaining the light to the body. These screws are accessible from inside the luggage boot. After removing the light from the body, the leads are accessible.

The glass is held firmly to the reflector with two visible screws in the glass. Fig. 3-66. The location of the bulbs is shown in Fig. 3-67. From Fig. 3-68 can be seen the connections for the rear light.

## NUMBER PLATE LIGHT

### 142, 144:

The number plate light is attached to the body by means of two screws accessible from inside the luggage boot. Replacement of the bulb is carried out by removing the small light glasses. The screws for the light glasses are accessible from beneath the plate lighting, see Fig. 3-69.

### 145:

The number plate light consists of two bulb housings secured to the tailgate. The bulbs are changed as follows:

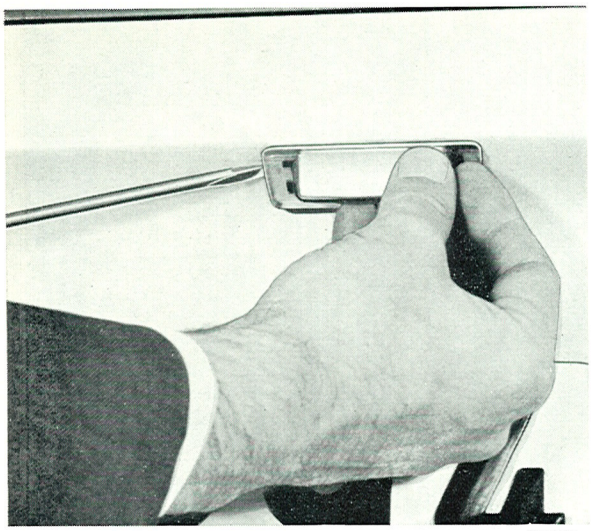
Press in the catches in the bulb housing by inserting a screwdriver in the opening on the left-hand side of the housing, see Fig. 3-70. Pull the housing out of its attachment.

Pull out the cover end not provided with a pin.

The bulb is now accessible for replacement.


VOLVO
102017

**Fig. 3-69. Number plate light with cap removed (142, 144)**



VOLVO
102972

**Fig. 3-70. Number plate light removal, 145**

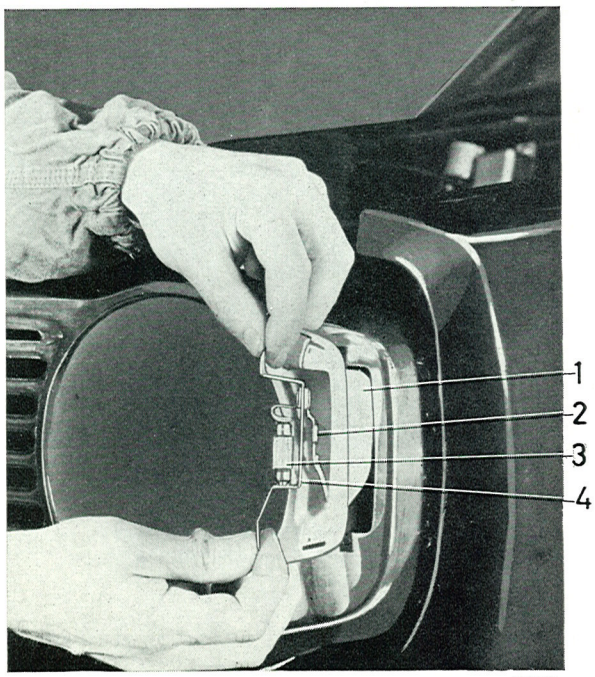
When installing, fit first the guide pins in the recesses and then press on the cover. Check that the rubber liner is correctly in position and push the bulb housing securely into the attachment.

VOLVO
101998

**Fig. 3-71. Parking light, removing the glass**

## PARKING LIGHTS

The parking lights are mounted in the grille. When removing the light to change the bulb etc., unscrew the two screws holding the light to the grille and this will allow all the parts belonging to the light to be accessible for removal, see Figs. 3-71 and 3-72.




VOLVO
102019

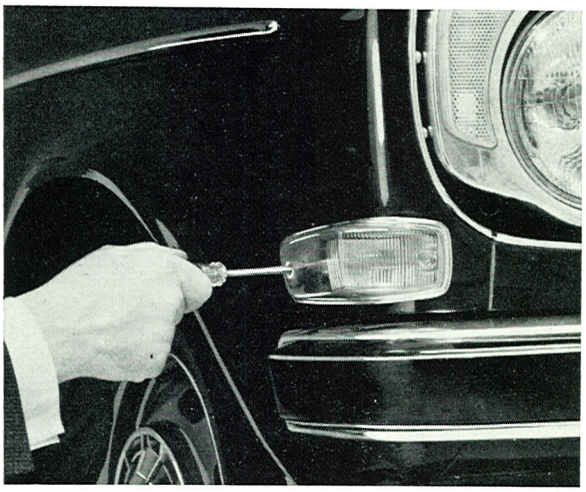
**Fig. 3-72. Parking light removed**

1. Rubber cover
2. Connection
3. Bulb
4. Bulb holder

GROUP 36

# OTHER ELECTRICAL STANDARD EQUIPMENT

## DESCRIPTION



VOLVO 102020

Fig. 3-73. Removing the glass for directional flashers

### DIRECTIONAL INDICATOR SYSTEM

The directional indicator system consists of a thermal-type flasher relay, directional indicator switch and bulbs in the rear lights. The flasher relay is located under the dashboard. The directional indicator lever switch, see Fig. 3-74, which has an automatic return, is placed under two plastic covers on the steering column. The control lamp for the directional indicators is connected in parallel across the indicator lever switch.

### IGNITION SWITCH

The ignition switch is integrally built with the steering wheel lock. The switch has four positions.

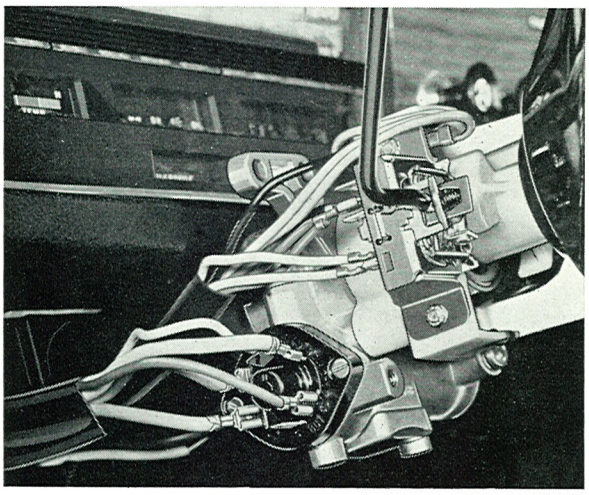
0. Complete electrical system disconnected and steering wheel lock engaged.
1. Radio (75) is cut in.
2. Current to ignition coil and fusebox (driving position).
3. Same as position 2 but current is also supplied to control solenoid on starter motor (starting position). When ignition key is released in position 3, it returns automatically to position 2.

### HORN

The horn is mounted to the left of the radiator behind the grille.

One of the horns has a low frequency and the other a high frequency.

The horn ring mounted inside the steering wheel operates the horns.



VOLVO 103328

Fig. 3-74. Directional indicator lever switch and ignition switch

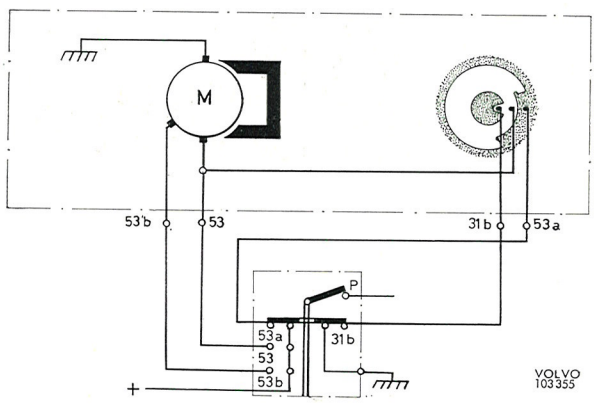



Fig. 3-75. Wiring diagram for windshield wiper motor

## WINDSHIELD WIPERS

The windshield wipers are driven by an electric motor. The motor is connected to the wiper blades by means of link arms. The motor, which has a permanently magneized field, has two speeds which are selected by means of the switch mounted on the dashboard. The motor is fitted with 3 brushes, one negative brush and two positive brushes. The positive brushes are connected up one at a time for full and half speed respectively. The gear housing for the wiper unit contains an integrally built parking switch. The purpose of this switch is to return the blades to a suitable, previously determined, parking position irrespective of where the blades are when shut off. See Fig. 3-75.

## WINDSHIELD WASHER

The windshield washer, which is placed on the left-hand wheel arch is driven by an electric motor, see Fig. 3-76. The pump located at the bottom of the water container is connected to the motor by means of a shaft. The pump is of the centrifugal type.
Turning the windshield washer switch mounted on the dashboard engages the windshield washer.

## SWITCHES

All switches are of the pull-push type. The switches for lighting and the fan have three positions. The switch for the windshield wiper has also three positions but the washer is also engaged by turning the knob on this switch.

## INTERIOR LIGHTING

The interior lighting consists of a lamp located in the middle of the roof. The lamp is switched on by means of a switch built into the light. The switch has three positions. In its first position, the light is switched off completely, in the second position the light is on when any of the front doors is opened, and in the third position the light is on continuously.
The 145 model has an extra light in the roof over the cargo space. Opening the tailgate switches on this light.

## CONTROL RELAYS

As standard the cars in the 140-series are fitted with two control relays, a step relay for the full-beam and dipped lights and a control relay for the back-up lights. The control relays are mounted on the front side of the cowl, see Fig. 3-77.

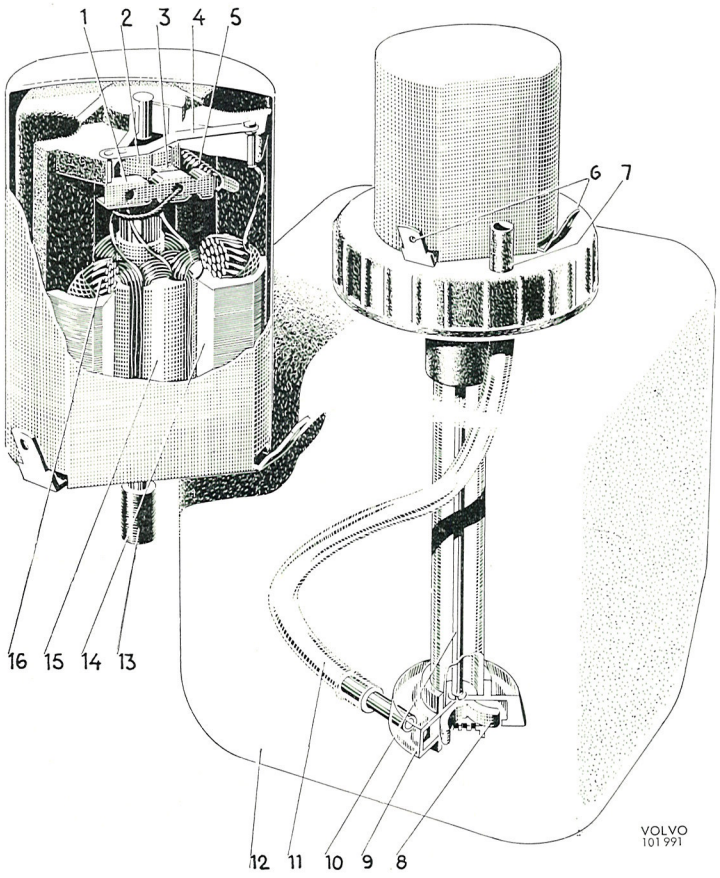



**Fig. 3-76. Windshield washer**

1. Brush holder
2. Commutator
3. Brush
4. Thermal fuse
5. Spring
6. Connecting lip
7. Water outlet
8. Pump gear
9. Pump housing
10. Shaft
11. Hose
12. Container
13. Flange
14. Stator
15. Rotor
16. Field winding

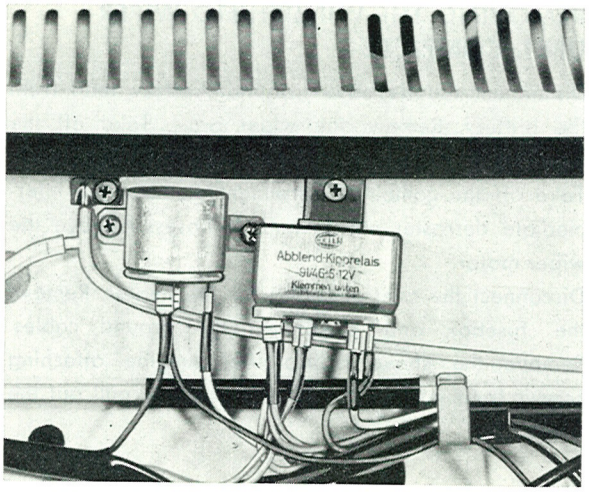



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**Fig. 3-77. Control relays**

1. Back-up light relay
2. Step relay for dipped/full-beam switching

## FUSES

The fuses are mounted in a fusebox secured to a bracket fitted on the car heater behind an opening in the protection panel under the dashboard.

## BRAKE LIGHT SWITCH

The brake light switch is placed on the pedal carrier beneath the dashboard. It is operated mechanically by the brake pedal.

# REPAIR INSTRUCTIONS

## REPLACING THE DIRECTIONAL INDICATOR LEVER SWITCH

Remove the screws holding the plastic covers (one screw for the upper cover, three screws for the lower cover) and remove the covers. Remove the screws holding the switch. (If the vehicle is fitted with an overdrive, the bracket holding the switch for the overdrive must first be removed). Replace the switch and secure the new one firmly. Fit the plastic covers.

## REPLACING THE IGNITION SWITCH

Remove the plastic covers round the ignition switch. Remove the ignition switch from the steering wheel lock by taking off the two screws holding the ignition switch to the steering wheel lock. Replace the ignition switch and fit the new one on the steering wheel lock. Re-fit the plastic covers.

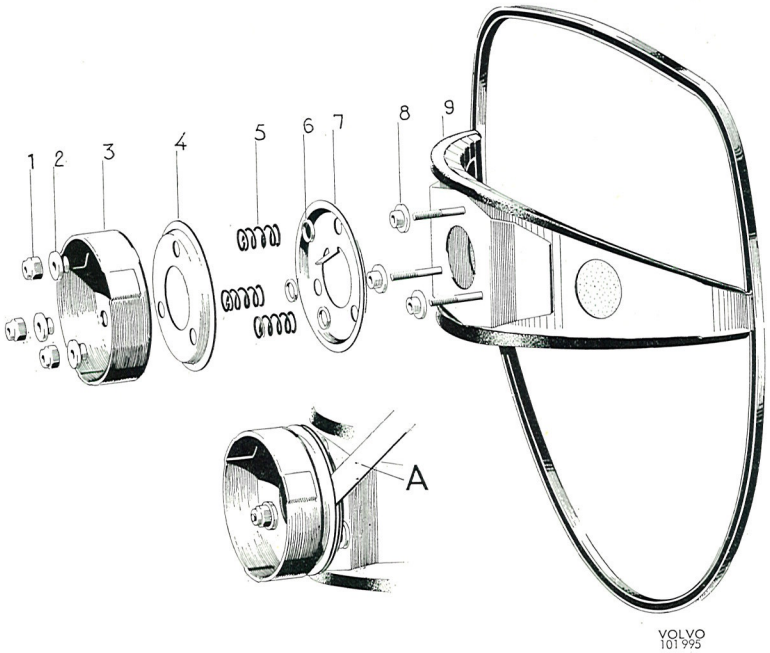


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**Fig. 3-78. Horn ring**

1. Nut
2. Bush
3. Retainer
4. Plate
5. Spring
6. Washer
7. Contact plate
8. Bush
9. Horn ring

## REMOVING AND ADJUSTING THE HORN RING

To remove the horn ring unscrew the two screws underneath the steering wheel. Then turn the ring about 30° and pull it upwards. The electric cable is then accessible and can be removed.

The distance A, Fig. 3-78, should be 0.4—0.6 mm (0.016—0.024") if the horn ring is to function satisfactorily. The distance is adjusted by means of the three self-locking nuts (1, Fig. 3-78).

## REMOVING THE WINDSHIELD WIPER UNIT, COMPLETE

Disconnect the negative (ground) battery lead from the battery. Remove the wiper arms. Take off the panel under the dashboard. Remove the heater switch. Take off the combined instrument. Remove the intermediate defroster nozzle and its hoses. Remove the wiper motor.

Disconnect the control cables for the heater. Remove the fusebox and disconnect the ground cables. Remove the choke control. Release the attaching screws for the wiper frame and carefully pull out the frame.

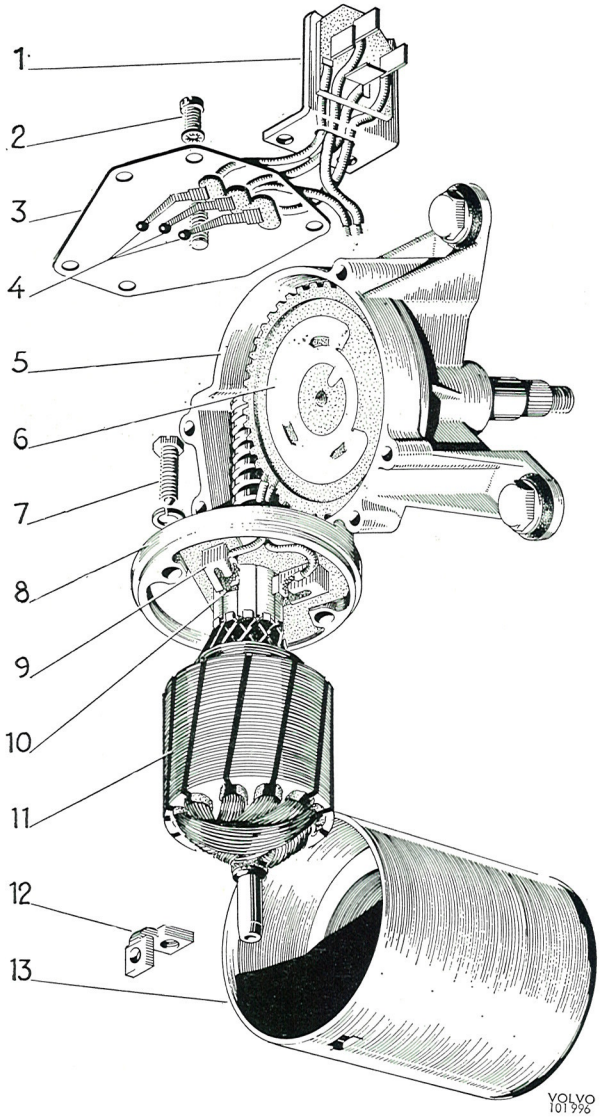


**Fig. 3-79. Windshield wiper motor**

1. Terminal contact
2. Screw
3. Cover
4. Contacts
5. Housing
6. Gear
7. Screw
8. End
9. Brush holder
10. Brush
11. Rotor
12. Nut
13. Stator

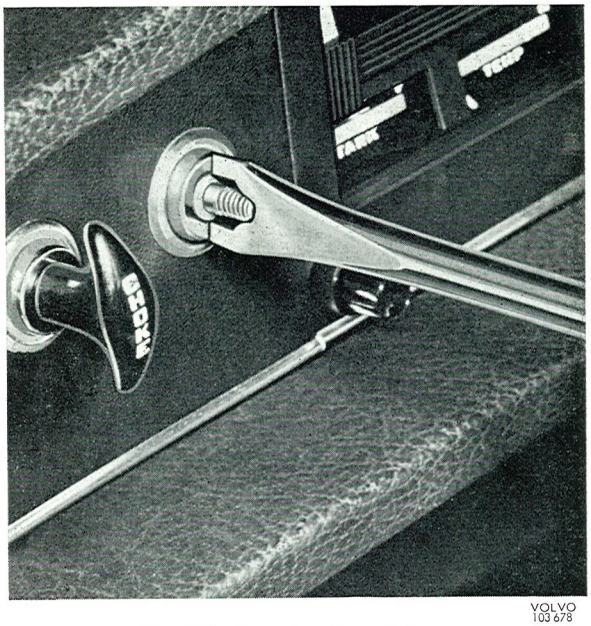


**Fig. 3-80. Removing the switch nut**

## DISMANTLING THE WINDSHIELD WIPER MOTOR

Remove the nut on the outgoing shaft and tap loose the crank arm.

Release the five screws (2, Fig. 3-79) and bend the cover (3) out of the way, then press out the plastic gear wheel. Remove the screws (7) and pull out the stator. Remove the screws for the negative brush and the washer on the ball bearing axial lock. Remove the washer for the axial lock. Move the brushes aside and carefully pull out the rotor. Take great care with the brushes since the ball bearing has a larger diameter than the collector. When assembling the motor, adjust the axial play for the plastic gear wheel (6) by means of the adjusting screw in the cover.

## FITTING THE WINDSHIELD WIPER UNIT, COMPLETE

Fit the wiper frame. Install the intermediate defroster nozzle. Re-fit the fusebox and secure the ground cables. Secure the control cables.

Fit the wiper motor. Fit the choke control and also the combined instrument. Install the switch for the heater. Fit the wiper arms and the battery lead.

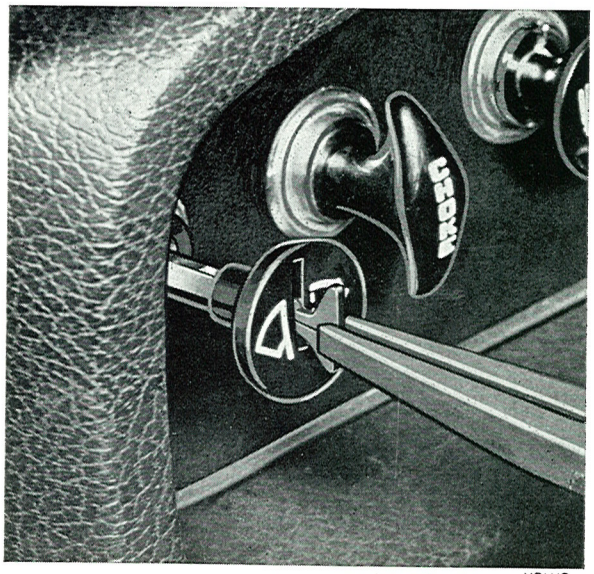

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**Fig. 3-81. Removing the lock key**

## REMOVING THE SWITCHES

To remove the switch, first unscrew the switch knob and then release the nut for the switch with a suitable screwdriver, see Fig. 3-80. To remove the windshield wiper switch, the plastic key inserted in the knob must first be removed by pulling it straight out, see Fig. 3-81. When re-fitting, push the plastic key straight in.

## REPLACING THE INTERIOR LIGHT BULB

Pull down the glass at the short side opposite the switch. Pull out the bulb. The glass is re-fitted by hooking it securely at the side where the switch is situated and then pressing in the glass firmly.

## REPLACING THE BRAKE LIGHT SWITCH

When replacing the brake light switch, make sure that the new switch is adjusted correctly so that it functions satisfactorily. The distance between the brake pedal released and the threaded bronze hub on the switch should be 4±2 mm (0.16±0.08") (A, Fig. 3-82). If the distance must be adjusted, release the attaching screw for the bracket and move the bracket until the correct distance is obtained.

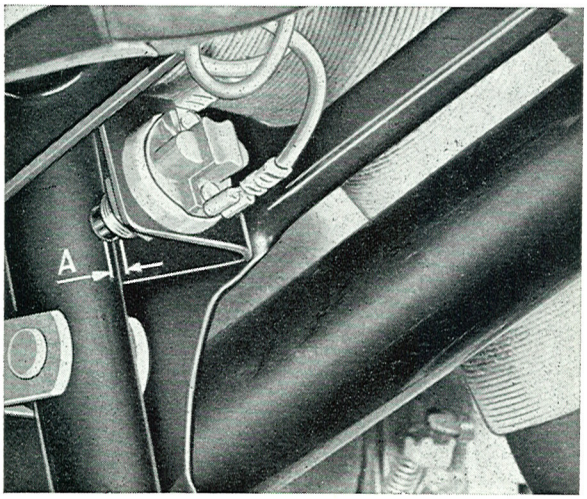


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**Fig. 3-82. Brake light switch**

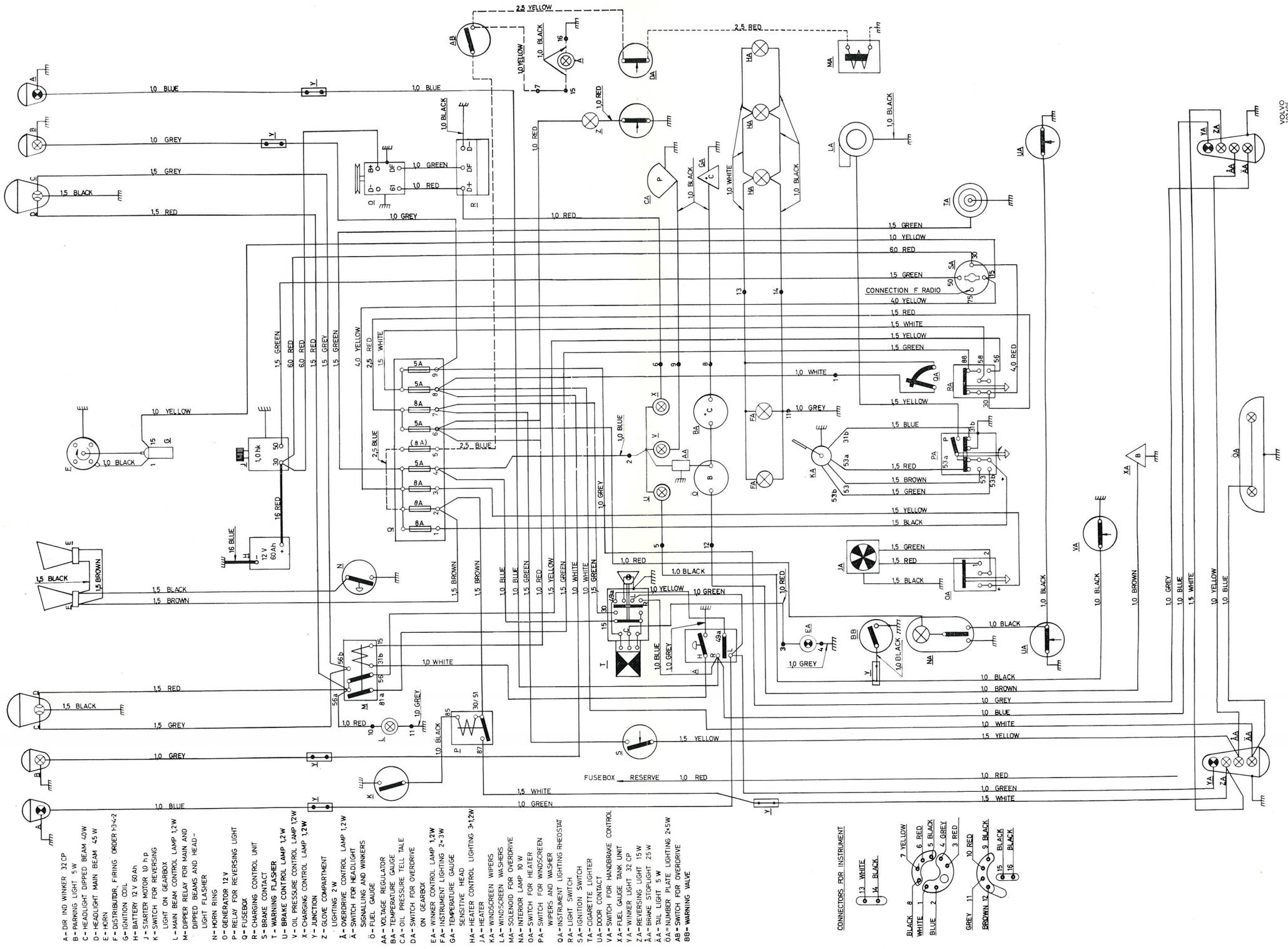


**Illustration 3-A Wiring diagram 142, 144 standard FSS**

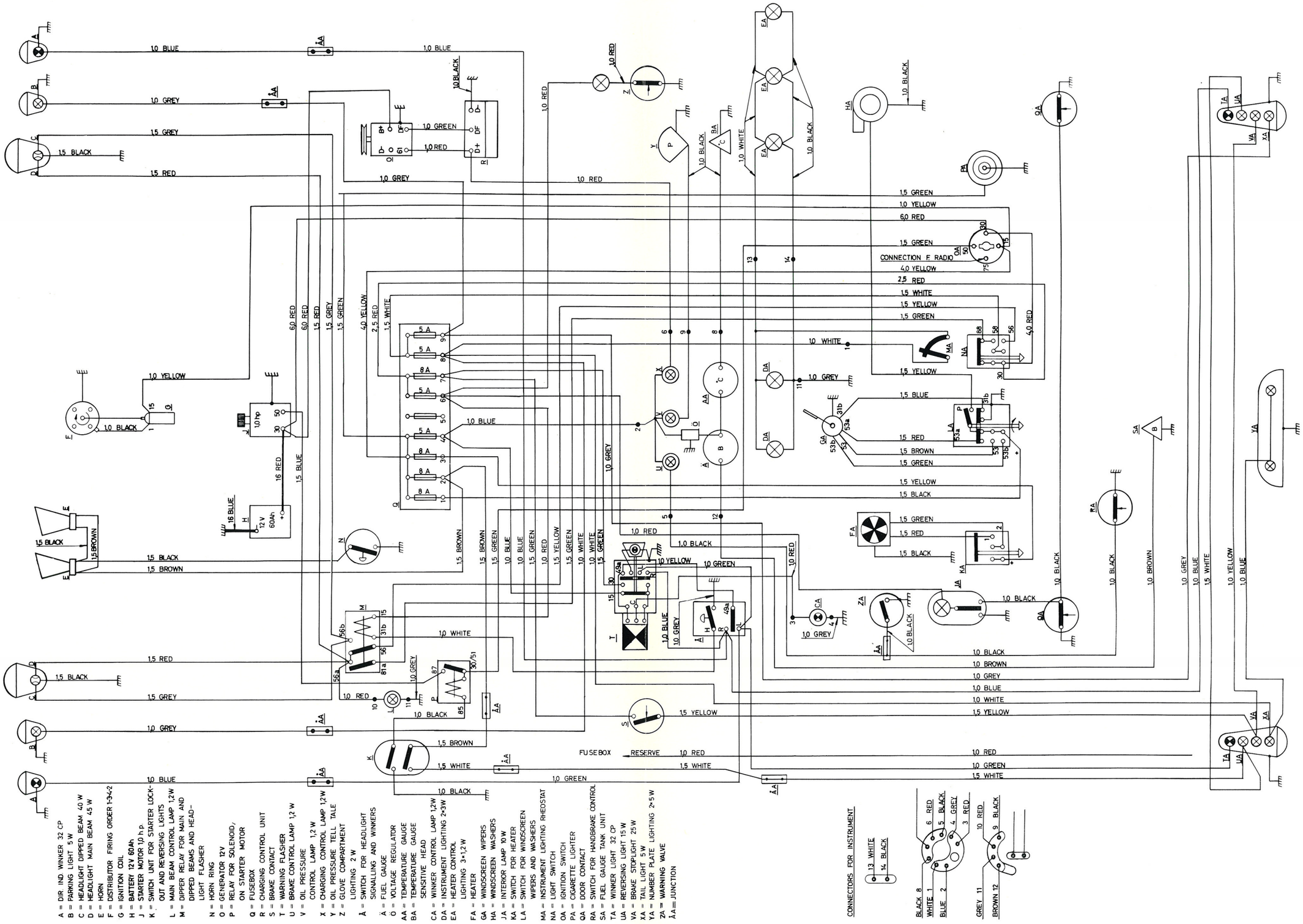


**Illustration 3-B Wiring diagram 142, 144 automatic FSS**