

# SERVICE MANUAL

PV 544

Part 103

<sup>6 VOLT</sup>  
6 VOLT

ELECTRICAL SYSTEM

*Service Department*

AKTIEBOLAGET

# VOLVO

GÖTEBORG SWEDEN

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## DESCRIPTION

PV 544 cars have a 6-volt electrical system. The system may suitably be divided into battery, dynamo, charging relay, starter motor, instruments, lighting and indicator devices as well as the necessary cables.

### Battery

The battery is mounted on a shelf on the front of the bulkhead. It is a lead battery consisting of 3 cells and has a capacity of 85 amp. hours.

### Dynamo

The dynamo is located on the right-hand side of the engine and is driven from the crankshaft by means of a V-belt. It is a shunt-type dynamo, i.e., the field windings are connected in parallel with the armature. Charging is regulated by means of the charging relay.

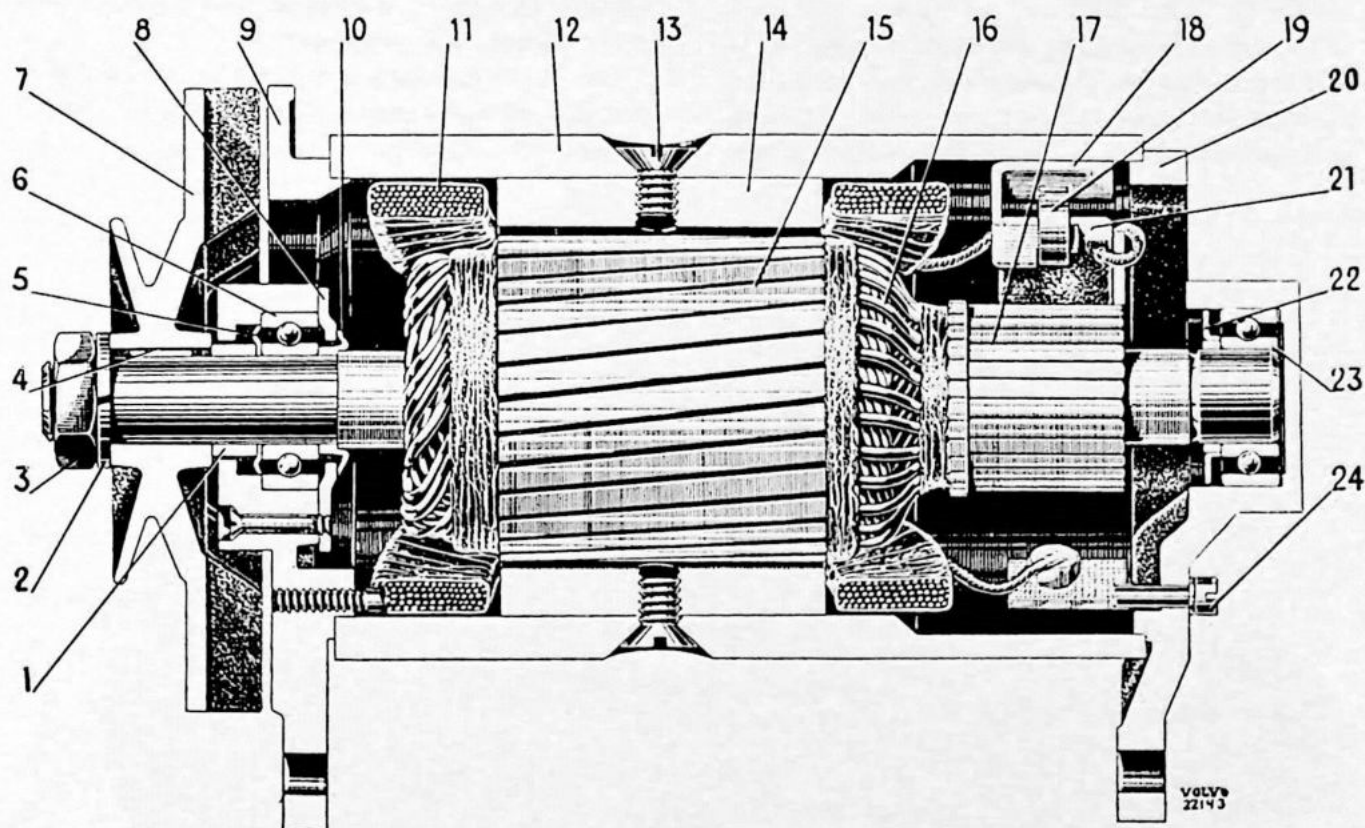
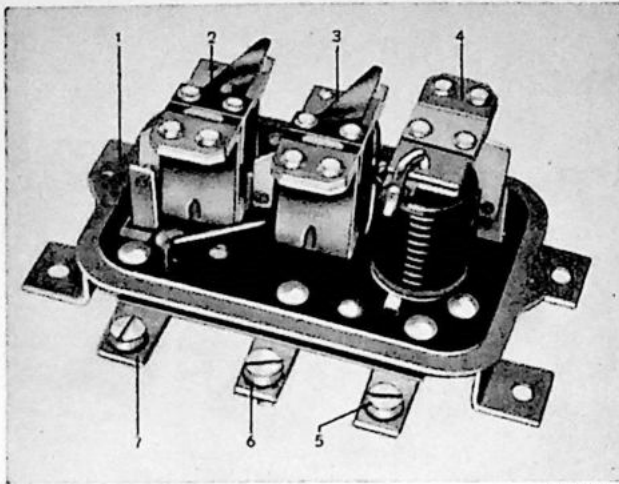


Fig. 1. Dynamo.

- |                     |                        |                        |
|---------------------|------------------------|------------------------|
| 1. Spacer sleeve    | 9. Front head assembly | 17. Commutator         |
| 2. Spring washer    | 10. Spacing ring       | 18. Brush holder       |
| 3. Nut              | 11. Sealed winding     | 19. Brush spring       |
| 4. Woodruff key     | 12. Dynamo housing     | 20. Rear head assembly |
| 5. Protector washer | 13. Pole shoe screw    | 21. Brush              |
| 6. Ball bearing     | 14. Pole shoe          | 22. Protector washer   |
| 7. Pulley           | 15. Armature           | 23. Ball bearing       |
| 8. Protector washer | 16. Armature winding   | 24. Screw              |



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Fig. 2. Charging relay.

1. Relay body
2. Voltage regulator
3. Current regulator
4. Cut-out relay
5. Battery terminal
6. Field terminal to dynamo
7. Armature terminal to dynamo

control principle. Apart from the voltage regulator there is also a current regulator and a cut-out relay.

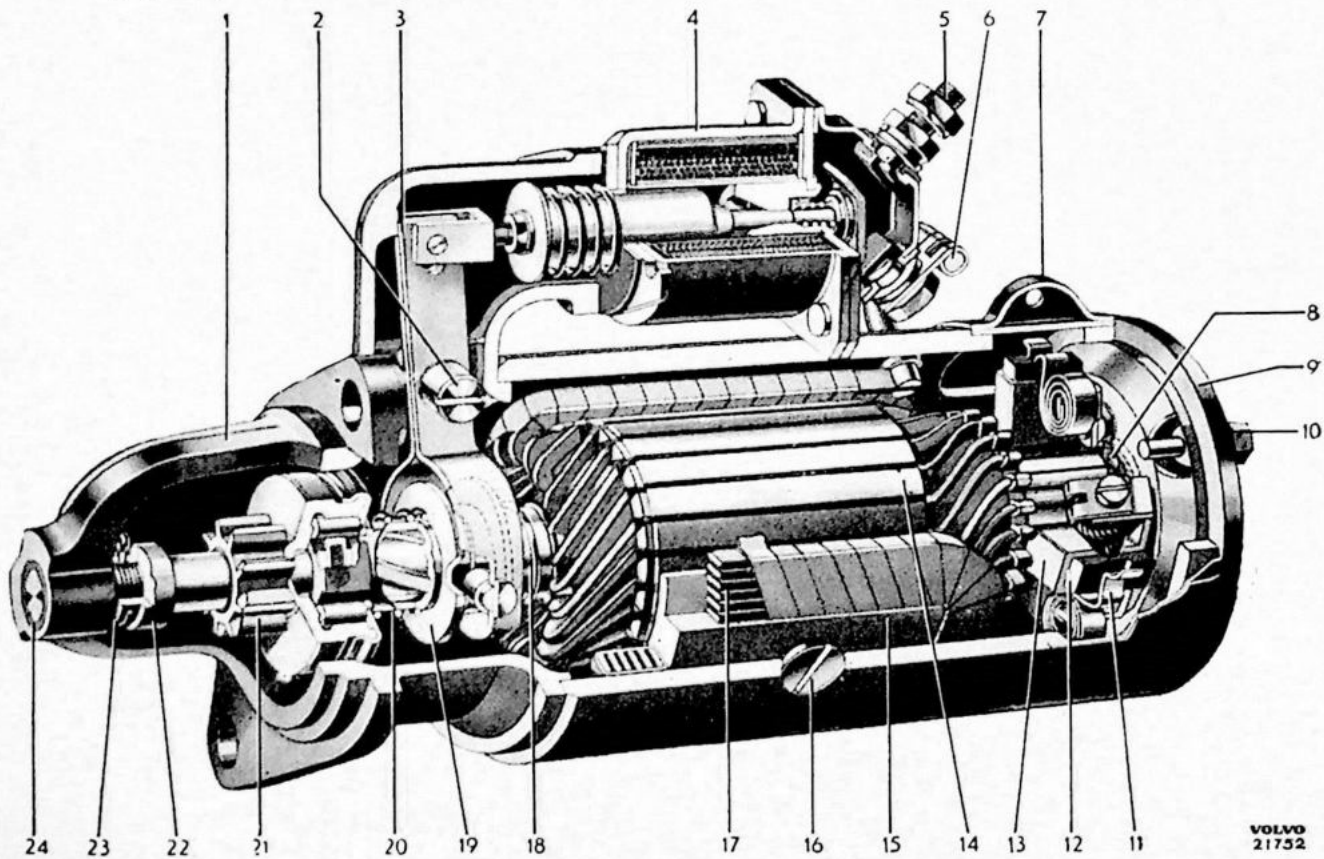
### Charging relay

The charging relay is fitted on the right-hand side of the front of the bulkhead. It is connected to the dynamo and the battery by means of cables. The charging relay functions on the constant voltage

### Starter motor

The starter motor consist of a four-pole series wound motor. It is fitted with a sliding pinion which is operated by a solenoid starter switch which also connects the starting current.

For more information concerning the dynamo, charging relay and starter motor, see in the general section (PV, Part 10).



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Fig. 3. Starter motor (Bosch with solenoid).

- |   |                        |                           |                           |
|---|------------------------|---------------------------|---------------------------|
| 1. Rear head assembly                     | 7. Protecting cover    | 13. Brush retainer        | 19. Guide ring            |
| 2. Screw for engaging arm                 | 8. Armature brake      | 14. Armature              | 20. Spring for guide ring |
| 3. Engaging arm                           | 9. Front head assembly | 15. Pole shoe             | 21. Pinion                |
| 4. Solenoid                               | 10. Screw              | 16. Pole screw            | 22. Castle nut            |
| 5. Terminal screw for battery lead        | 11. Brush spring       | 17. Field winding         | 23. Split pin             |
| 6. Connecting lead for field and armature | 12. Brush              | 18. Spring for guide ring | 24. Bushing               |

## Fuel gauge

The fuel gauge shows the level of petrol in the fuel tank. It is fitted on the right-hand side of the instrument panel and is operated by a fuel gauge tank unit.

## Headlights

The headlights are mounted in the mudguards and are held in place by means of screws. The headlight inserts are fitted into a bowl into which they are secured by a retainer. The bowl is secured to the headlight protective casing by means of four springs and two screws. These screws also serve as adjusting screws for headlight beam adjustment.

## Horns

There are two types of horn. The PV 544 has one horn whereas the PV 544 S has two. In the

latter case, one of the horns has a high tone and the other a low tone. On cars with two horns there is a horn relay for connecting in the battery current.

## Traffic indicators

The traffic indicators are of the flasher type. They are fitted at front and rear and are operated by an automatic flashing device which is fitted under the instrument panel. They are controlled by means of a lever fitted under the steering wheel which operates the switch through an actuator.

## Fuses

The fuses consist of wire filaments fitted on short porcelain bodies. The wires melt when the current exceeds the stipulated level. The fuses used are rated at 8 and 25 amps. Some are contained in a fusebox fitted on the mounting panel under the bonnet and some in a box at the front on the left wheel housing.

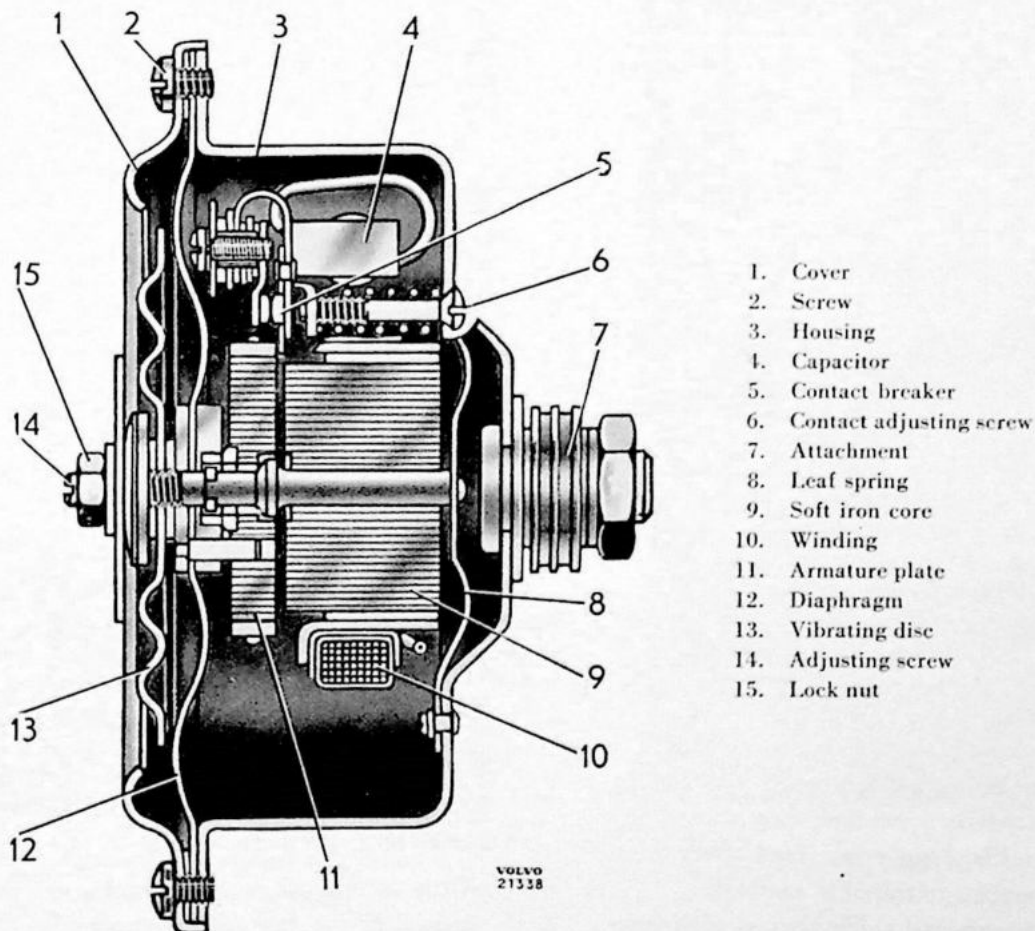


Fig. 4. Horn.

## REPAIR INSTRUCTIONS

### Battery

#### Maintenance

See under "Battery" in the general section (PV-10).

#### Removing

1. Remove the cable clamps from the battery terminals. Use a puller if the clamps are very tight.
2. Loosen the wing nuts on the retainer bar and lift out the battery.
3. Brush off the battery with a stiff brush and rinse clean with tepid water.
4. Clean the battery shelf and the cable clamps. For the cable clamps, use a special steel wire brush or battery terminal pliers.

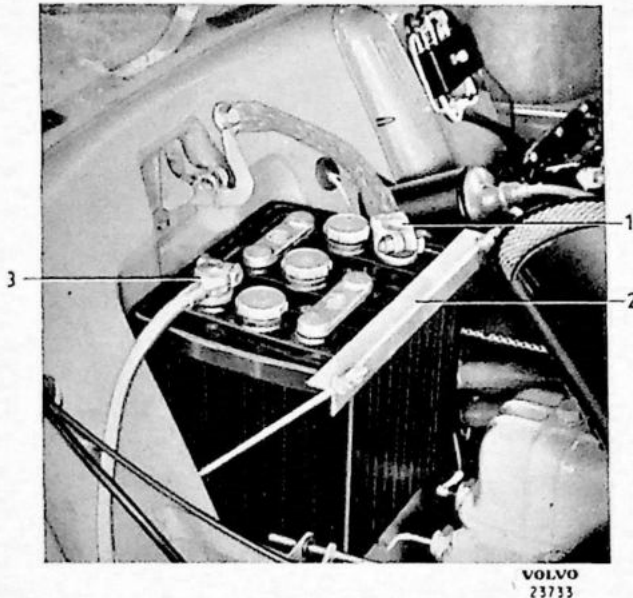


Fig. 5. Battery.

1. Earth lead, negative terminal
2. Retainer bar
3. Lead to starter motor, positive terminal

### Dynamo

#### Precautions before removing

See under "Dynamo" in the general section.

#### Removing

1. Remove the cable clamp for the battery negative terminal.
2. Disconnect cables from dynamo.
3. Release the V-belt tensioning stay and lift off the V-belt.
4. Remove the two bolts attaching the dynamo to the engine and lift it off.
5. Clean the dynamo externally with a cloth soaked in petrol.

Regarding overhaul of dynamo, see the general section.

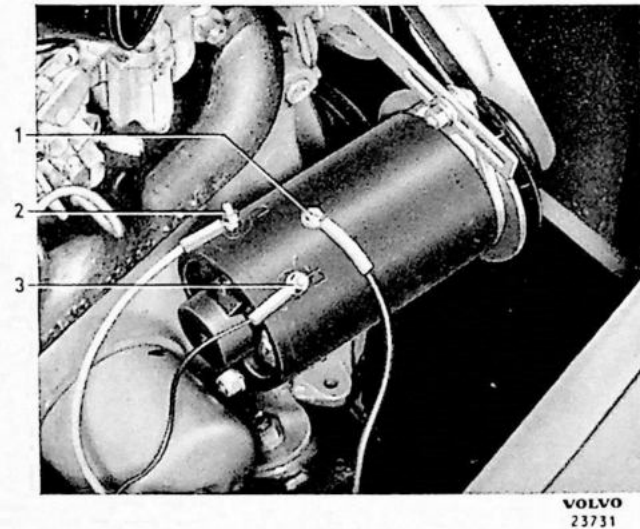


Fig. 6. Dynamo.

1. Earth lead
2. Lead from dynamo armature
3. Field terminal

#### Fitting

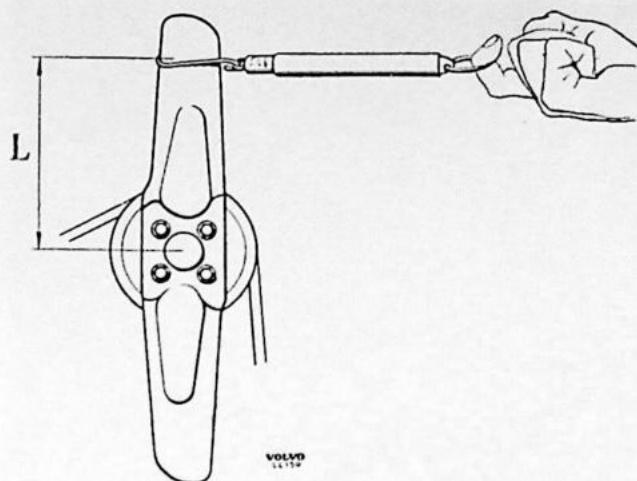
1. Place the battery in position. Ensure that it is turned the right way. Tighten in position by means of the retainer bar and wing nuts.
2. Tighten the cable clamps onto the battery terminals. The negative terminal is earthed.
3. Coat the terminals and cable clamps with vaseline.

#### Fitting

Fitting is carried out in the reverse order to removing.

#### Adjusting the fan belt

1. Turn the engine in its direction of rotation by means of the fan until compression resistance is felt.



L = 150 mm = 6"

Fig. 7. Checking belt tension.

2. Apply a spring balance as shown in Fig. 7 and pull on this. If the belt is tensioned correctly, the belt pulley should begin to slip at a pull of 5.5—6.5 kg = 12—14<sup>1</sup>/<sub>4</sub> lbs. (Torque 0.8—1.0 kgm = 5.8—7.23 lb. ft.).
3. Adjust the belt tension if necessary. Recheck as above.

## Charging relay

### Adjusting when fitted in car

See under "Charging relay" in the general section.

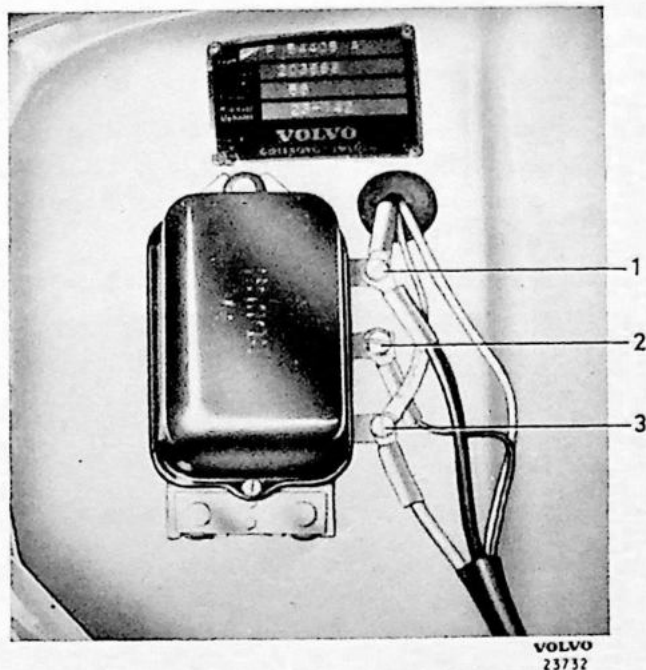


Fig. 8. Charging relay.

1. Live lead from starter motor
2. Field terminal
3. Lead from dynamo armature

## Removing

1. Disconnect the three cables from the charging relay.
2. Remove relay from mounting board.
3. Clean thoroughly externally.

## Fitting

1. If the relay is to be replaced, make sure that the correct type is fitted.
2. Screw into position on the mounting board.
3. Connect the cables. The lead from the dynamo armature terminal should be connected to the terminal marked A, from the field terminal to the terminal marked F and from the battery to the terminal marked Bat.

## Starter motor

### Precautions before removing

See under "Starter motor" in the general section.

## Removing

1. Remove the cable clamps from the battery negative terminal.
2. Remove the leads from the starter motor solenoid switch.
3. Remove the bolts which hold the starter motor in position on the flywheel housing and remove it.

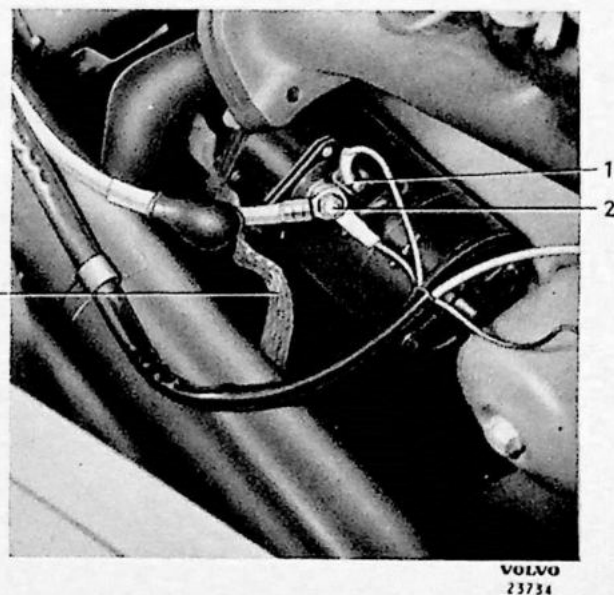


Fig. 9. Starter motor.

1. Control lead
2. Field terminal
3. Earth lead

4. Clean externally with a cloth soaked in petrol.  
Regarding overhaul of starter motor, see the general section.

## Fitting

Fitting is carried out in the reverse order to removing. Tighten the nuts evenly but not too tightly. Connect the cables carefully.

## Headlights

### Replacing the headlights

If a headlight is to be completely disassembled, follow the instructions below. For partial disassembly, follow the relevant instructions.

1. Remove the headlight rim screw, see Fig. 10.  
Remove the rim by pulling out the lower part slightly and then lifting upwards, Fig. 11.

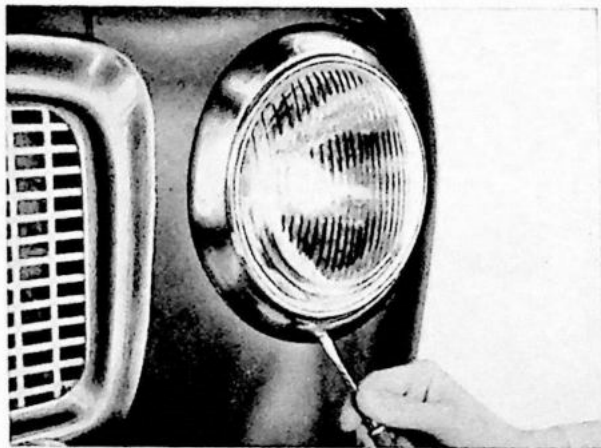


Fig. 10. Removing headlight rim screw.

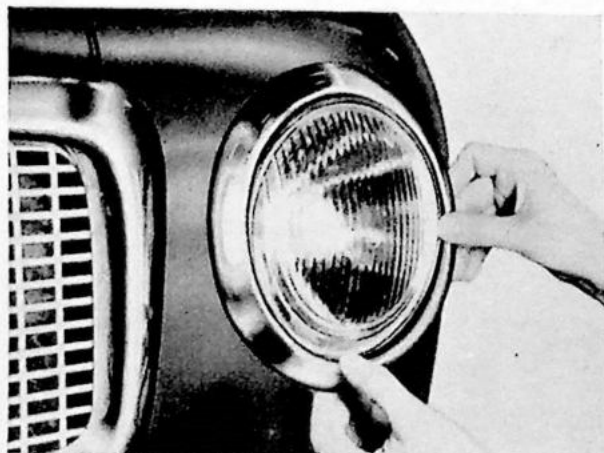


Fig. 11. Removing headlight rim.



Fig. 12. Removing retainer ring.

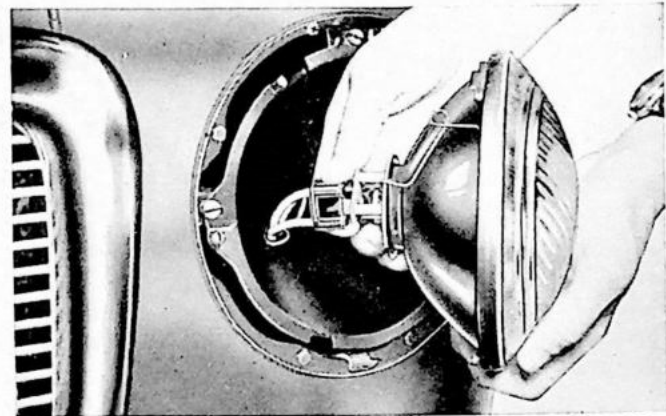


Fig. 13. Removing contact plug.

2. Unscrew the screws for the retaining ring for the headlight insert a few turns, Fig. 12. Turn the retainer until the hooks are free from the screws and lift out the insert.
3. Remove the contact plug from the bulb holder by pulling it straight out as shown in Fig. 13.
4. Unscrew the screws (1 and 2, Fig. 14) for headlight adjustment 8—10 turns. Unhook the springs (3—6) from the bowl (7). Remove the bowl from the protective casing (8).
5. Remove the springs and adjusting screws from the protective casing.
6. Remove the protective casing from the mud-guard and pull out the cable and rubber bushing.
7. Fitting is done in the reverse order. Be sure that the leads are connected correctly and that the screws are tightened carefully.

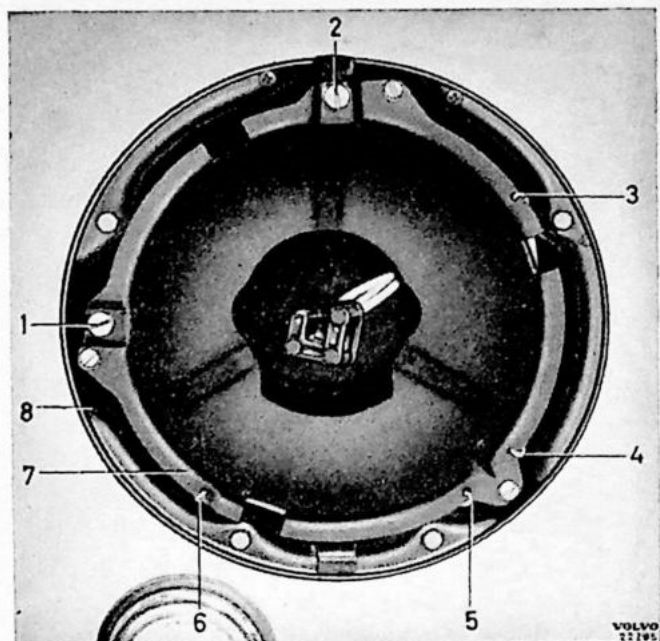


Fig. 14. Headlight bowl.

## Replacing the bulbs

1. Carry out operations 1—3 under the heading "Replacing the headlights".
2. Remove the spring which holds the bulb holder to the headlight insert (Fig. 14). Separate the insert and the bulb holder.
3. Take out the broken bulb.
4. Fit the new bulb. This is done as shown in Fig. 16. Do not touch the actual bulb with the fingers but only pull out the bulb socket far enough from the carton so that the bulb can be fitted. Any dirt, oil, etc., on the bulb glass will become carbonized, causing damage to the reflector. This considerably impairs lighting strength.
5. Fit the other parts in the reverse order to removing.

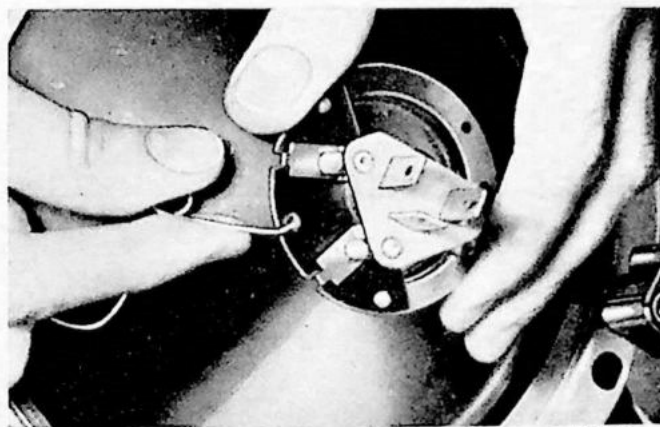


Fig. 15. Removing bulb holder.

## Alignment of headlights

See general section.

## Stop and tail lights

### Replacing stop, flasher and tail light bulbs

1. Remove the glass as shown in Fig. 17.
2. Remove the bulb by pressing it inwards and then turning anti-clockwise.
3. Fit the new bulb. Do not touch the bulb glass with the fingers.

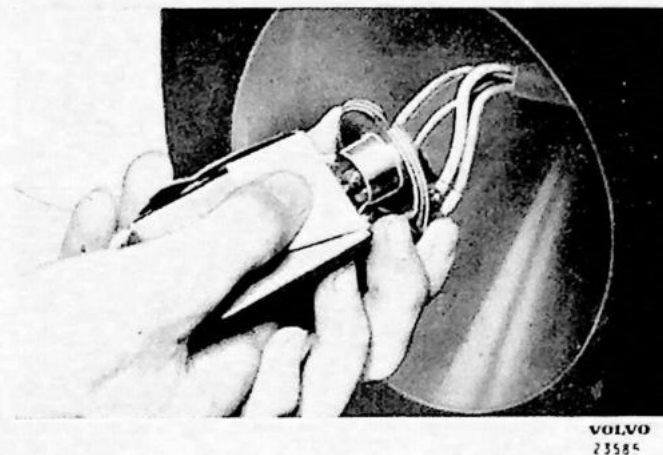


Fig. 16. Replacing headlight bulb.

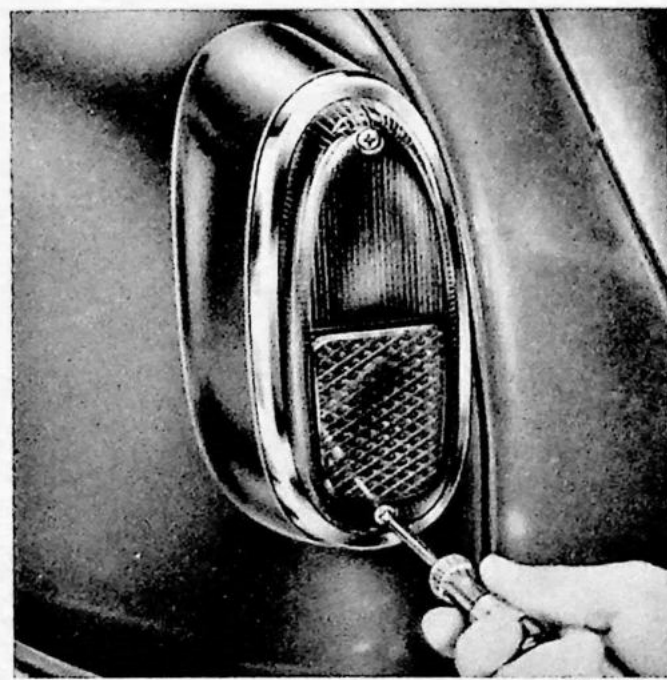


Fig. 17. Removing the glass.

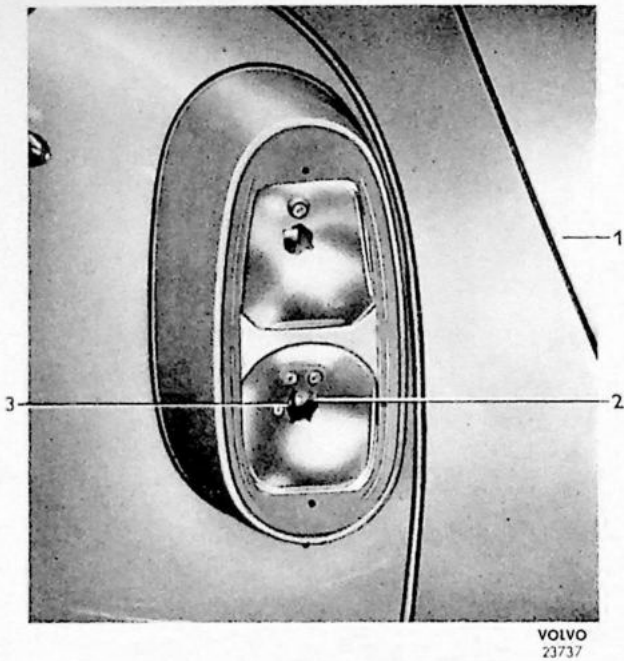


Fig. 18. Rear light.

1. Flasher
2. Stop light
3. Tail light

## Number plate lighting

A bulb is fitted in each of the rear bumper overriders. The glass and lamp housing are removed by unscrewing the two screws shown in Fig. 19. The bulb and lead are then accessible, see Figs. 20 and 21.



Fig. 19. Removing the glass and lamp housing.

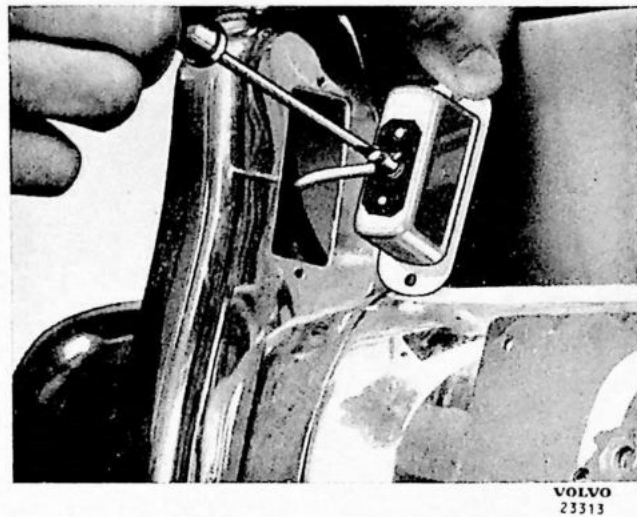


Fig. 20. Removing the lead.

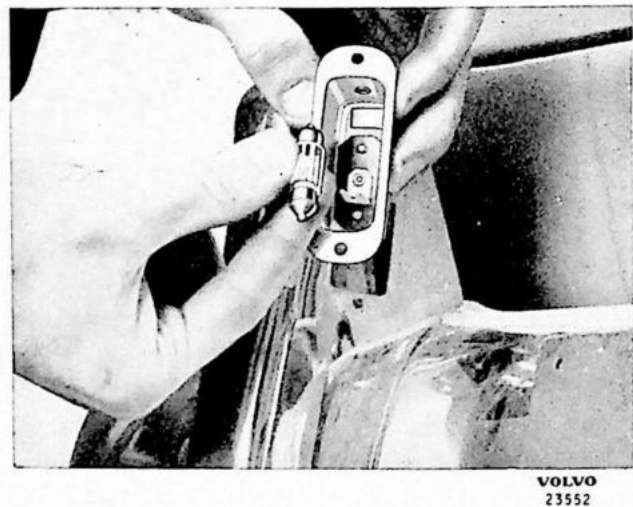
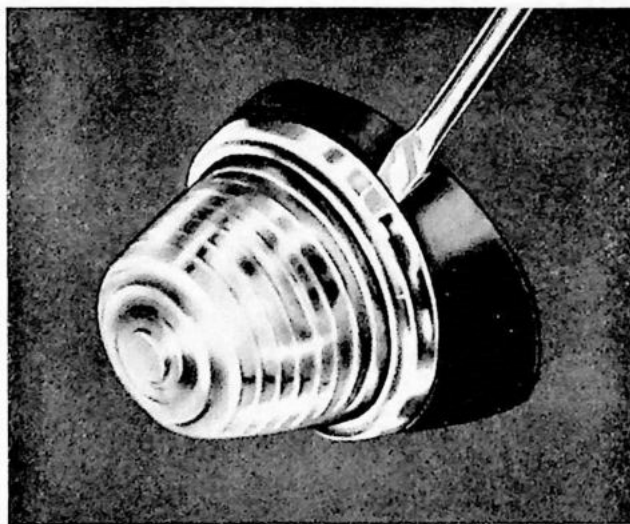


Fig. 21. Removing the bulb.

## Traffic indicators and parking lights

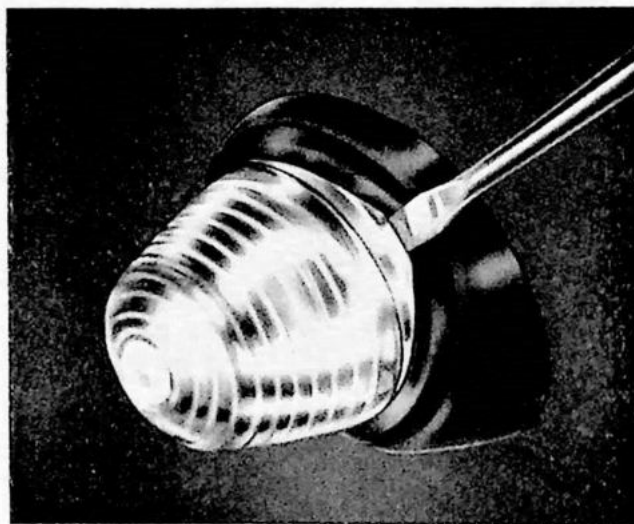
At the front the parking lights and traffic indicators are combined. Replacing the bulbs at the front is done as follows:

1. Remove the rim with a screwdriver, Fig. 22.
2. Remove the glass in the same way, Fig. 23.
3. The bulb is now accessible for replacement.



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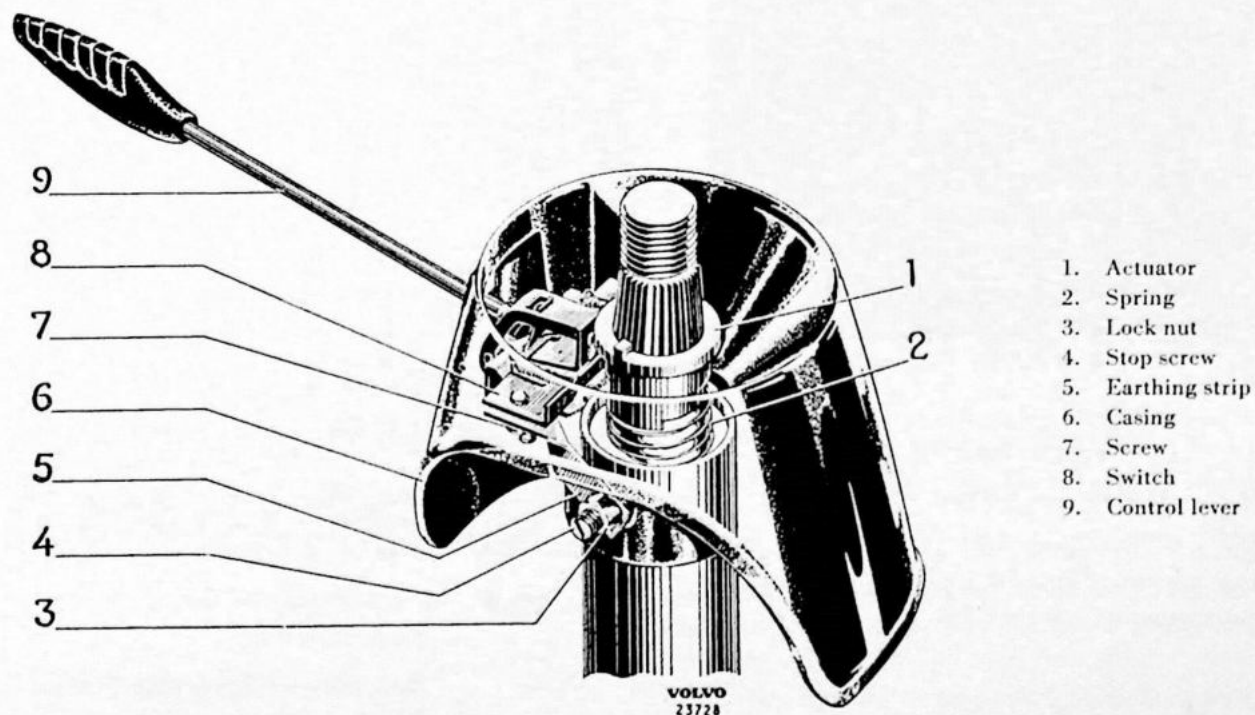
Fig. 22. Removing the rim.



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Fig. 23. Removing the glass.

## Traffic indicator switch



1. Actuator
2. Spring
3. Lock nut
4. Stop screw
5. Earthing strip
6. Casing
7. Screw
8. Switch
9. Control lever

Fig. 24. Traffic indicator switch.

## Removing and fitting

1. Remove the steering wheel in accordance with the instructions in Part 6.
2. Remove the leads at the underside of the switch. These are removed by pulling out of their retainers.
3. Slacken the lock nut, (3, Fig. 24) and screw out the stop screw (4) a few turns.
4. Lift the switch casing with switch straight off from the jacket tube.
5. Fitting is done in the reverse sequence.

The switch is attached to the switch casing by two screws. When these are removed the switch can be taken out of the casing.

The traffic indicator switch can be adjusted by slackening the screw (4, Fig. 24) and then turning the casing with switch to the desired position. A space of about 2 mm (5/64") should be left between the steering wheel and casing.

The leads are connected to the traffic indicator switch as shown in Fig. 25. The cable terminals are pressed firmly into the holders. After fitting, check that the leads fit properly into the holders.

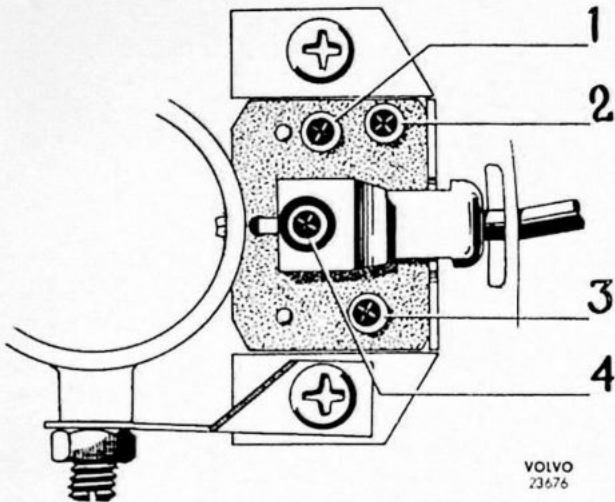


Fig. 25. Connecting the traffic indicator switch. Switch seen from below.

- 1. Terminal for right-hand indicator
- 2. Terminal for left-hand indicator
- 3. Terminal for flasher mechanism
- 4. Terminal for full headlight signal

## Electric windscreen wipers

The PV 544 is fitted with electrically driven windscreen wipers. Figs. 26 and 27. Concerning fitting and removing, see Part 11.

## Lubrication and maintenance

The bushings on the wiper link arms are made of nylon. These bushings are lubricated with water-resisting grease. The wiper gear mechanism and outgoing shaft should be lubricated with special grease in conjunction with overhaul.

The shafts on the wiper arms should be lubricated with light engine oil every 5000 km (3000 miles).

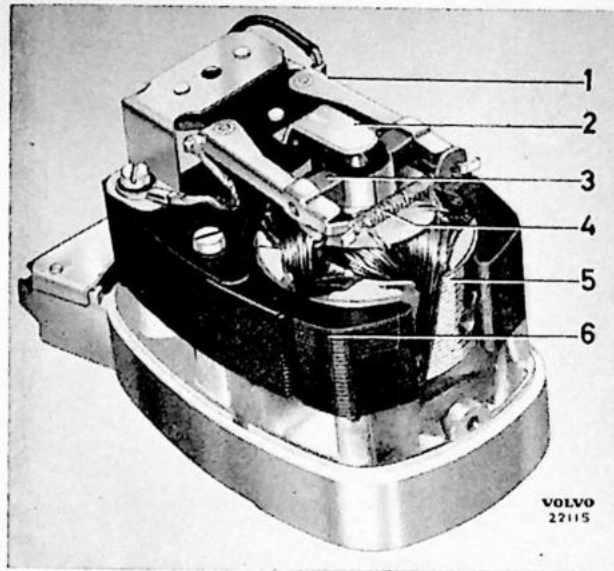


Fig. 26. Electric windscreen, wiper.

- 1. Pressure arm for brush
- 2. Stop plate for rotor axial clearance
- 3. Brush
- 4. Brush spring
- 5. Rotor
- 6. Pole shoe

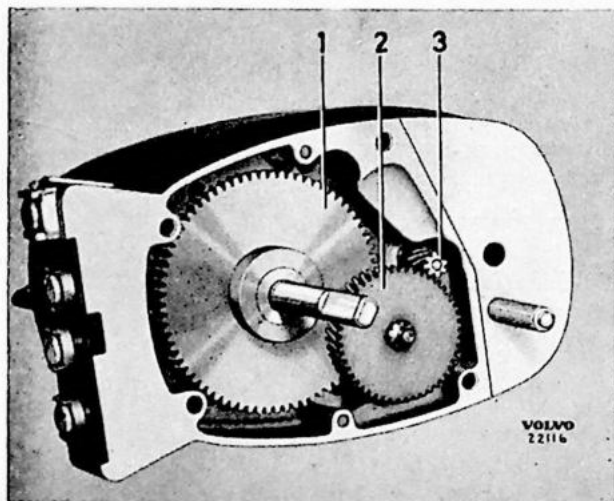


Fig. 27. Drive mechanism for electric windscreen wiper.

- 1. Drive gear on outgoing shaft
- 2. Idler gear, fibre
- 3. Rotor shaft gear

## Horn

### Examination and adjusting

See "Horn" in the general section.

## Removing and fitting

The horn is fitted on the intermediate section. When removing, first take off the radiator grille and then disconnect the leads after which the horn can be removed from the intermediate section.

The sound of the horn is dependent to a large extent on the suspension, which therefore must be checked. In the case of two horns, the battery current is connected by means of a relay fitted on the left wheel housing.

## Instrument and interior lighting

Instrument lighting consists of two bulbs fitted into the combination instrument. The bulb holders are removed by being pushed to one side. The bulbs are accessible from the rear of the instrument panel.

Interior lighting consists of a lamp in the roof above the windscreen. The bulb is accessible after the lamp glass has been removed. The glass is removed as shown in Fig. 28.

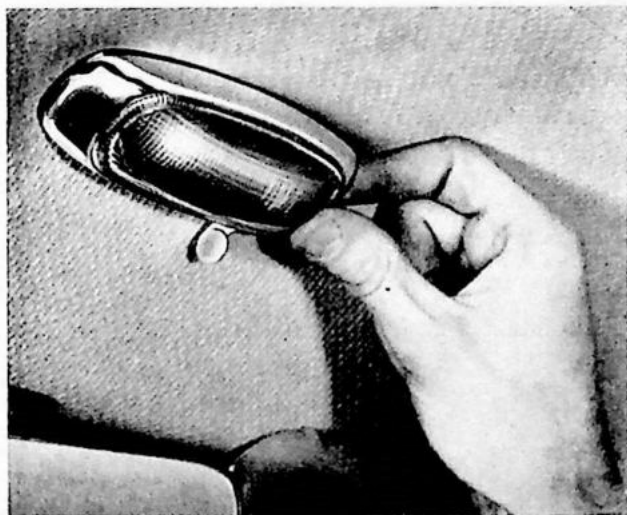
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Fig. 28

## Lighting switches

The pull switch for the headlights has three positions: off, parking and full-dimmed headlights.

The switch can be removed by slackening the nut on the instrument panel as shown in Fig. 29. When doing so, use a suitable tool so that the nut is not damaged. The switch can then be pulled out backwards, see Fig. 30, so that the leads are accessible.

The switch is provided with special cable ter-

minals which are removed by being pulled out from the cable retainer on the contact, Fig. 30.

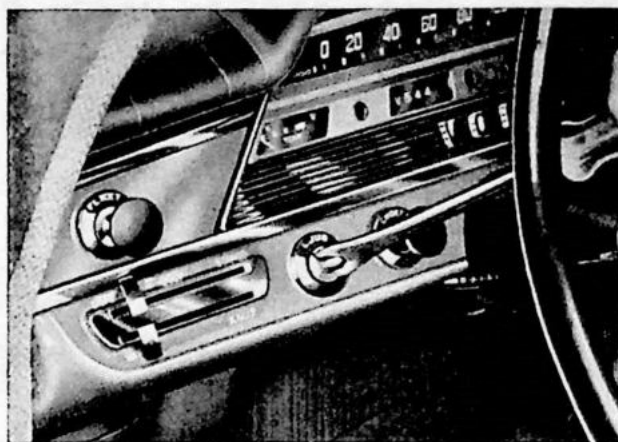
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Fig. 29. Removing the lighting switch.

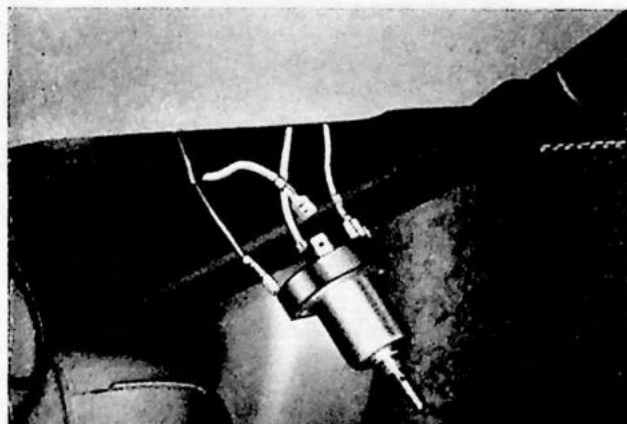
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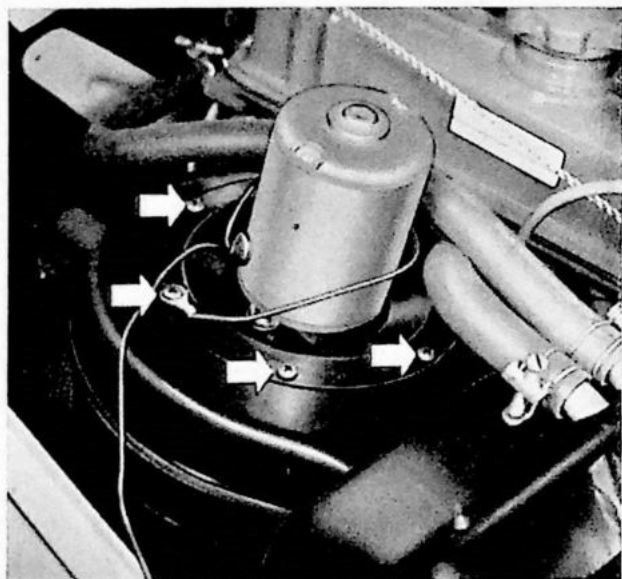
Fig. 30. Lighting switch removed with special cable terminal pulled out.

The foot dimmer switch has two positions: full headlights and dimmed headlights. This is fitted by means of screws onto the lower underside of the bulkhead.

The lighting switch and foot dimmer switch must be in good condition in order for full lighting strength to be obtained. Damaged or faulty switches must therefore be replaced. If the lighting strength is low, the switch and foot dimmer switch should be examined by measuring the voltage drop across them. This should not exceed 0.1 volt.

The rheostat for instrument lighting is built into the lighting switch. The strength of the instrument lighting is adjusted by turning the switch button.

Concerning measurement values of the electrical system, see the general section.



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Fig. 31. Fan motor for heater.

## Heater

Removing the fan motor.

1. Disconnect the live lead at the connecting piece.

2. Remove the six screws which hold the fan motor to the casing. The screws are marked with arrows on Fig. 31 (two of the screws are not visible).
3. Lift up the fan motor with impeller wheel. Fitting is done in the reverse sequence.

## Electric cables

The electric cables which connect the battery and dynamo with the various instruments and current consuming devices are shown in the wiring diagrams. These also shows the markings and cross-sectional areas of the leads.

In order to avoid the menace to traffic safety, as represented by "one-eyed" cars, the electrical system has been adapted so that the parking lights operate even when the headlights are on. If a headlight bulb should burn out, the parking light on that side still functions.

If a cable has broken or is earthed, it must be replaced. Ensure that the new cable used has the same cross-section as the original. If a smaller cross-section lead is used, this can cause overloading which means that heat is generated, resulting in damage to the leads and possibly also to the vehicle.

## FAULT TRACING

Regarding tracing of faults in the electrical system, see "Fault tracing" in the general section (PV, Part 10).



**Test values**

Brush spring tension .....	0.45—0.60 kg (0.99—1.32 lbs.)
Field coil resistance.....	1.0+0.1 ohm
Dynamo as motor .....	8 amp. at 5 volt
Charging, cold dynamo:	
6.0 volt 0 amp. ....	1500 r.p.m.
200 watt.....	2350 r.p.m.
Charging, warm dynamo:	
6.4 volt 0 amp. ....	1500 r.p.m.
200 watt.....	2400 r.p.m.

**Type**

Type .....	Bosch RS/UA 200/6/23
Balancing resistance AR .....	5.5—6.0 ohm
Control resistance W1.....	3.2—4.0 ohm
W2.....	3.2—4.0 ohm

**Test values**

Cut-out relay:	
Cut-in voltage .....	6.3—6.7 volt
Cut-out current .....	4—9 amp.
Voltage control:	
Control voltage, unloaded dynamo .....	7.0—7.5 volt
Current control:	
Control current .....	47—51 amp. (warm dynamo)

**Starter motor**

Voltage .....	6 volt
Earth connection .....	Negative terminal
Direction of rotation .....	Clockwise
Type .....	Bosch EGD 0.6/6 AR 19
Rated output .....	0.6 h.p.
Number of teeth on pinion .....	9
Brushes, designation .....	DSK 35/5
number .....	4

**Test values**

Mechanical:	
Armature axial clearance .....	0.15—0.30 mm (0.006—0.012")
Brush spring tension .....	0.8—0.9 kg (1.76—1.98 lb.)
Distance of pinion from ring gear .....	2.5—3.0 mm (0.098—0.118")
Armature brake friction torque .....	3—5 kgcm (2.61—4.34 lb.in.)
Pinion idling torque .....	1.3—1.8 kgcm (1.13—1.56 lb.in.) (with AKF pinion)
Electrical:	
Starter motor unloaded:	
Check time (idling) .....	Max. 15 seconds
5.5 volt and 60—80 amp. ....	4000—6000 r.p.m.
Starter motor loaded:	
4.5 volt and 260 amp. ....	700—1000 r.p.m.
Starter motor locked (r.p.m.=0) .....	3.5 volt and 450—500 amp.

**Solenoid switch**

Type .....	SSM 120 L 15
Test values:	
Current consumption of windings:	
Between connection 50 and body .....	15 amp. at 6.0 volt
Between connection 50 and 30 .....	60 amp. at 6.0 volt
Control voltage, cut-in .....	Max. 3.5 volt
cut-out .....	0.6—1.8 volt
Distance "a" (see Fig. 32) .....	32.2 ± 0.1 mm (1.268 ± 0.004")

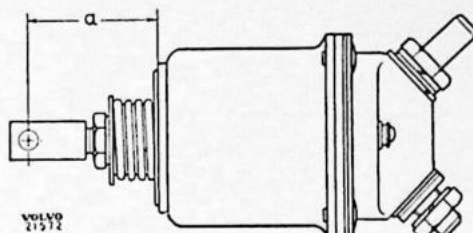


Fig. 32. Adjusting solenoid switch. (Iron core withdrawn).

**Horn**

Voltage .....	6 volt
Type, low tone .....	Bosch HO/FDG 6 (1/9)
Type, high tone .....	Bosch HC/FDG 6 (5/9)
Air gap between magnet and armature:	
type, low tone .....	0.55—0.65 mm (0.022—0.025")
type, high tone .....	0.55—0.65 mm (0.022—0.025")
Current consumption:	
Setting value, type, low tone .....	4.5—6.0 amp.
type, high tone .....	4.5—6.0 amp.
Voltage for armature attraction .....	4 volt
Voltage for full power .....	6—10 volt
Resistance in winding .....	0.17—0.21 ohm

**Fuses**

	Number	Type
PV 544 .....	8	8 amp.
	2	25 amp.

**Bulbs**

	Watt	Socket	Number
Headlights .....	45/40 Duplo	BA 20 d	2
Front flashers/parking lights .....	20/5	BA 15 d spec.	2
Rear number plate lighting .....	5	S 8	2
Stop lights/tail lights .....	20/5	BA 15 d spec.	2
rear flashers .....	20	BA 15 d	2
Roof light .....	10	S 8	1
Instrument panel lighting .....	2	BA 9 s	2
Control lamp for traffic indicators .....	2	BA 9 s	1
for full headlights .....	2	BA 9 s	1
for charging .....	2	BA 9 s	1
for oil pressure .....	2	BA 9 s	1



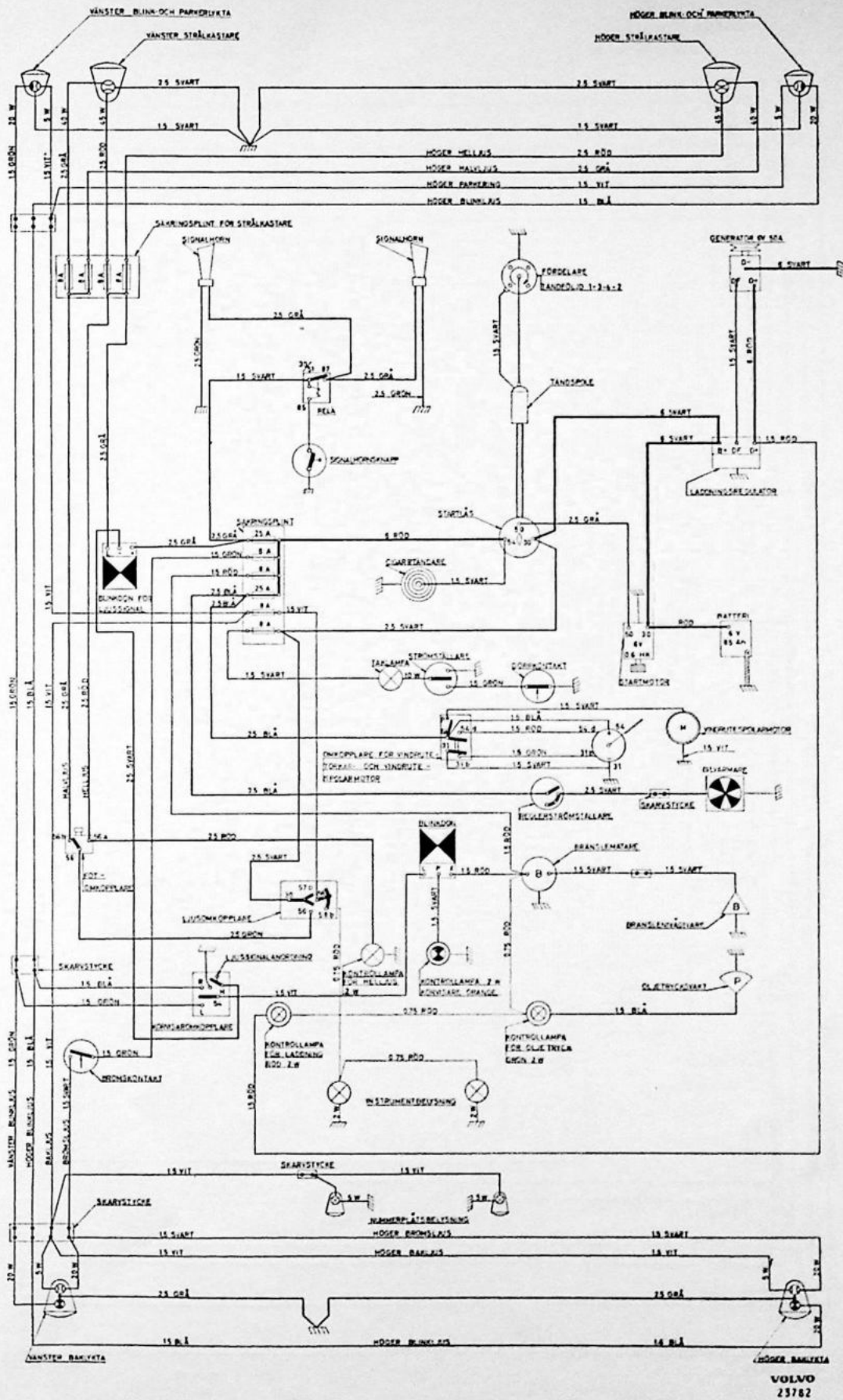


Illustration II. Wiring diagram for Volvo PV 544S up to chassis number 269999.





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