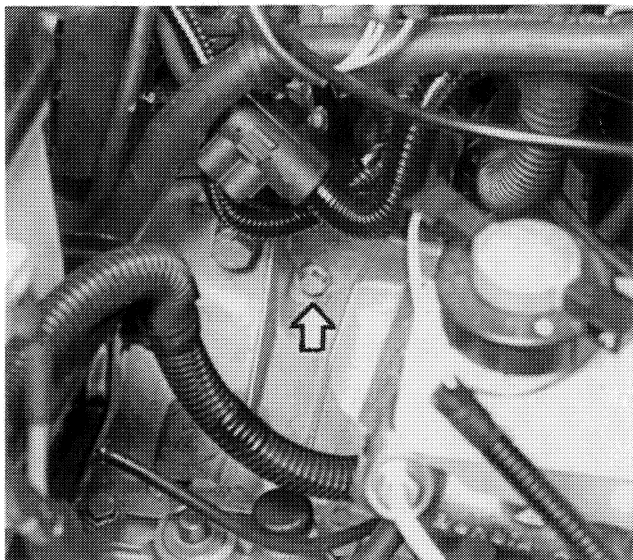


# PUNTO eMANUAL

Electrical Equipment

Title	Page
Removing/refitting starter motor .....	1 ➡
Overhauling motor .....	2 ➡



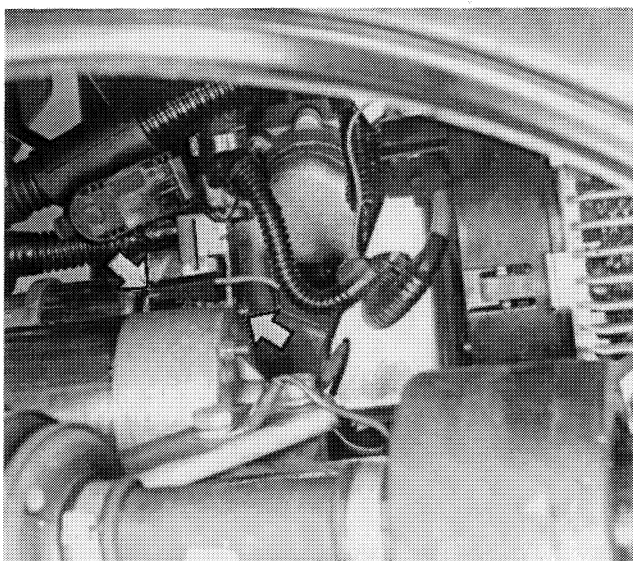
P3M049L01



#### REMOVING-REFITTING STARTER MOTOR



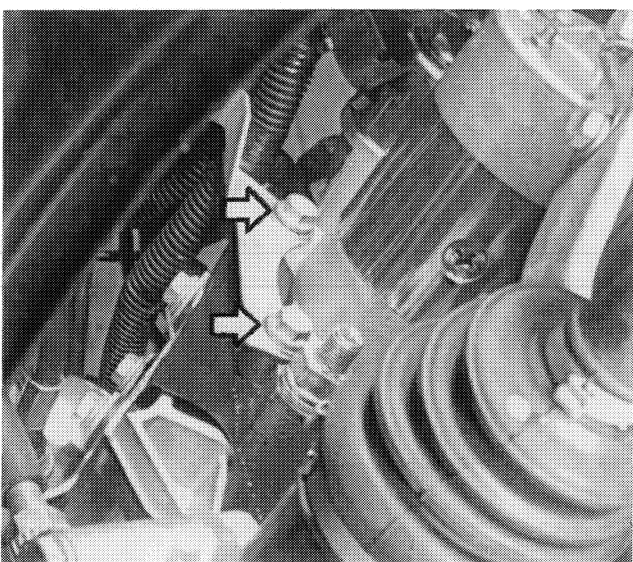
- Undo the bolt arrowed in the figure;



P3M049L02



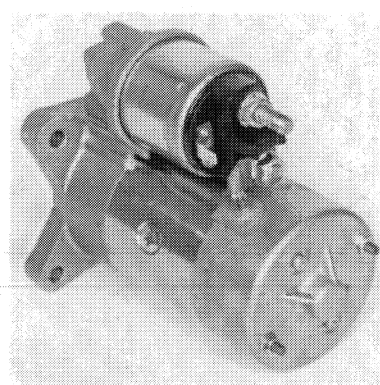
- from underneath the car, raise the connector's protective cover;
- disconnect the connector (arrowed);
- undo the attachment nut and disconnect the positive cable from the starter motor;



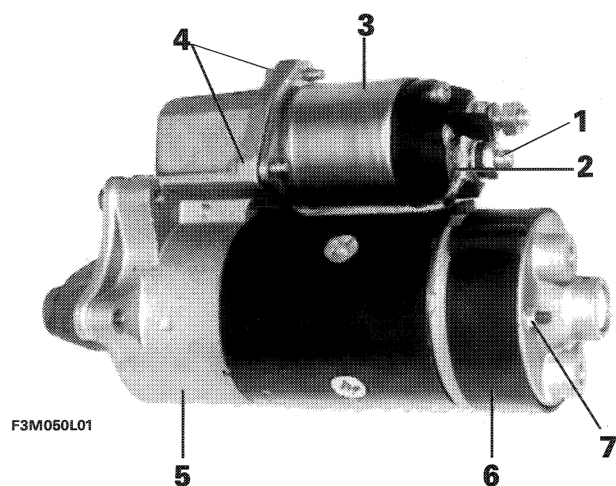
P3M049L03



- undo the bolts shown in the figure and remove the starter motor;
- to refit, reverse the procedure for removal.



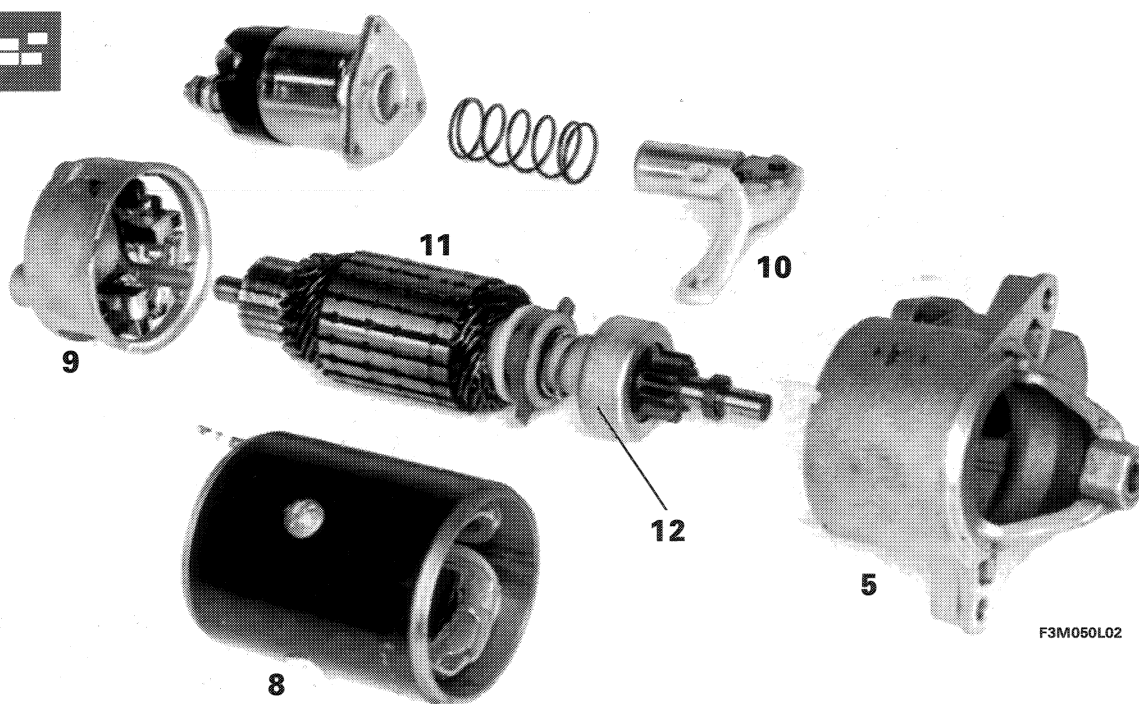
P3M049L04



### OVERHAUL OF M. MARELLI STARTER MOTOR



*Before proceeding with overhauling the starter motor, check that any insufficient engagement torque on starting is not due to low battery charge conditions.*



### Disassembly

To dismantle the starter motor, proceed as follows:

- undo the nut (1) and release the cable (2) from the solenoid (3);
- undo the bolts (4) securing the solenoid (3) to the front end bracket (5);
- remove the brush protective band (6);
- undo the nuts (7) and remove the bolts which join the front end bracket (5) to the central casing (8) and the brush carrier (9);
- separate the various components and release the yoke (10) from the front end bracket (5) and the armature (11).

### Checks

Conduct the following tests on the components of the starter motor:

**armature:** continuity, short circuit and earth insulation tests

**stator:** continuity and earth insulation tests

**brush carrier:** earth insulation

**solenoid:** continuity and earth insulation tests



*The roller clutch (12) must be replaced whenever the starter motor engagement is noisy during starting.*

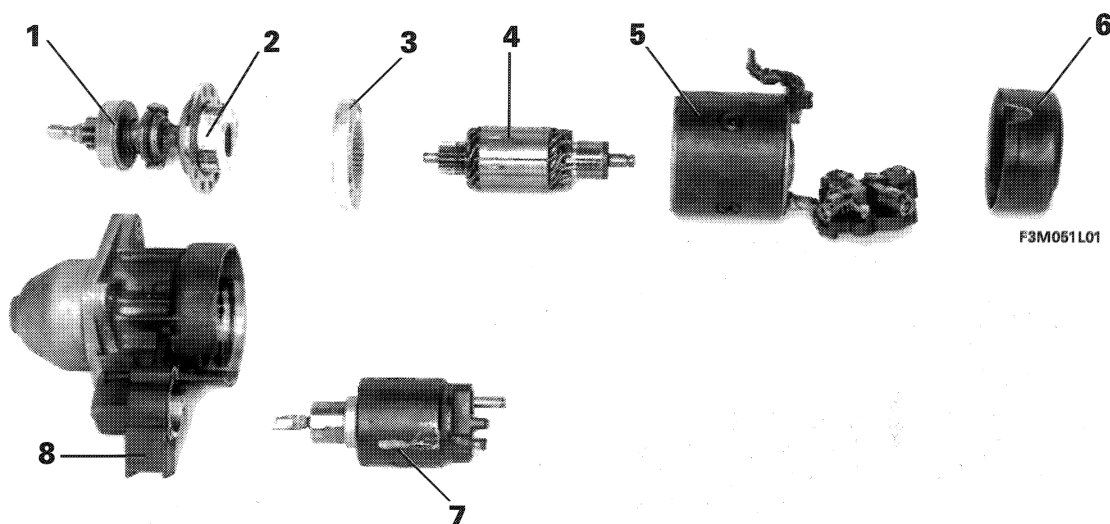
### BOSCH STARTER MOTOR WITH EPICYCLIC REDUCTION GEAR

This motor can deliver considerable power despite its light weight. This advantage is achieved by combining a small armature, which can reach a very high rpm speed, with an epicyclic reduction gear which multiplies the torque delivered.

#### Epicyclic reduction gear unit

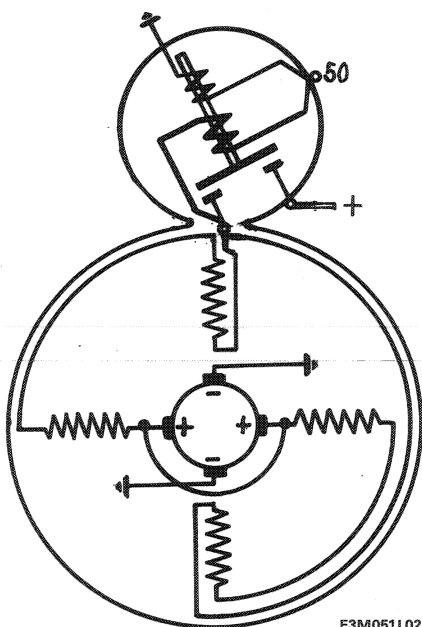
The driving gear is formed on the end of the armature. It meshes with 3 satellite gears, mounted on three pins on the satellite gear shaft, the end of which comprises the starter pinion for starting the engine. At the same time, the satellite gears mesh with a stator gear, fixed to the motor body, comprising internal teeth. The stator's reaction makes the satellite gear shaft rotate around the motor's axis at a slower speed than the armature.

The total rpm transmitted by the armature become transformed into revolutions of each satellite on its own axis, and rotations of the satellite gear shaft on the motor's axis.



1. Drive pinion with roller clutch
2. Satellite gear shaft
3. Stator (wheel with inner teeth)
4. Armature

5. Casing with windings and brushes
6. End bracket
7. Starter solenoid
8. Bracket

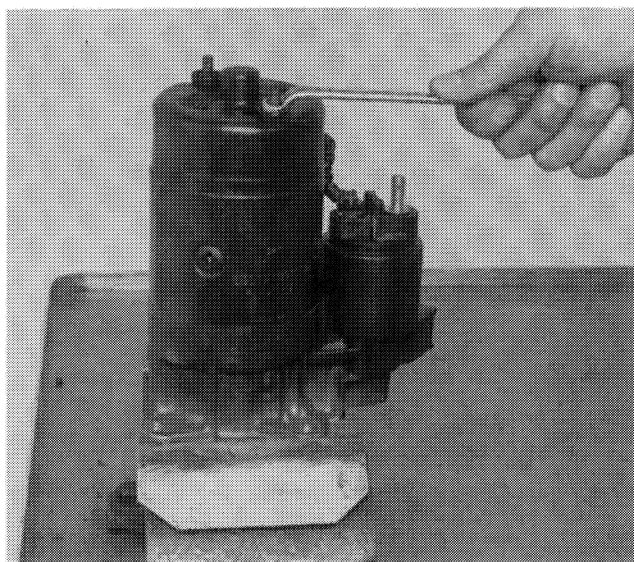


F3M051L02



*To renew the brushes only, break the old brushes with a hammer or crush them in a vice, then tin solder the winding terminals in the new brushes.*

**Diagram of Bosch starter motor connections**



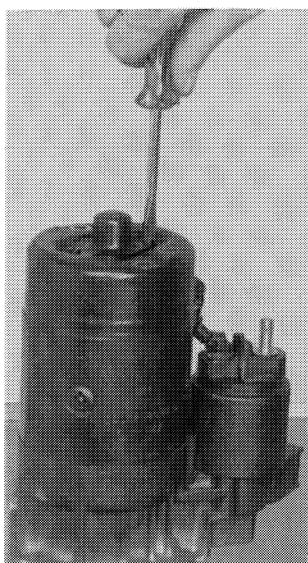
F3M052L01



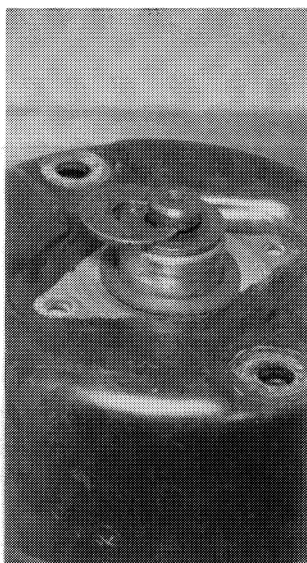
#### BENCH OVERHAUL

##### Dismantling side mounting bolts

Disconnect the nut securing the stator winding terminal to the relay.



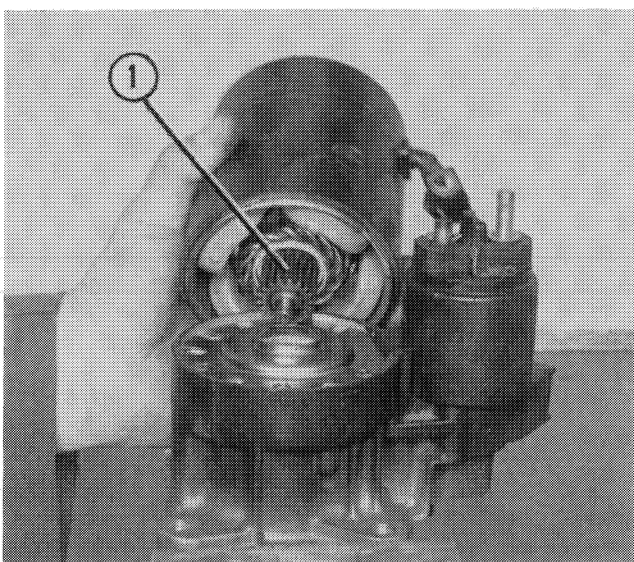
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F3M052L03



##### Dismantling armature axial thrust washer and cover

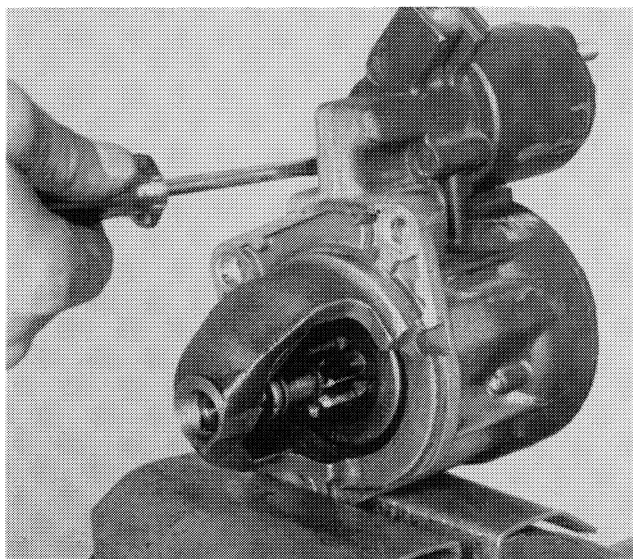


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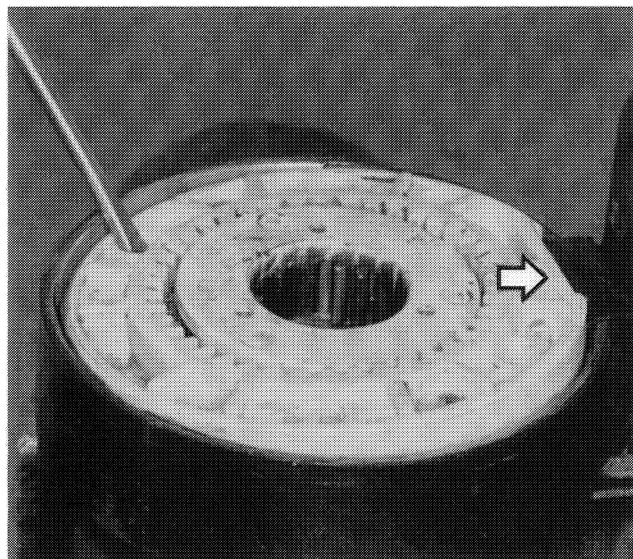


##### Dismantling armature-stator assembly

1. Driving gear of the epicyclic rpm reduction unit, joined to the armature.



F3M053L01

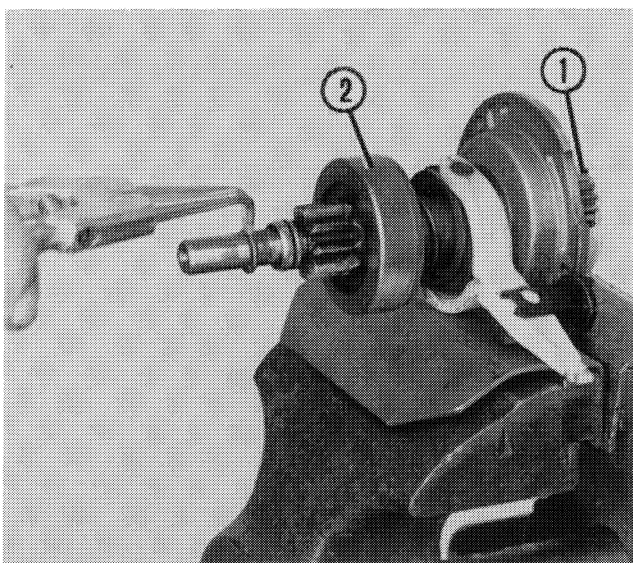


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#### Dismantling drive pinion control relay

#### Dismantling stator gear with inner teeth from the casing

The arrow indicates the gear attachment and reference notch.

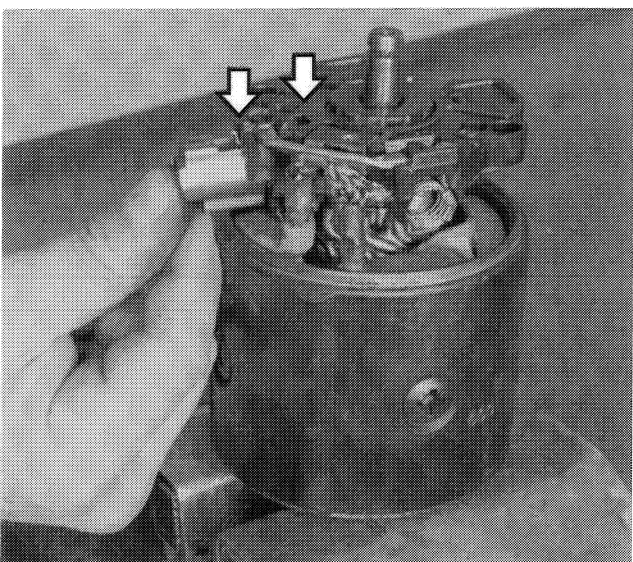


F3M053L03



#### Dismantling retaining ring on drive pinion-roller clutch assembly

1. Satellite shaft, joined to the pinion
2. Drive pinion with roller clutch



F3M053L04

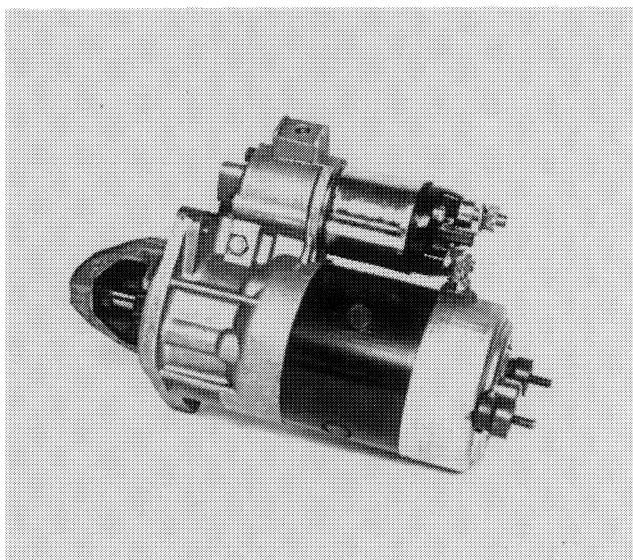


#### Refitting brushes and brush carrier (complete with spring)

Push the brush carrier into its seating until the stop is inserted in its recess.



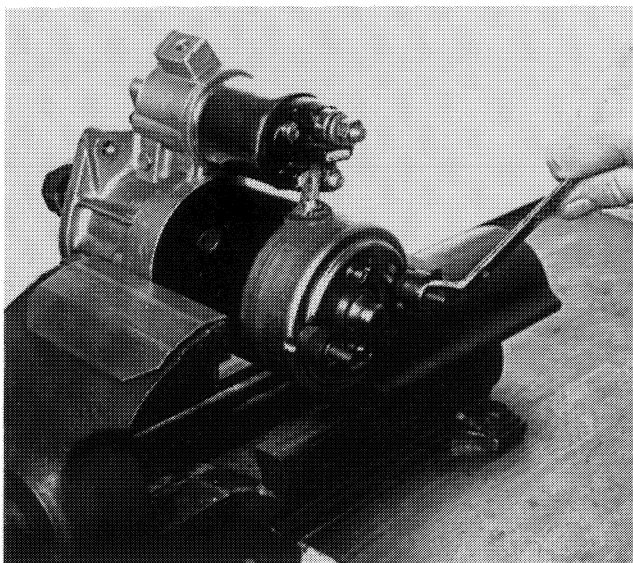
*To refit, simply reverse the sequence of operations for removal.*



P3M054L01

#### M. MARELLI STARTER MOTOR WITH EPICYCLIC REDUCTION GEAR

Questo motore può disporre di una grande potenza nonostante il suo peso ridotto. Tale vantaggio si ottiene combinando un indotto di piccole dimensioni, tale che possa raggiungere un elevatissimo numero di giri, con un riduttore epicicloidale capace di moltiplicare la coppia sviluppata.



P3M054L02

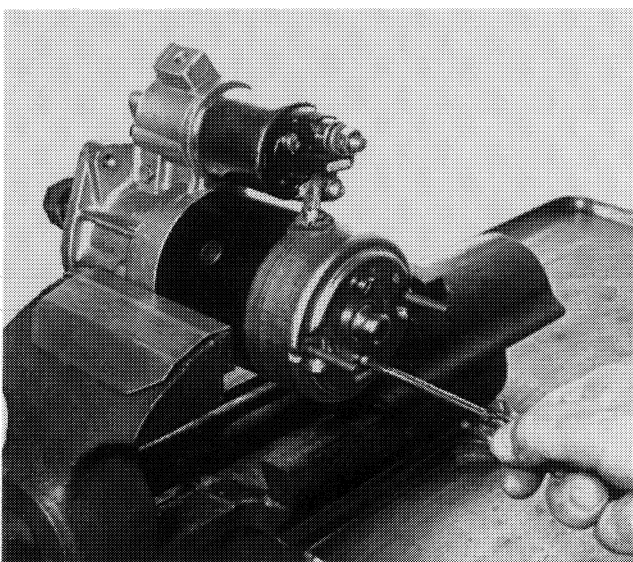


#### REVISIONE AL BANCO



*Prima di procedere alla revisione del motore di avviamento occorre accertarsi che la causa dell'insufficiente coppia di spunto all'avviamento non sia dovuta alle cattive condizioni di carica della batteria.*

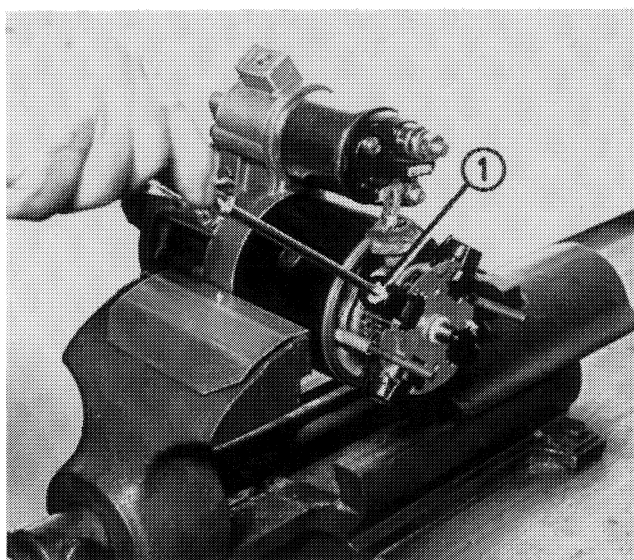
#### Smontaggio viti fissaggio supporto posteriore



P3M054L03



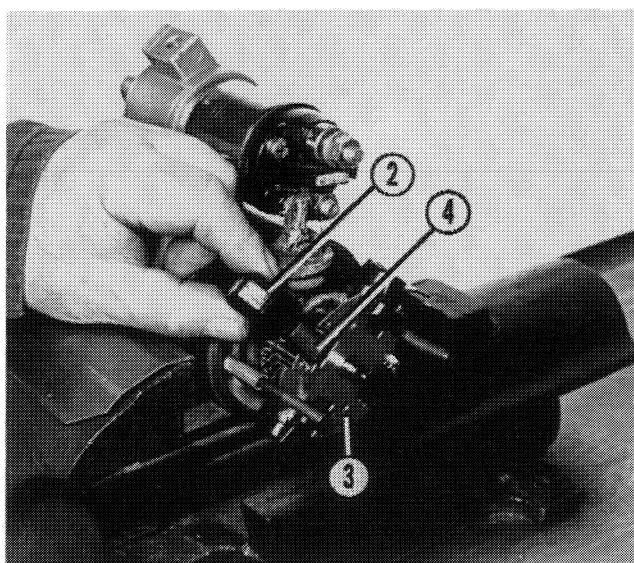
#### Smontaggio viti fissaggio piastra portaspazzole al supporto posteriore



P3M055L01

### Dismantling brush carrier and its plate

1. N° 4 brush spring retaining button



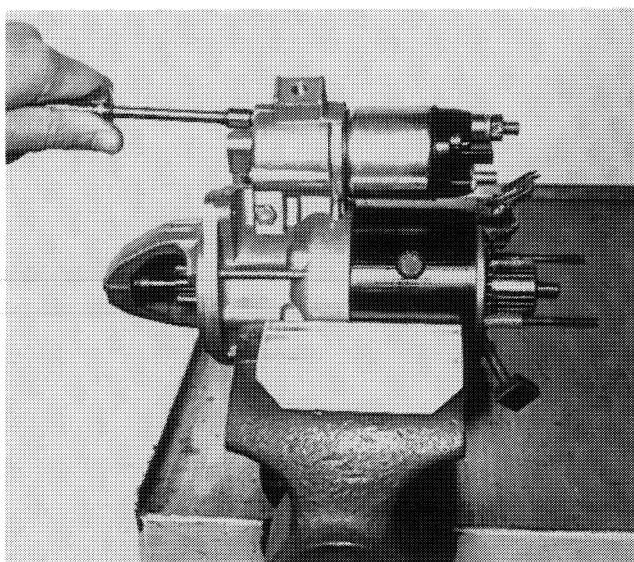
P3M055L02

### Dismantling brush carrier and its plate



*To renew the brushes only, break the old brushes with a hammer or crush them in a vice, then tin solder the winding terminals in the new brushes.*

2. N° 4 brush carrier
3. Brush carrier plate
4. Brush n° 4



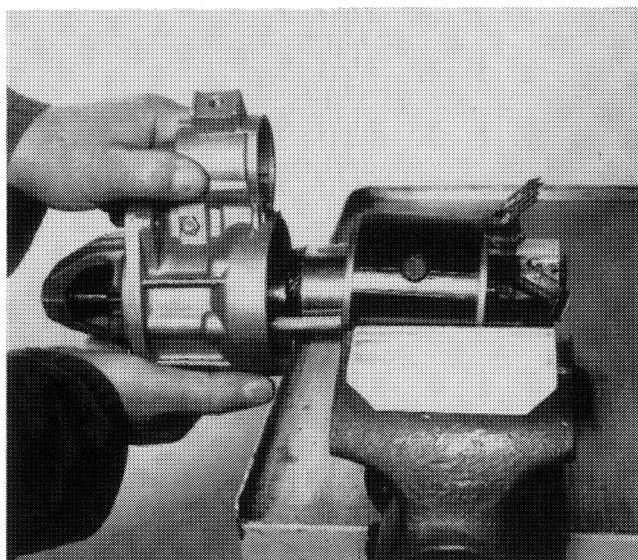
P3M055L03

### Removing bolts securing solenoid to front end bracket

Disconnect the nut securing the stator winding to the solenoid.



**Solenoid:** *conduct the continuity and earth insulation tests.*



P3M063L01

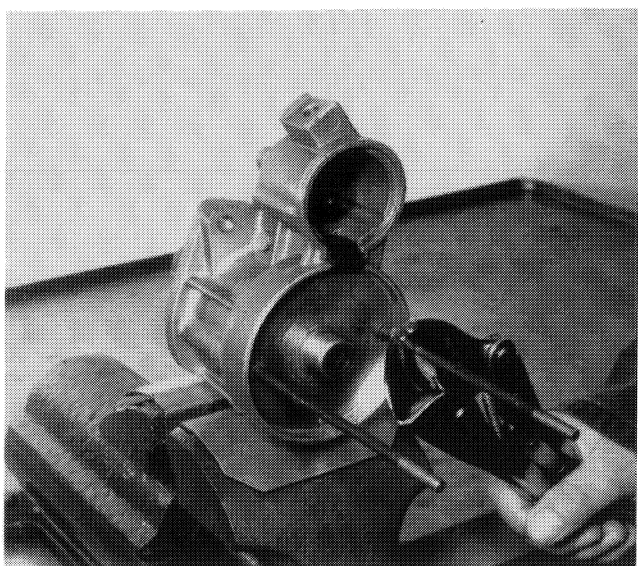


**Dismantling front end bracket from the stator casing**



**Stator:** conduct continuity and earth insulation tests on the stator.

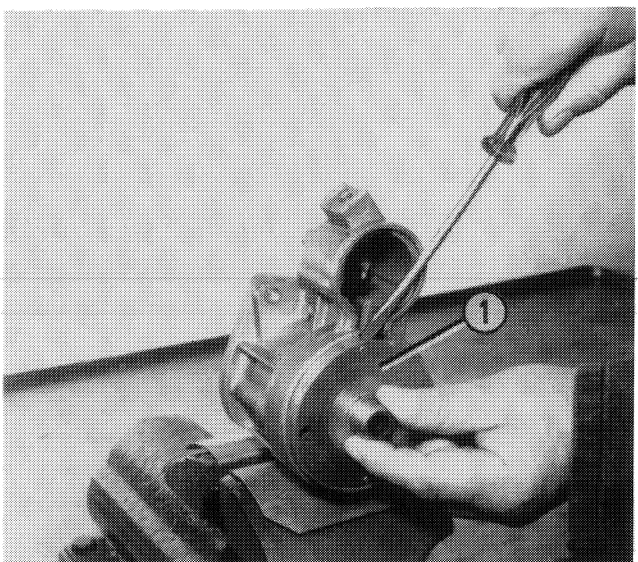
**Rotor:** continuity, short circuit and earth insulation tests.



P3M056L02



**Dismantling tie bolts securing front bracket to rear bracket, and securing reduction gear**



P3M056L03

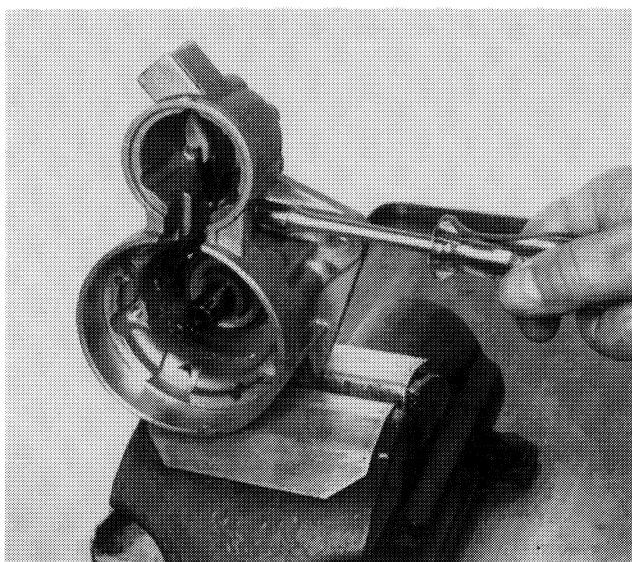


**Removing epicyclic reduction gear assembly**



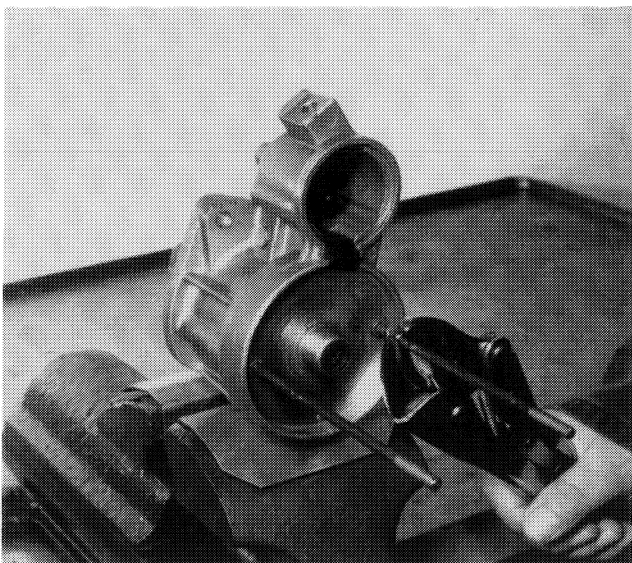
*The epicyclic reduction gear is supplied as a spare part in the form of an assembly, since it cannot be overhauled. Renew it if operating faults are discovered (noise, jamming, etc.).*

1. Epicyclic reduction gear assembly



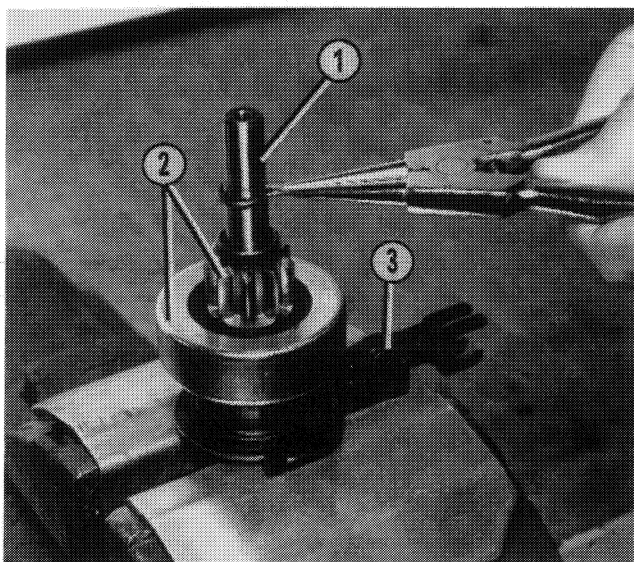
P3M057L01

**Dismantling pinion engagement yoke pin**



P3M057L02

**Withdrawing pinion-roller clutch complete with shaft**



P3M057L03

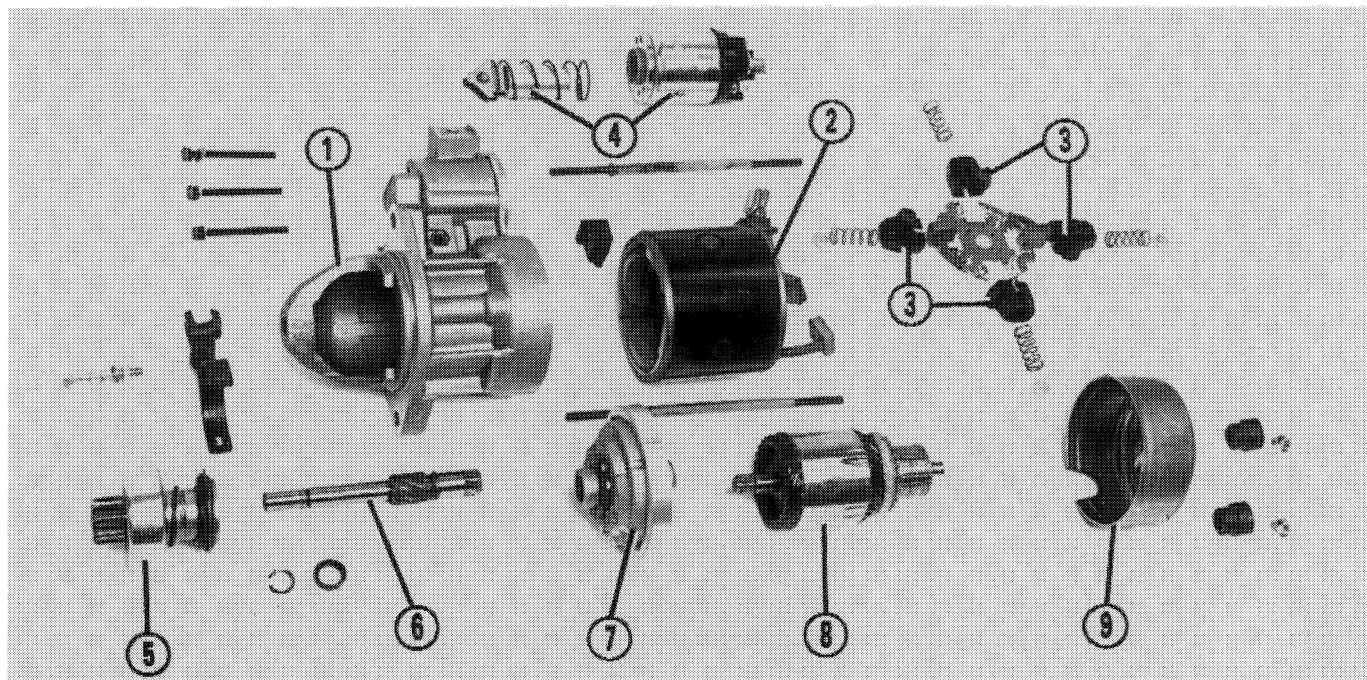
**Dismantling pinion-roller clutch from shaft**



*The pinion complete with roller clutch (2) must be replaced whenever the starter motor is noisy during starting.*

1. Shaft
2. Pinion complete with roller clutch
3. Pinion advance fork

View of the components of the M. Marelli starter motor with epicyclic reduction gear



P3M068L01

1. Front end bracket
2. Casing with stator windings
3. Brush carrier
4. Starter solenoid
5. Pinion complete with roller clutch

6. Shaft
7. Epicyclic reduction gear assembly
8. Rotor
9. Rear end bracket



To refit, reverse the sequence of operations for removal.

### DIAGNOSING OPERATING FAULTS ON THE STARTER MOTOR

#### 1. The motor does not turn

The cause may be:

- battery terminals and relevant clamps corroded
- battery - starter motor terminal loose
- terminals on the electrical system junction connection disconnected
- battery fully discharged
- no contact between armature and brushes, or short circuit in one or both brushes
- starter switch contacts corroded, worn or insulated by the presence of debris
- armature or stator centrifuged
- armature or stator centrifuged

#### 2. The motor turns very slowly

The cause may be:

- worn brushes and commutator segments
- some of the stator or armature winding coils short-circuited
- battery terminals and relevant clamps corroded
- battery in very low state of charge, or one or several cells damaged

#### 3. Excessive noise during starting

The cause may be:

- worn roller clutch mechanism on pinion
- incorrect alignment between stator motor and flywheel ring
- some teeth on the flywheel ring excessively worn on the engagement side
- speed reduction gear faulty or excessively worn