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December 23, 2019
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TECHNICAL OFFICE
Stavale

T390

TECHNICAL SERVICE MANUAL

WARNINGS

! DANGER!

Indicates the need for attention in order to avoid a series of consequences which could cause death or damage to the health of the operator.

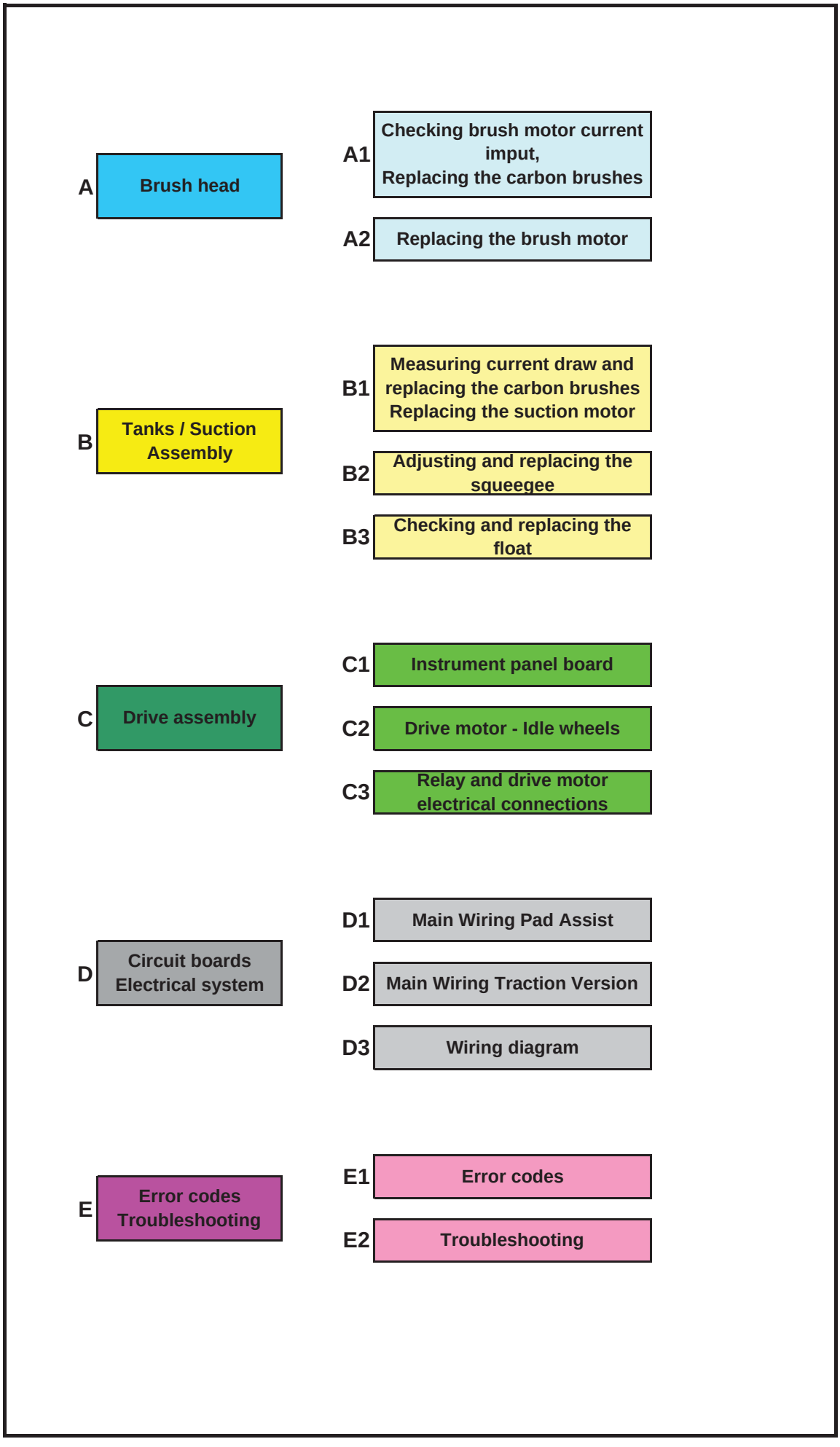
☝ WARNING!

Indicates the need for attention in order to avoid a series of consequences which could cause damage to the machine or work environment or financial loss.

i INFORMATION

Indicates particularly important instructions.

In line with the company's policy of constant product development and updating, the Manufacturer reserves the right to make modifications without warning.
Although your machine may differ appreciably from the illustrations in this document, safety and the information contained in this manual are guaranteed.


A
Brush head
A1
Checking brush motor current imput,
Replacing the carbon brushes
A2
Replacing the brush motor
B
Tanks / Suction Assembly
B1
Measuring current draw and replacing the carbon brushes
Replacing the suction motor
B2
Adjusting and replacing the squeegee
B3
Checking and replacing the float
C
Drive assembly
C1
Instrument panel board
C2
Drive motor - Idle wheels
C3
Relay and drive motor electrical connections
D
Circuit boards Electrical system
D1
Main Wiring Pad Assist
D2
Main Wiring Traction Version
D3
Wiring diagram
E
Error codes Troubleshooting
E1
Error codes
E2
Troubleshooting

INDEX

INDEX

Subject **Page**

E ERROR CODES - TROUBLESHOOTING

A BRUSH HEAD

WARNING

Go to the designated draining area and empty the solution and dirty water tanks using the drain plugs and the hose provided.

Move the machine onto flat ground. If necessary, place chocks under the wheels.

Press the emergency switch, for the version with drive, or disable the functions by moving the switch to position “0” on all other versions.

Disconnect the battery from the machine’s electronics by simply disconnecting the negative pole only, for the battery versions, or unplugging from the mains power supply for the cable versions.

i INFORMATION

Indicates particularly important instructions.

In this Service Manual, the terms RIGHT and LEFT are used to indicate the sides of the machine.
These always refer to the direction of travel of the machine.

In this Service Manual, the machine version may be written in brackets (Traction, Pad Assist) or quotation marks "Traction - Pad Assist".
This note indicates that the instructions only refer to the version specified in brackets or quotation marks.

A1 *BRUSH MOTOR*

Fig. 1

A1.1 Checking current input

1 Empty the solution tank and the dirty water tank.
2 Bring to zero the amount of water dispensed.
3 Move the machine onto flat dry and smooth flooring.
4 Press the emergency switch to switch off all the functions.
5 **Make sure that the batteries on the machine are charged.**
6 Use a clamp-on ammeter with an end scale reading of at least 200 amperes, as shown in Figure 1.
7 Remove the brush head cover.
8 **Lift one of the machine's two drive wheels, see paragraph C 2.1.**
9 Move the speed knob on the instrument panel to zero, turning it anticlockwise.
10 Remove the brush head cover, unscrewing the four screw.
11 Switch the ammeter to **amperes** and **DC.**

CHECKING POWER INPUT FOR EACH INDIVIDUAL MOTOR

Alternatively, electrically disconnect one motor, and then check the power input of the other motor, both at no load and when working.

Checking the current with no load, i.e. without brushes.

12 Remove the brushes and lower the head using the special pedal control.
13 Turn the emergency button clockwise.
14 Press the button on the instrument panel to activate the brushes.
15 Controlling the rotation of the brushes using the drive lever, read the **CURRENT (A)** drawn by the brush reduction drive; for practicality, hold the lever in place with string.
16 Note down the value read, and then run the following check.
Checking the current in operation, i.e. with the brushes.
17 Replace the brushes on the reduction drive, and lower the brush head to the floor.
18 Repeat the readings, as described above.
19 Compare the values measured against the chart below.
20 If the values are OK, replace the brush motor cover.
21 If the values do not correspond to those specified (higher):
21a Check that the brush drive (and thus the motor) is free to rotate, without interference.
21b Check the power supply **VOLTAGE (V)** directly on the poles of the motor.
21c Check that the motor carbon brushes are intact, replace if necessary.
21d Replace the defective motor or motors.

Fig. 2

Fig. 3

CHECKING THE LEFT MOTOR (*)

A - Disconnect the right motor

B - Check the left motor

Fig. 4

CHECKING THE RIGHT MOTOR (*)

A - Disconnect the right motor

B - Disconnect the black wire from the left motor

C - Connect the black wire to the right motor

D - Check the right motor

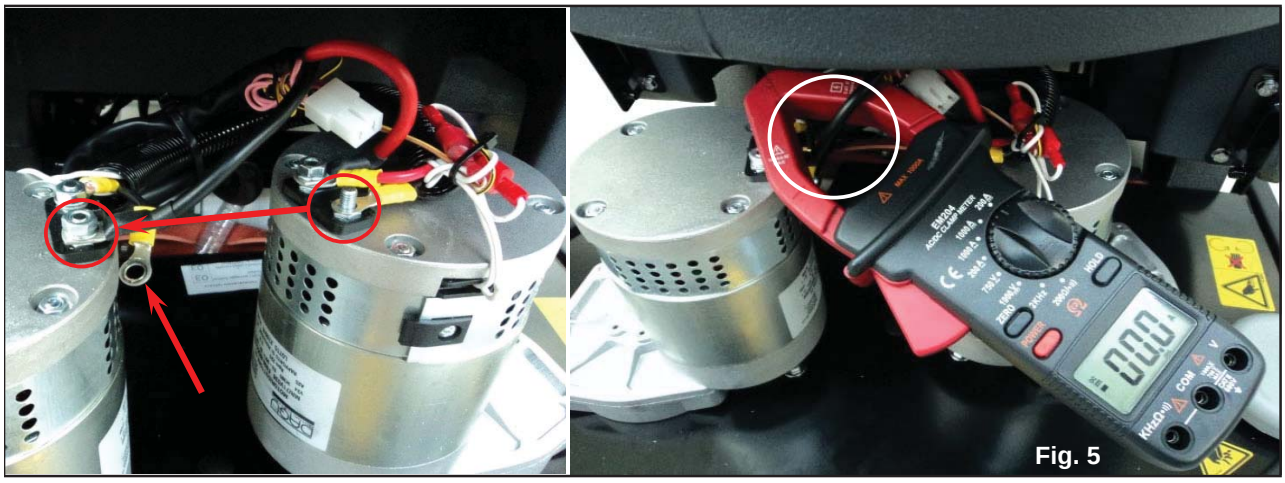


Fig. 5

Current input A (Amperes)	*Min*	*Max*
No load, head lifted	*4.0 A*	*6.0 A*
With brushes operating	*14.0 A*	*19.0 A*

(*) see "INFORMATION" at the start of the chapter

A1.2 Replacing the brush motor carbon brushes

Dismantling

1. Move the machine to the tank draining area, and empty the solution tank and the dirty water tank.
2. Move the machine onto flat and dry flooring.
3. Press the emergency switch to switch off all the functions.
4. Lower the brush head using the pedal control.
5. Disconnect the batteries from the machine's main wiring.
6. Remove the brush head cover, unscrewing the four screw.
7. Identify the two screw **A** that secures the metal band on the brush motor.
8. Unscrew the screw **A** and remove the metal band on the brush motor

Fig. 6

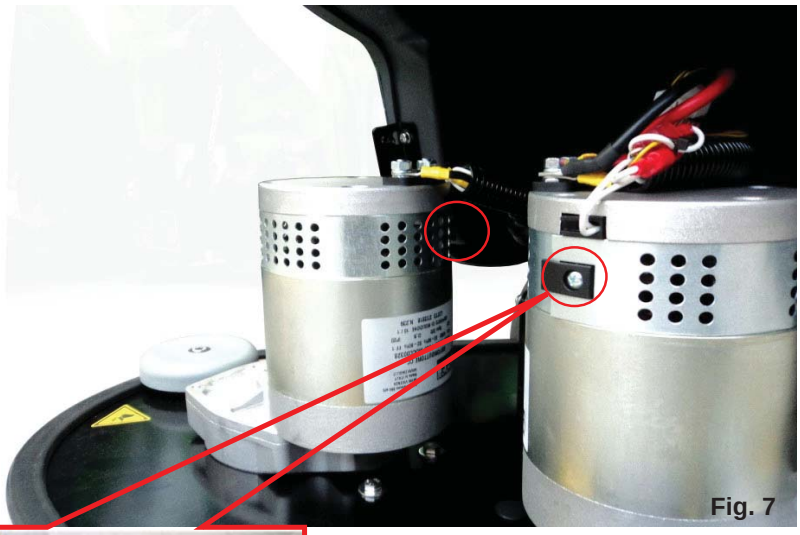
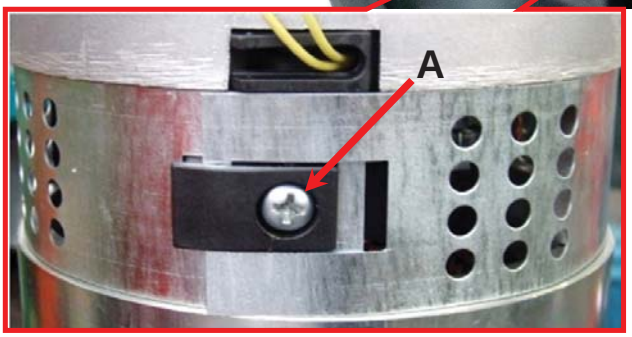


Fig. 7



9 Identify the four carbon brushes (for each individual motor), arranged 90° degrees apart.
10 Remove and check or replace the brush carbon brushes.
11 Using long-nosed pliers remove the fast-on **B** from its socket.
12 Use a hook to lift the spring **C**, and pull the carbon brush **D** outwards.

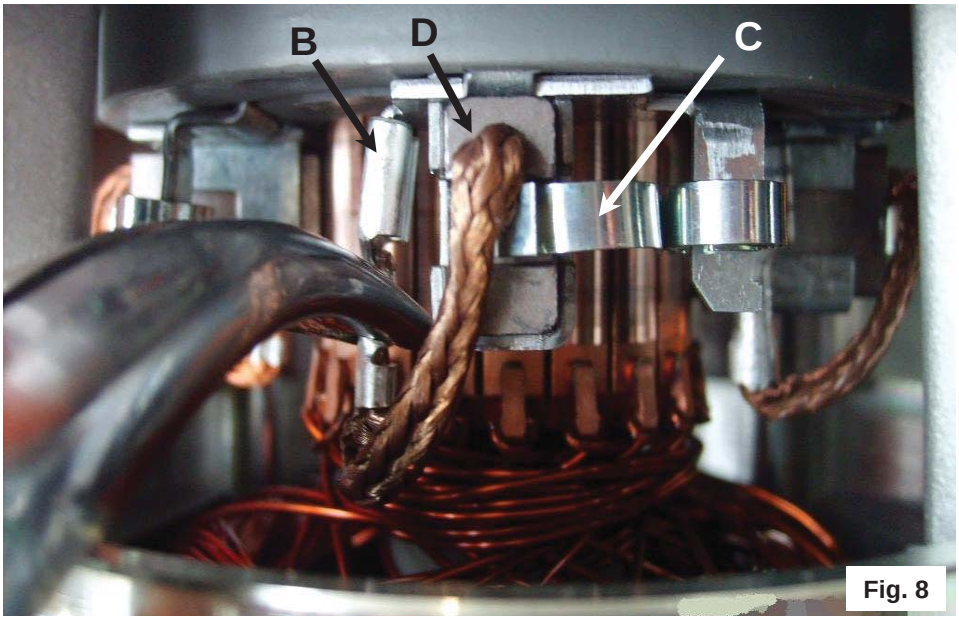


Fig. 8

13 Check that the dimensions of the carbon brush **E** lie within the tolerances given in the figure below. The brush must have a minimum length of 8.0 mm / 0,315 in.
14 Check the sliding contact surface **D1** of the carbon brushes I for wear or damage. The surface must not be badly worn or burned.
15 When fitting new carbon brushes, compare the new ones with the old ones, or check them against the dimensions given in the figure below. Only the length must be different.

The carbon brushes must all be replaced at the same time.

When fitting the carbon brushes, make sure that they slide freely in their seats.

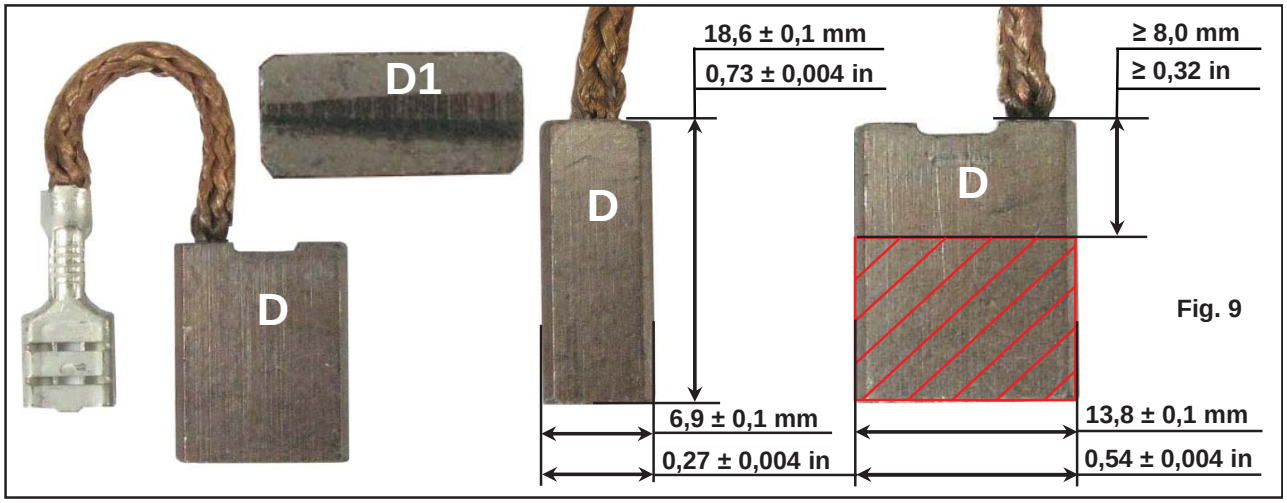


Fig. 9

16 Blow the inside of the motor clean with a jet of compressed air, paying particular attention to the area around the carbon brushes and to the part of the rotor **F** with which the carbon brushes come into sliding contact.
17 Check the rotor M for wear, paying particular attention to the area of contact with the carbon brushes.

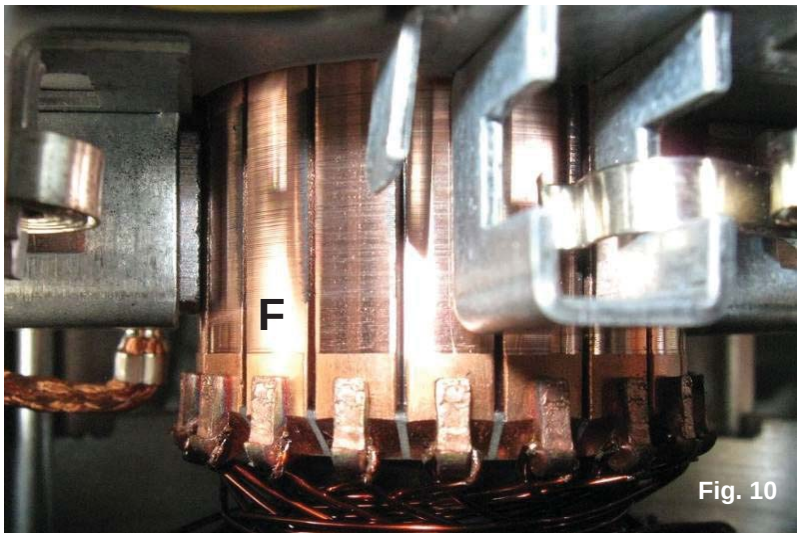


Fig. 10

18 When repositioning the metal strap over the carbon brushes **D**, align the notch **E** in the strap with the corresponding reference on the motor body.
19 Arrange the clamp E1 of the metal strap E as shown in the figure below when reassembling.

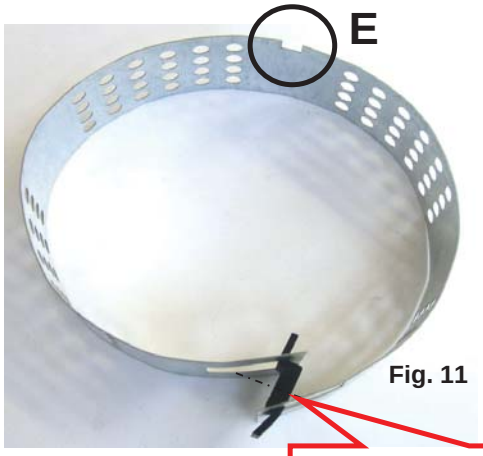


Fig. 11

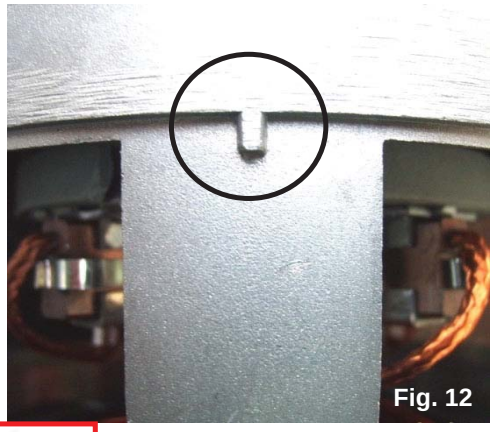
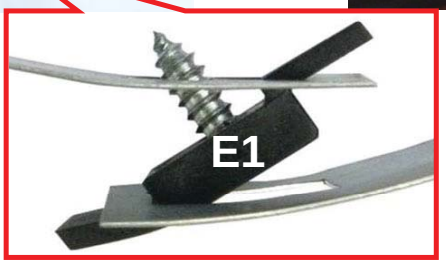


Fig. 12



Reassembly

1 Repeat the dismantling operations in reverse.
2 To reassemble the carbon brushes, perform the dismantling operations in reverse.
3 Reposition the protection clamp, making sure it is positioned on the catch, for correct assembly see Figure 1
4 To reassemble the solution tank, perform the dismantling operations in reverse.

A1.3 Replacing the brush motor

Dismantling

1. Move the machine to the tank draining area, and empty the solution tank and the dirty water tank.
2. Move the water delivery control to zero
3. Move the machine onto flat and dry flooring.
4. Press the emergency switch.
5. Remove the brush motor cover, unscrewing the four screws **A** on the sides.
6. Lower the head to simplify the dismantling operations.
7. Disconnect the cables **B** on the motor and the thermal cables **C**.

Fig. 13

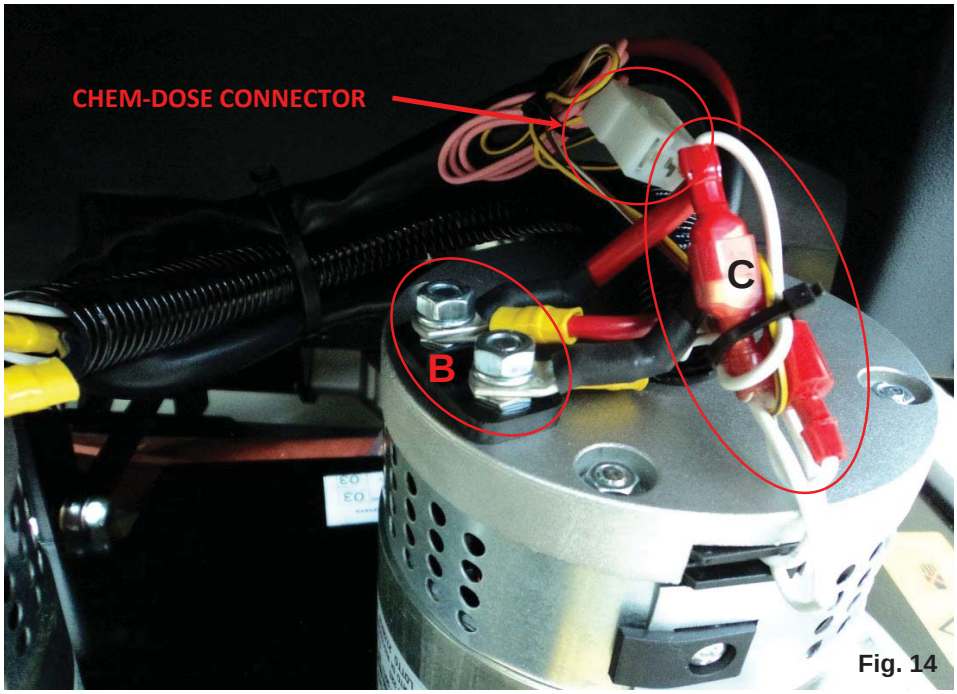


Fig. 14

8 Lift the machine on the right side.
9 Unscrew the metal clamp **D** from the solution hose **E,** and remove the latter from the distributor.
10 Unscrew the 4 bolts **F** and **G** that fasten the head, checking the positions of the bushings.
11 Pull the machine backwards, so as to release the head.

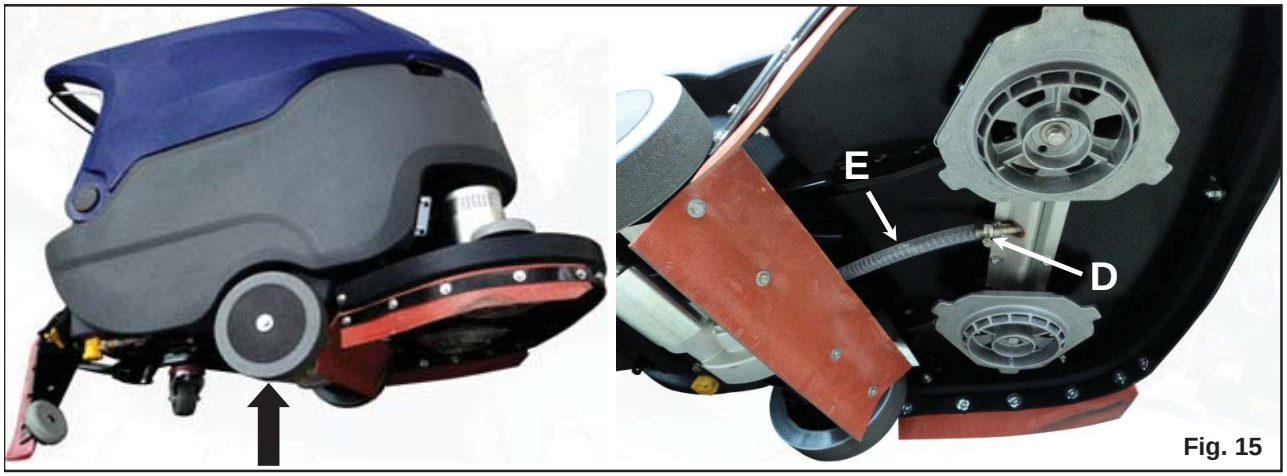


Fig. 15

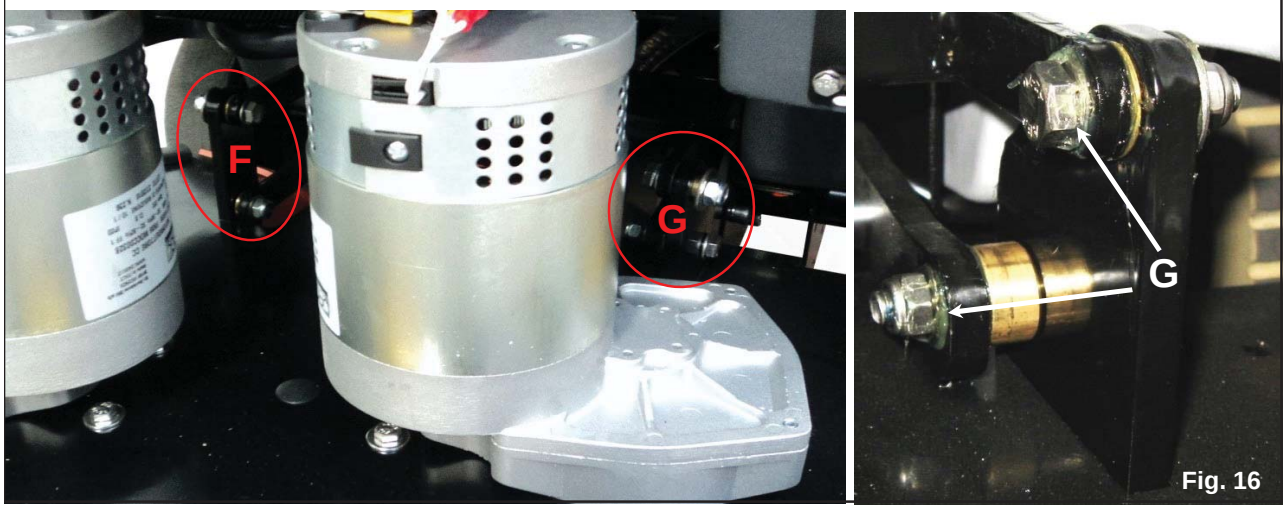


Fig. 16

12 Disconnect the two motors electrically between each other, both the power supply and the thermals.

Fig. 17

14 Tip over the head and dismantle drive disk/disks **O**.
15 Unscrew the bolt **P** that fastens the drive to the shaft.
16 Lift the drive **O**, with the help of a hammer plastic or a puller.
17 Pay attention to the tab **Q** that holds the disk to the shaft.
18 Unscrew the seven bolts **R** (on each motor) that fasten the reduction drive to the head plate.
19 Replace the reduction drive with a new one.

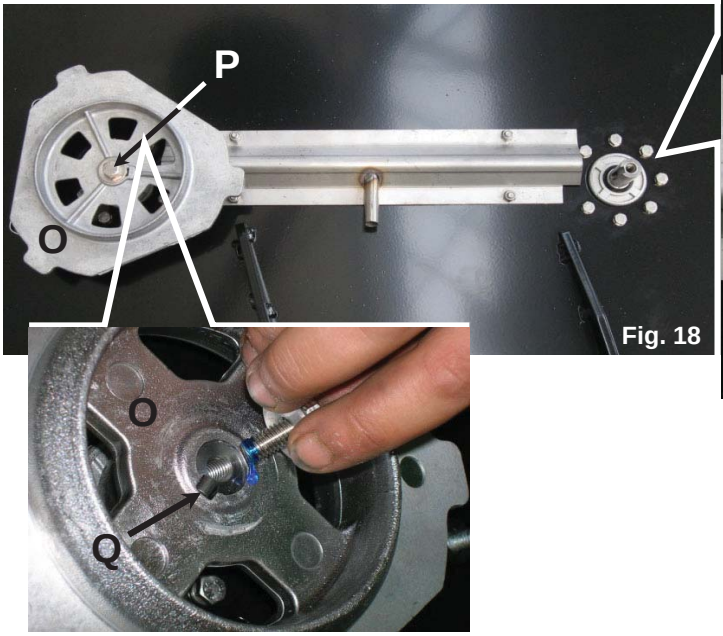


Fig. 18

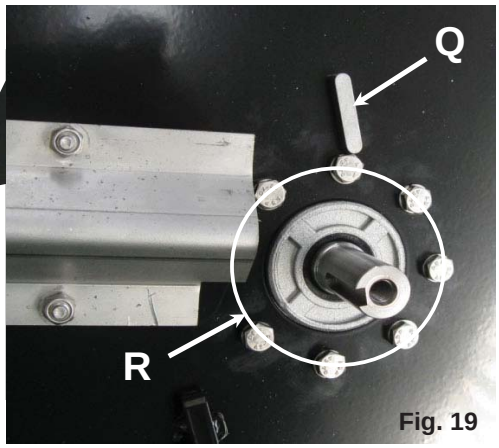


Fig. 19

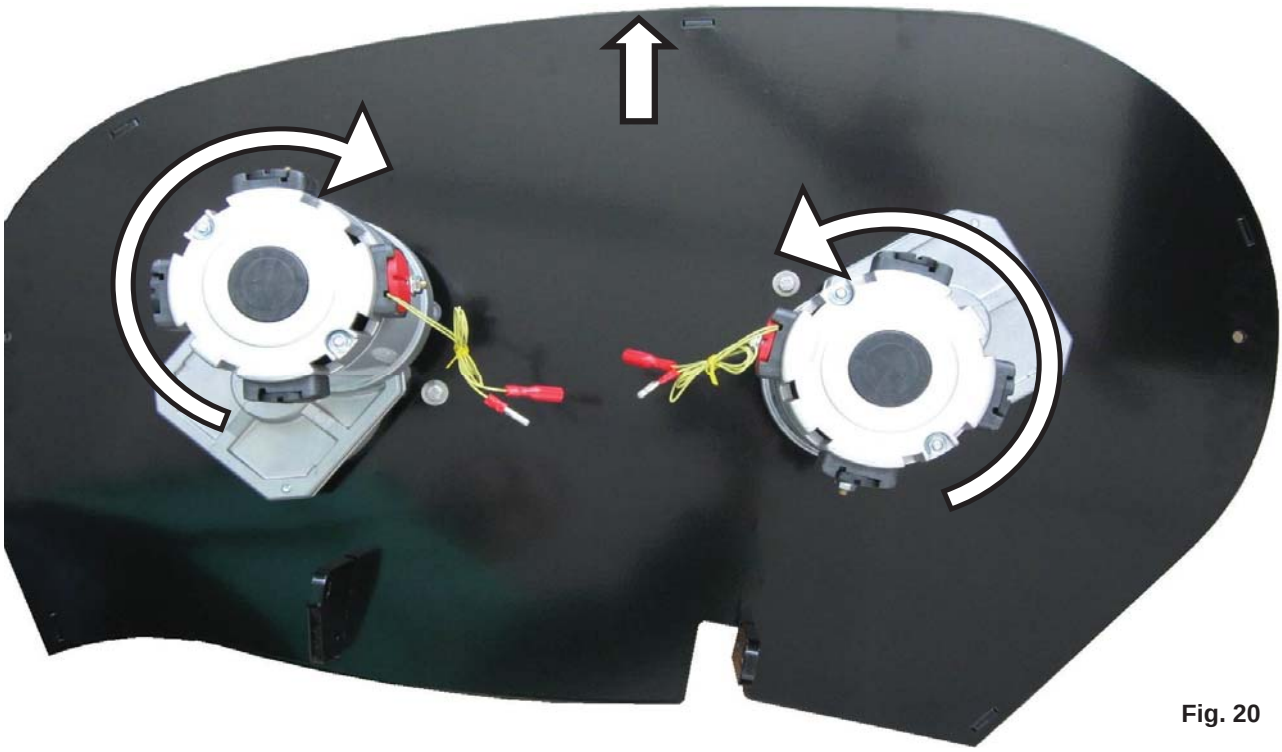


Fig. 20

Reassembly

1. To assemble the new reduction drive/drives, perform the dismantling operations in reverse.
2. **Warning, tighten the seven bolts R to a maximum torque of 7.5 Nm ~ 66,4 lbf in, and always place the Grover washers between the plate and the bolts.**
3. **Warning, always fit the bolt P with the Grover washer and a drop of thread lock, tighten to a maximum torque of 25.5 Nm ~ 225,7 lbf in.**
3. Respect the positioning of the reduction drives on the brush head plate, see Figure 20.

☝ Check the direction of rotation of the brushes see Figure 46, the right brush must rotate *anticlockwise,* and the left brush *clockwise.* If this is not the case, reverse the electrical cables to the motor that is rotating in the wrong direction, paying special care to the motor that is powered directly from the machine's wiring, as reversing the cables on this will also reverse the rotation of the other motor.

B SUCTION UNIT

WARNING

Go to the designated draining area and empty the solution and dirty water tanks using the drain plugs and the hose provided.

Move the machine onto flat ground. If necessary, place chocks under the wheels.

Press the emergency switch, for the version with drive, or disable the functions by moving the switch to position “0” on all other versions.

Disconnect the battery from the machine’s electronics by simply disconnecting the negative pole only, for the battery versions, or unplugging from the mains power supply for the cable versions.

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B1 *SUCTION MOTOR*

Fig. 21

B1.1 Checking the suction motor current input

1 Move the machine onto flat and dry flooring.
2 Press the emergency switch (Traction) or switches into position "0" (Pad Assist).
3 **Make sure that the batteries on the machine are charged.**
4 Use a clamp-on ammeter with an end scale reading of at least 200 amperes, as shown in Figure 16.
5 Remove the suction hose **A** from the squeegee, see Figure 17.
6 Lift and turn the top dirty water tank.
7 Isolate one of the two power wires **B** to the suction motor.
8 Connect the ammeter clamp around one of the two wires **B** as shown in Figure 18.
9 Switch the ammeter to **amperes** and **DC.**
10 Turn the ignition key on the mushroom-shaped switch clockwise to connect power.
11 Start the suction motor by pressing the corresponding button on the instrument panel.
12 Read the **CURRENT** (A) drawn by the suction motor.
13 Compare the values measured against the chart below.
14 If all the values are normal close the top dirty water tank again.
15 If the measurements do not correspond to those specified:
15a Check that the suction hose **B** is in good condition, is not crushed and is not blocked inside.
15b Check that the motor carbon brushes are intact, see paragraph B1.2, if necessary replace them with new ones.
15c Replace the suction motor with a new one, see paragraph B1.3.


Fig. 22

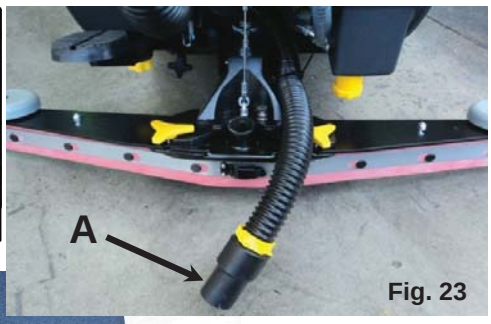


Fig. 23

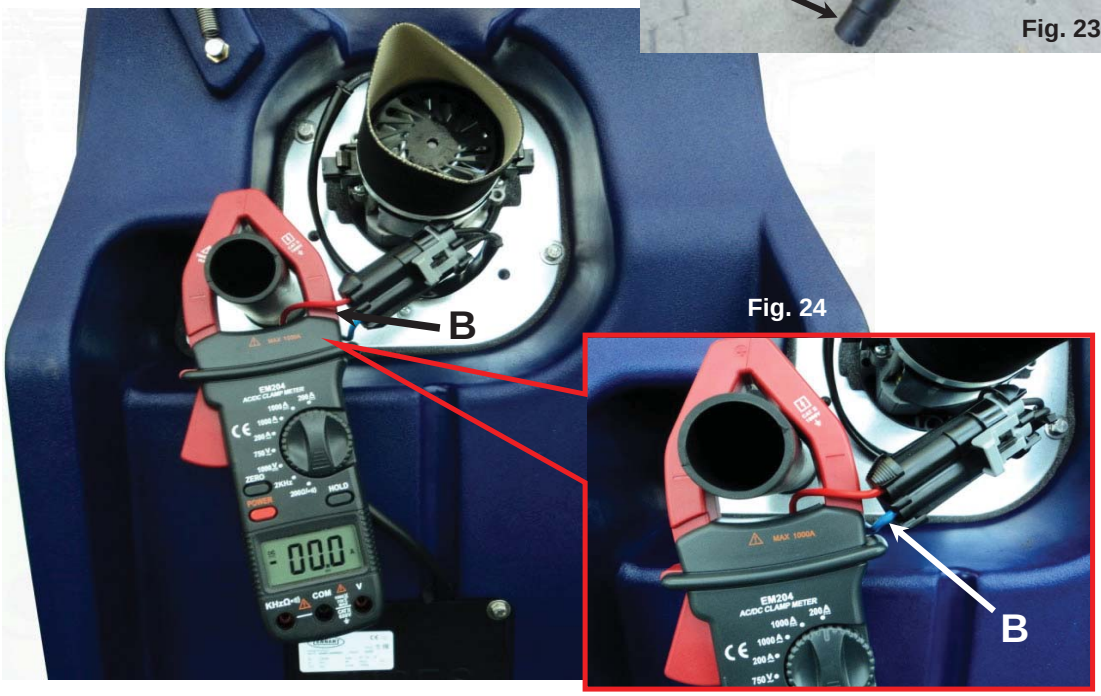


Fig. 24

Current input A (amperes)	Min	Max
No load (hose open)	15.0 A	19.0 A

B1.2 Replacing the suction motor carbon brushes

1. Move the machine onto flat and dry flooring.
2. Press the emergency switch (Traction) or switches into position "0" (Pad Assist).
3. Lift and turn the top dirty water tank.
4. Isolate and disconnect the power connector **A** to the suction motor, see Figure 19.
5. Remove the top cap **B** on the suction motor; this operation can be performed without removing the air exhaust pipe.
6. To remove the cap **B** pull the metal catch **C** outwards and open the two tabs **D**.

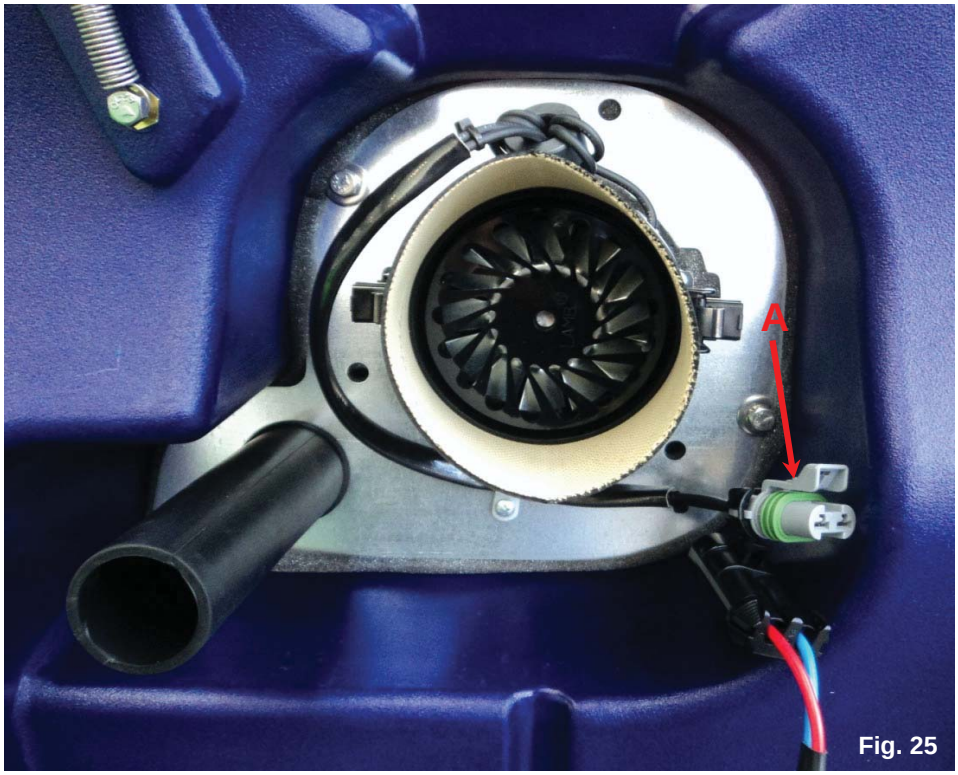


Fig. 25

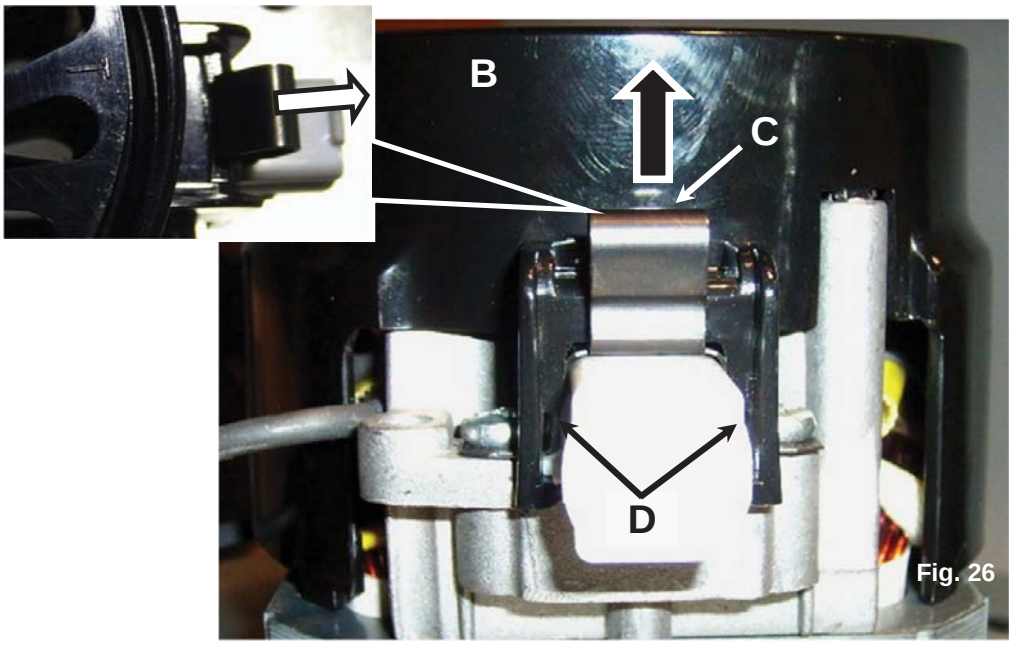


Fig. 26

7 Unscrew the two screw **E** that fasten the carbon brush support **F**.
8 Take care when handling the carbon brush support **F**, as it contains the spring that presses the carbon brush against the rotor, which may propel out the carbon brush

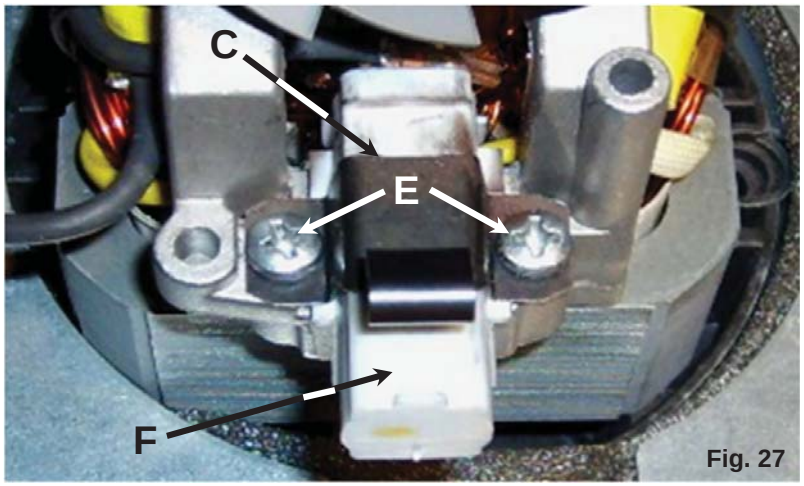


Fig. 27

9 Lift the carbon brush support **F** and remove the motor carbon brush **G**.
10 Measure the carbon brush: if the length is between 23,7 mm / 0,93 in (maximum), and 5,0 ± 1 mm / 0,2 ± 0,04 in (minimal), the carbon brush is still working, otherwise it must be replaced.
11 Repeat the operation for the second carbon brush.

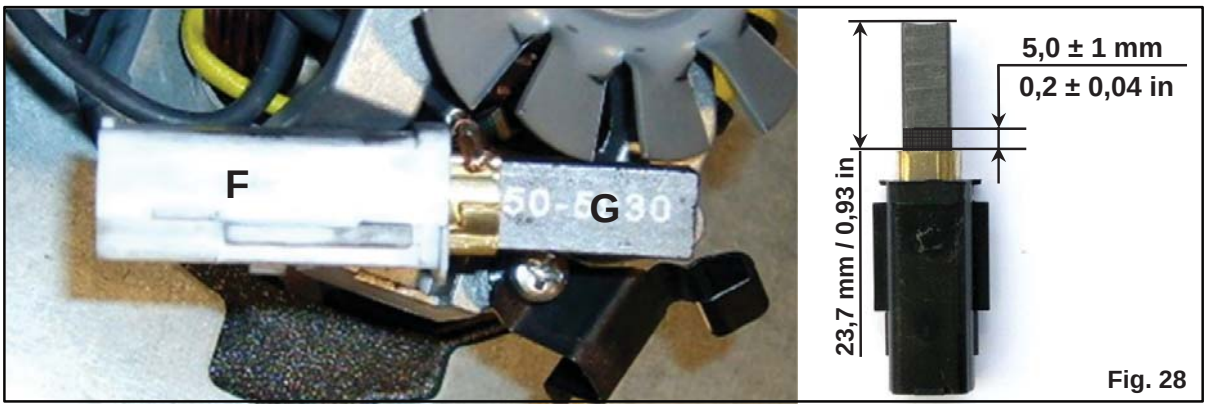


Fig. 28

Reassembly

1 Replace the suction motor performing the dismantling operations in reverse.
2 Test the correct operation of the suction motor, see paragraph B 1.1.

B1.3 Replacing the suction motor

Dismantling

1. Move the machine onto flat and dry flooring.
2. Press the emergency switch (Traction) or switches into position "0" (Pad Assist).
3. Lift and turn the top dirty water tank.
4. Isolate and disconnect the power connector **A** to the suction motor, see Figure 23.
5. Remove the white plastic clamp **B** that fastens the cable to the suction motor plate.
6. Unscrew the two M6 screw **C** that fasten the suction unit motor to the dirty water tank.

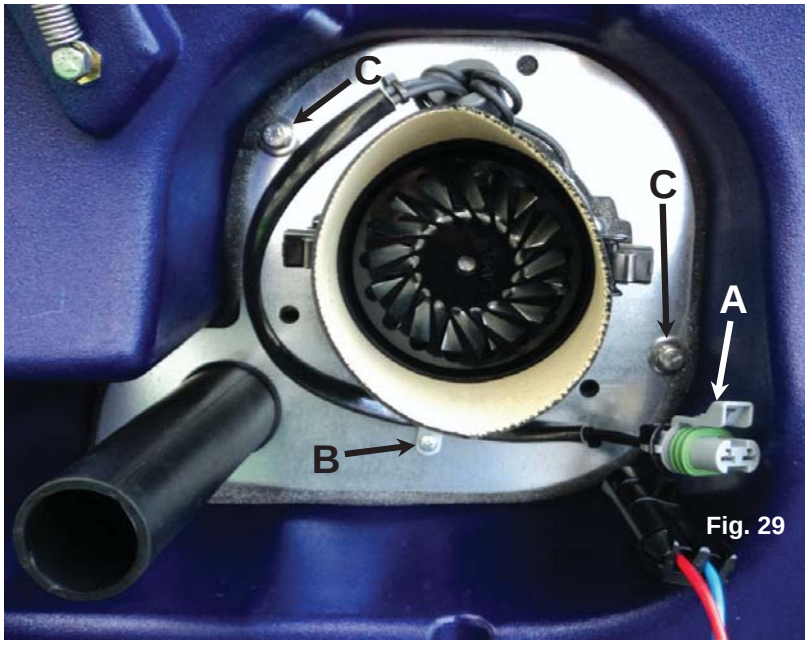


Fig. 29

7. Remove the suction motor from its compartment.
8. Check that the area inside the circle and the suction motor gasket **D** are not moist or wet, a sign of liquid being drawn in that may damage the bearings inside the suction motor, causing a louder metallic noise than normal.

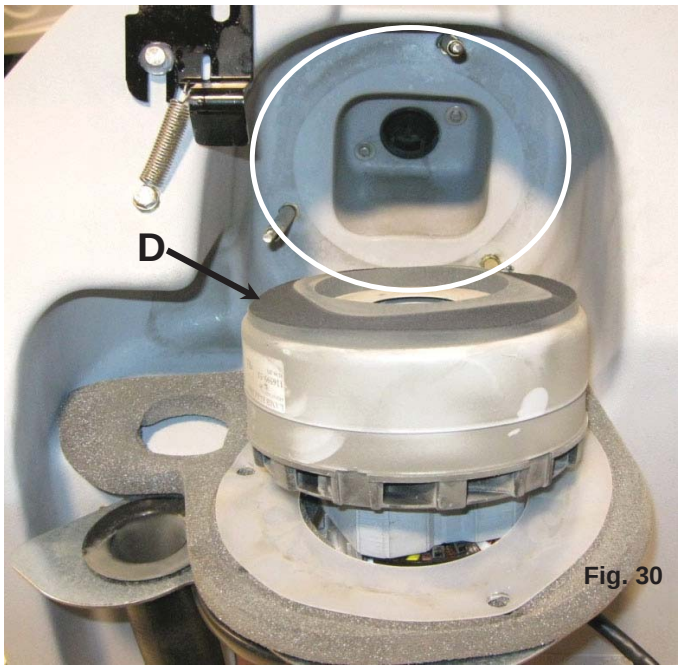


Fig. 30

9 Check that all the parts of the suction unit are in good condition: **D** suction motor gasket, **E** nylon flange, **F** sound absorbing sponge, **G** suction motor air exhaust pipe.

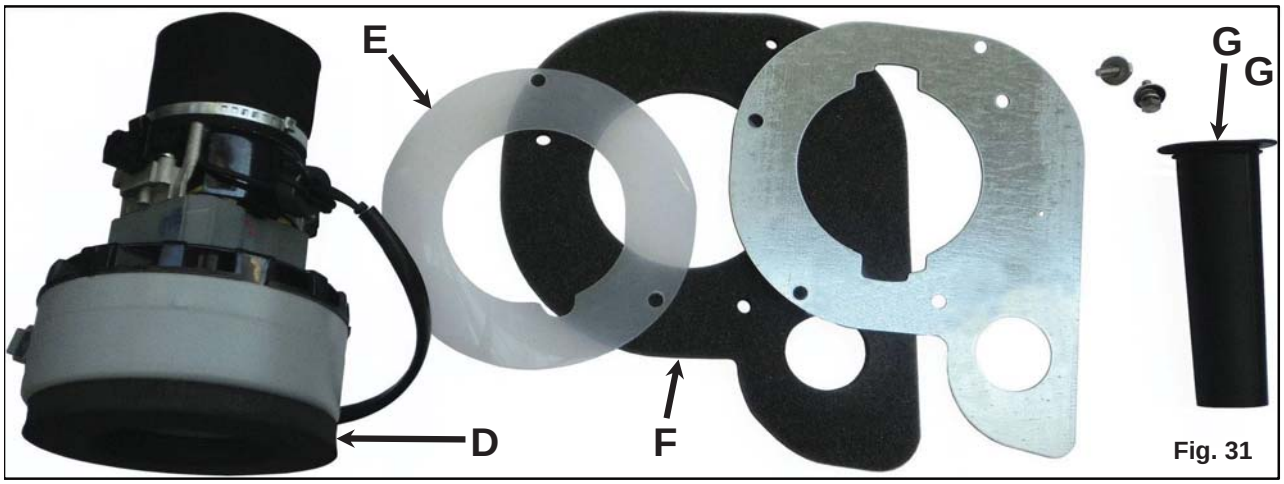


Fig. 31

When replacing the motor, also replace the suction motor gasket D purchased separately.

10 Replace the motor, and assemble it as shown in Figures 25 - 26.

Fig. 32

Reassembly

1 For assembly perform the dismantling operations in reverse.
2 Test the correct operation of the suction motor, see paragraph B 1.1.

B2 SQUEEGEE UNIT

Fig. 33

B2.1 Adjusting the squeegee

1. Move the machine onto flat and dry flooring.
2. Press the emergency switch (Traction) or switches into position "0" (Pad Assist).
3. Start a washing cycle in normal operation.
4. Travel a few metres (forwards) with the machine.
5. Check that the blade is in even contact with the floor, with suitable deflection across the width, Figure 28.
6. If this is not the case, adjust the blade.
7. First adjust the angle of the squeegee, using the bolt **A,** until the blade touches the flooring uniformly.
8. Adjust the deflection of the squeegee blade using the two wheels **B**, tightening decreases the deflection, loosening increases the deflection. Adjust until one edge of the blade is touching the flooring, see the box in Figure 28 - 29 - 30 - 31.

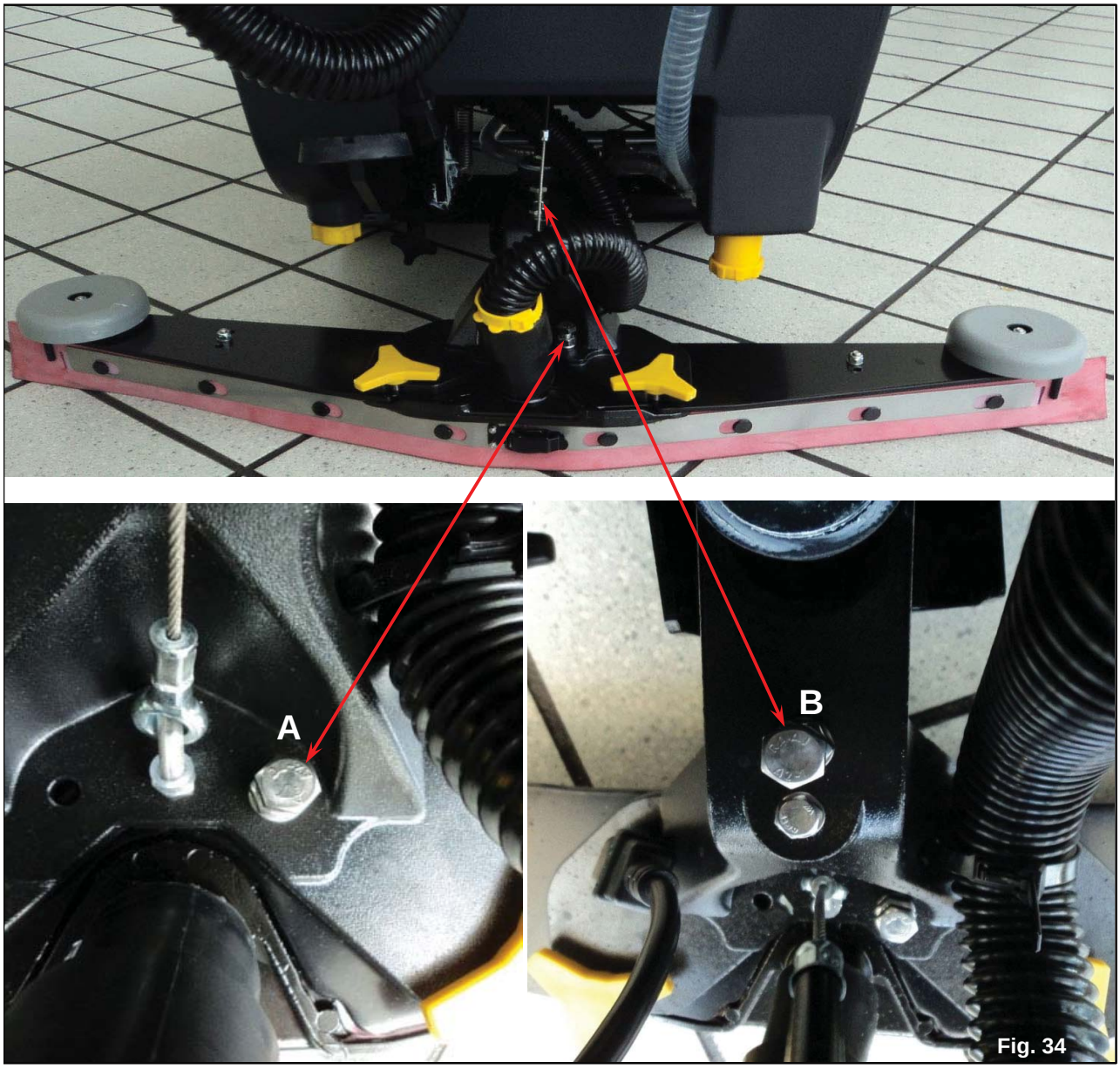


Fig. 34

9 Screwing the screw **A**, the squeegee support lowers the edges of the squeegee, increasing the deflection (compression) on the blade at the sides of the squeegee, taking deflection off the centre.

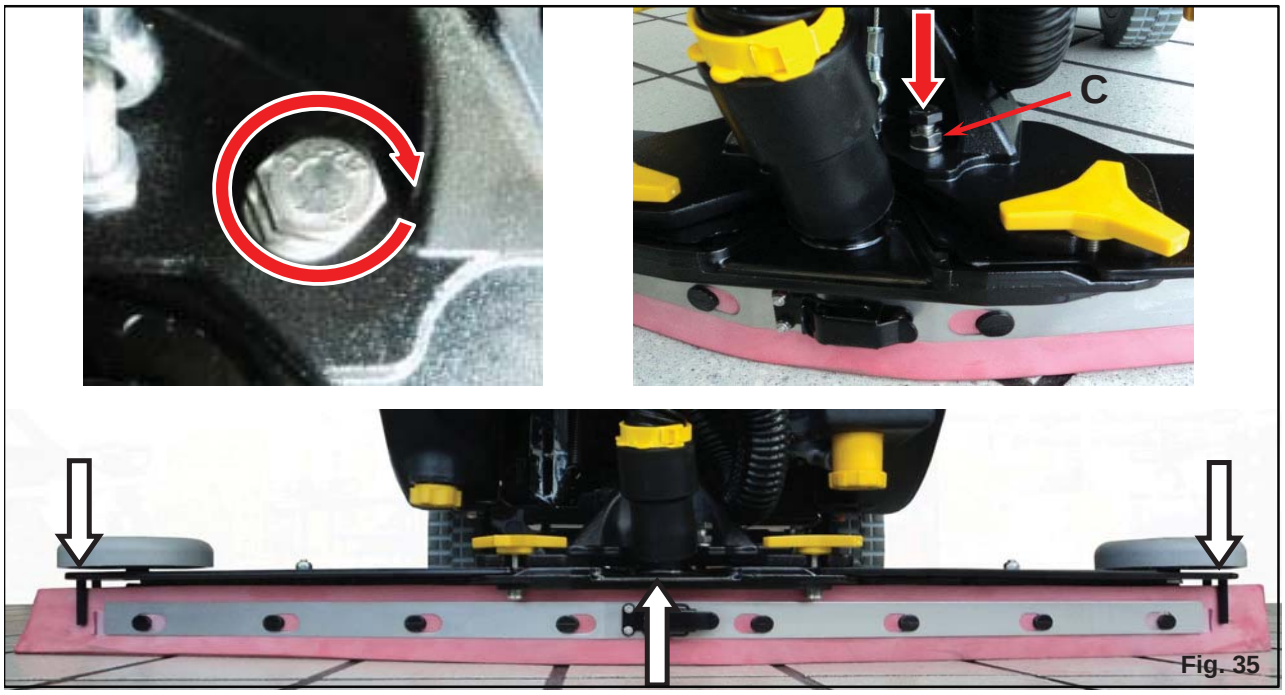


Fig. 35

10 Unscrewing the bolt **A**, the squeegee support rais the edges of the squeegee, decreasing the deflection on the blade at the sides of the squeegee and it increasing deflection on the centre.

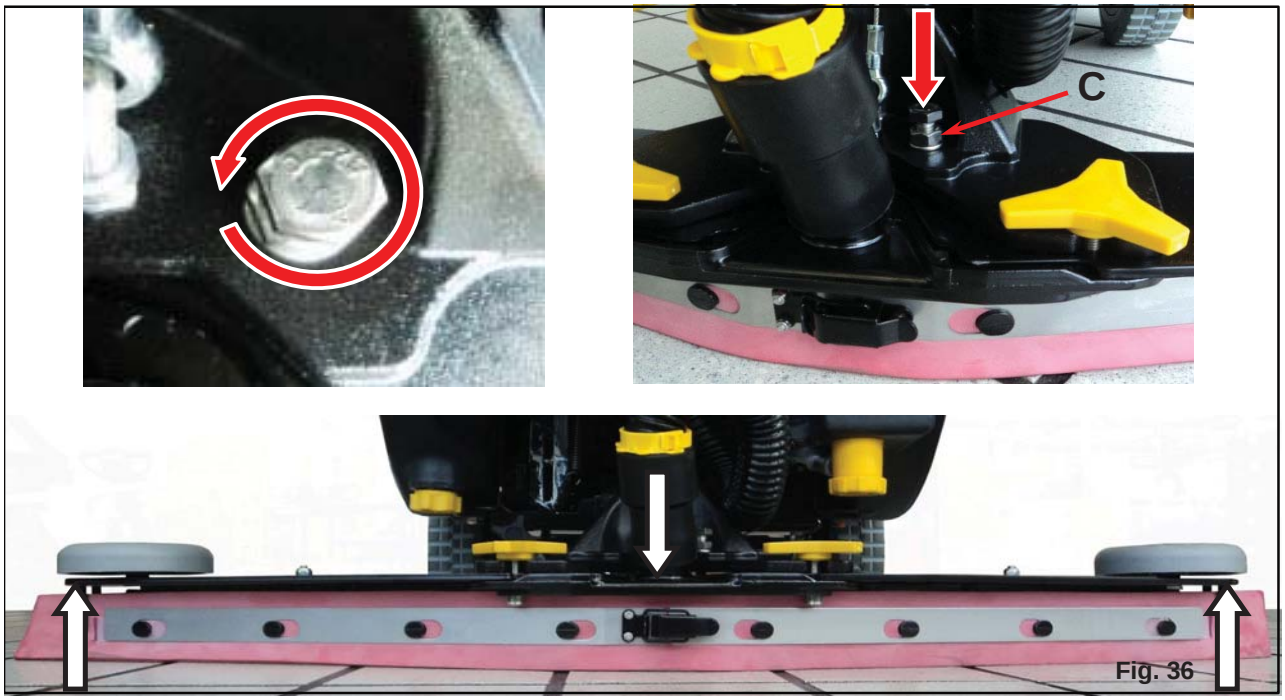


Fig. 36

11 Once having found the right angle, when the squeegee is perfectly parallel to the flooring, hold screw **A i**n place lock the position with the nut **C**.

12 Adjust the deflection of the blade by means of the screw **D**.
13 By screwing the screw **D**, the squeegee rises, decreasing the deflection on the blade.
14 By unscrewing screw **D**, the squeegee is lowered, increasing the deflection on the blade.
15 Once having found the right deflection, when the blades are slanted correctly with respect to the floor, hold screw **D** in place lock the position with the nut **E**.

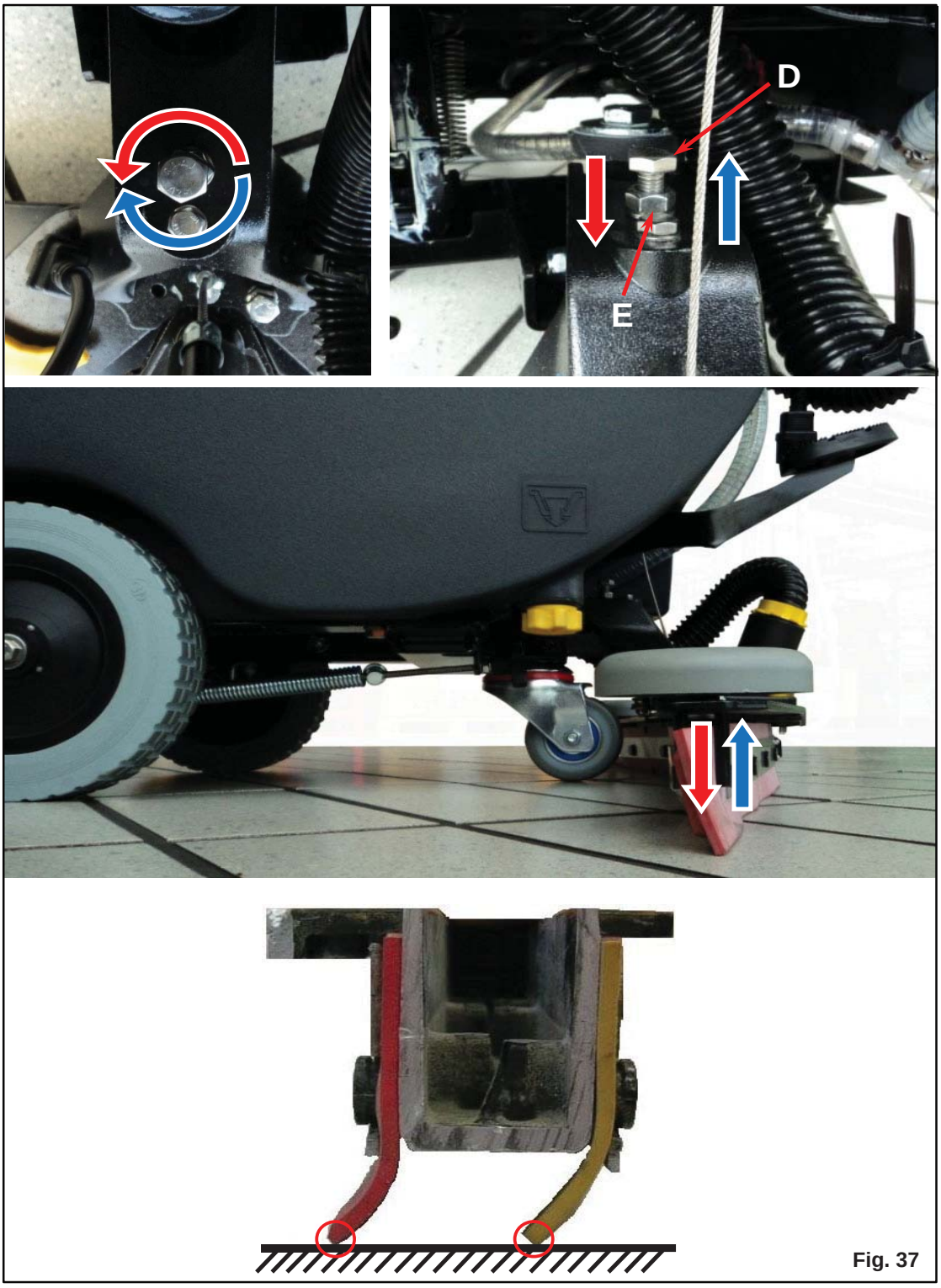


Fig. 37

B2.2 Replacing the squeegee blades

Dismantling

1. Remove the suction hose **A** from the squeegee.
2. Remove the squeegee from the dedicated support, unscrewing the knobs **B**
3. Open the levers that lock the blade pressing devices, front **C** and rear **D**, once released slide them outwards.
4. Remove the blades.
5. **The squeegee blades have been designed symmetrically, so that they can be rotated on all four edges before being replaced, see Fig. 33.**

The rear squeegee blade should be turned around every 50 operating hours.

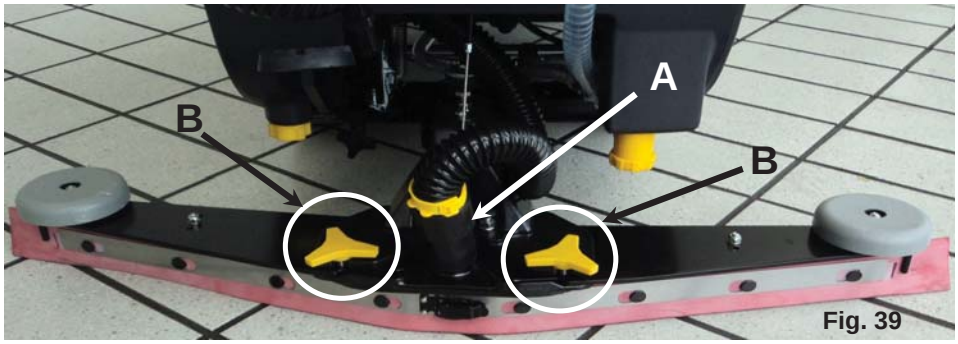


Fig. 39

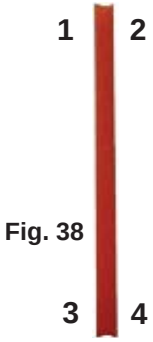


Fig. 38

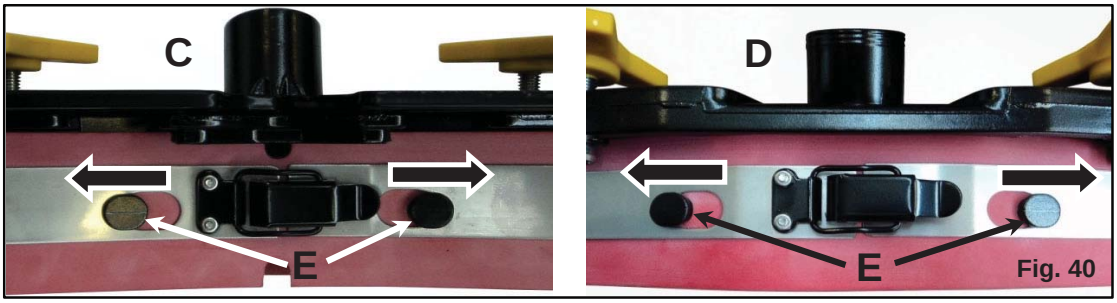


Fig. 40

Reassembly

1. Clean the squeegee blades before reassembling them.
2. Clean the body of the squeegee where the old or new blades will be fitted.
3. Arrange the blades on the squeegee, lining up the holes with the reference pins **E**; do not exchange the front blades **F** and rear blades **G**.

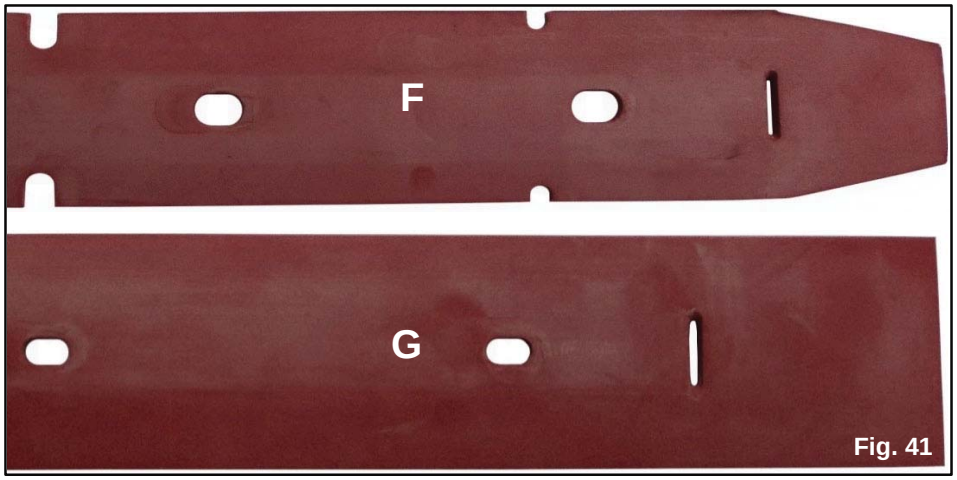


Fig. 41

4 Reassemble the front and rear blade by fixing the ends using the white nylon straps **H**, as shown in the photos below.

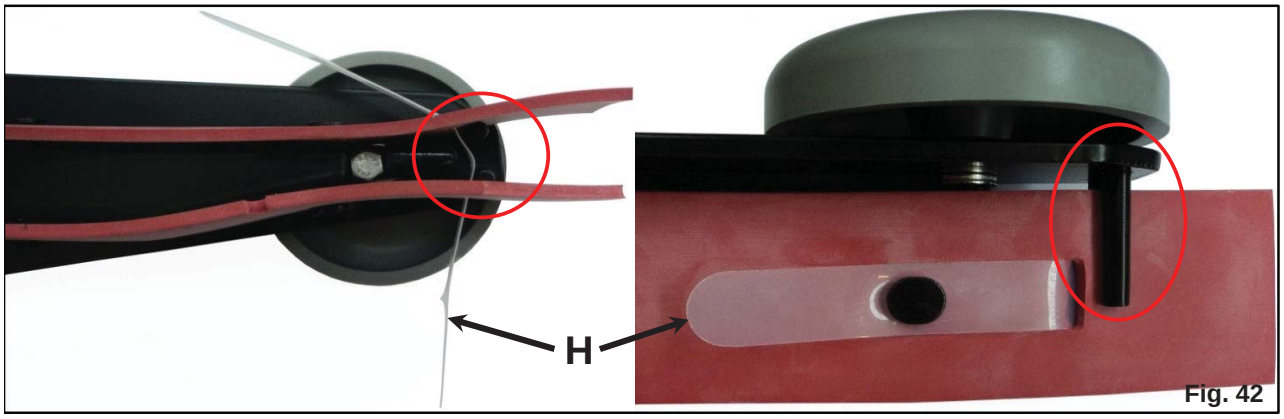


Fig. 42

5 Reassemble the blade pressing devices, front and rear.
6 Reposition the squeegee on the support, and reassemble the suction hose.
7 Adjust the squeegee, as described in paragraph B 2.1.

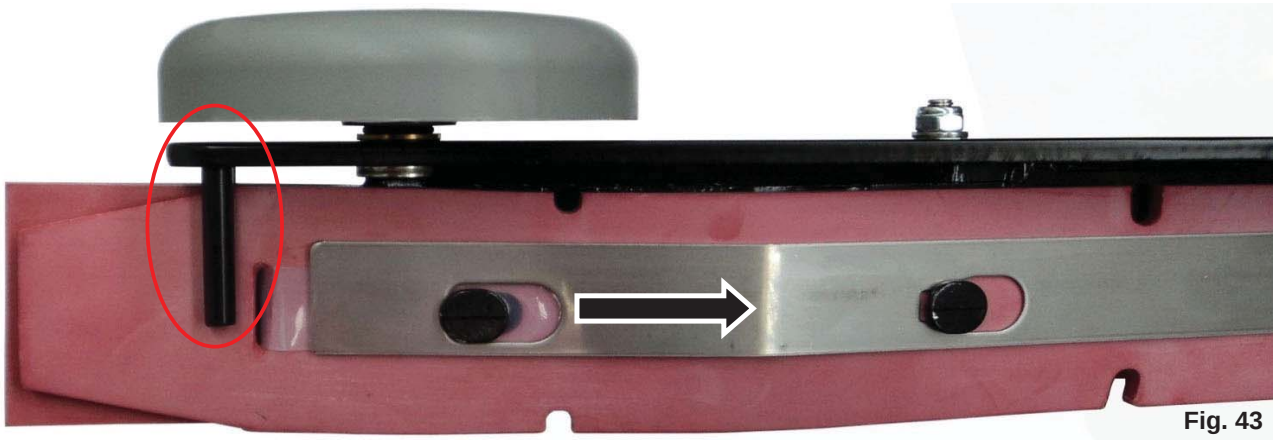


Fig. 43

B2.3 Replacing the squeegee.

1 For the complete replacement of the squeegee, proceed as described in points B 2.1.
2 For the replacement of the squeegee, body only, proceed as described in points B 2.1 and B 2.2.

B3 CHECKING AND REPLACING THE FLOATS

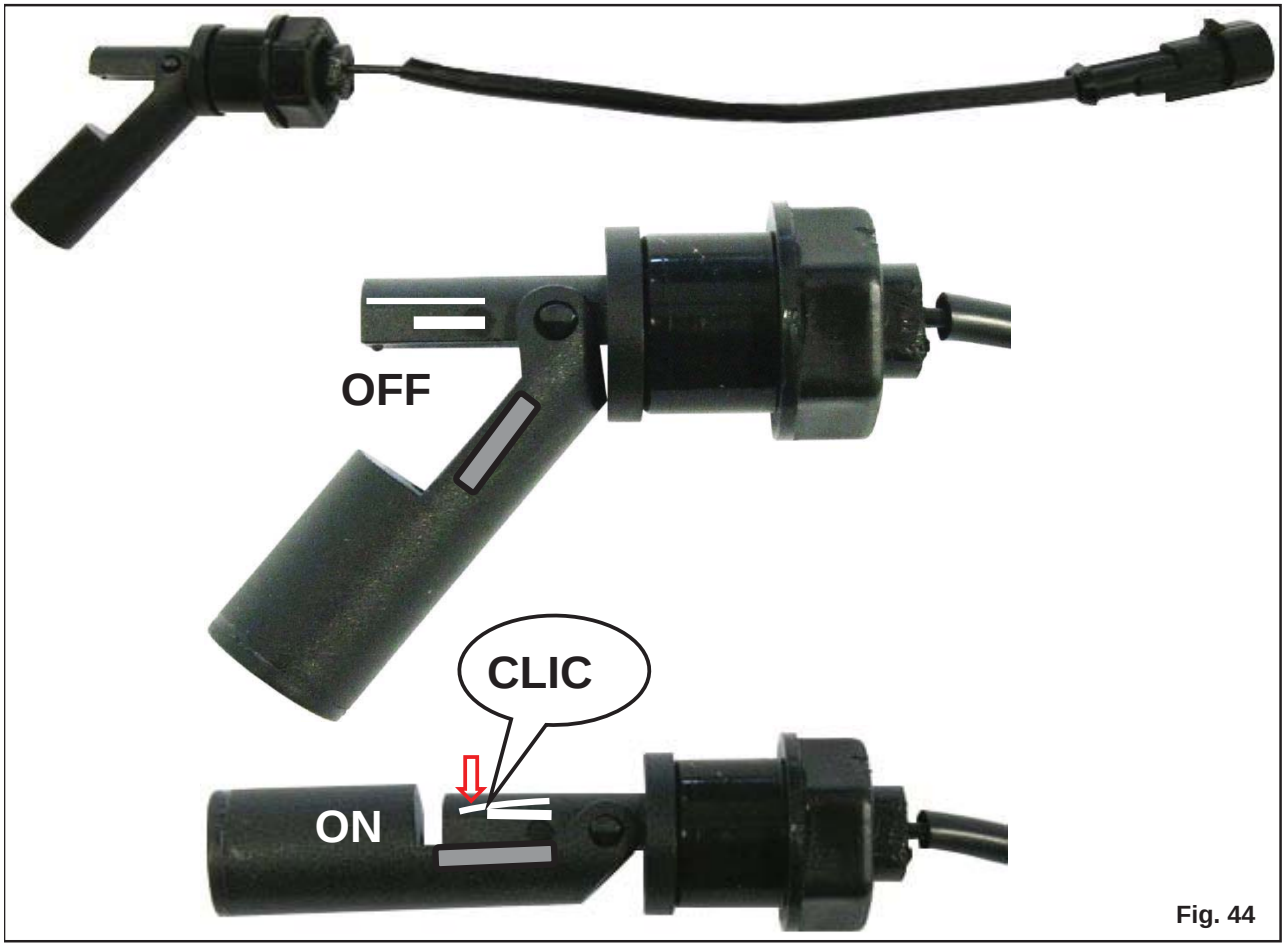


Fig. 44

B3.1 Checking operation of the solution tank float

1 Use a tester set to read resistance in **Ω** or check the diodes, see Figure 41.
2 Move the machine to the tank draining area, and completely empty the solution tank.
3 Move the machine onto flat and dry flooring.
4 Press the emergency switch (Traction) or switches into position "0" (Pad Assist).
5 Identify the point where the float is fitted on the solution tank.
6 Lift the dirty water tank to access the connector **A** on the float.
7 Unplug the connector **A** so as to be able to perform the check.
8 Connect the two tester probes to the pins on the float connector; the position is not important.
9 If the float is working correctly, the tester will emit a BEEP (if featured), or will display a value with just zeroes.
10 Plug the connector back in.
11 If the tester display does not change:
11a Remove the float to check that there is nothing stopping it from rotating completely.
11b Reposition the float.

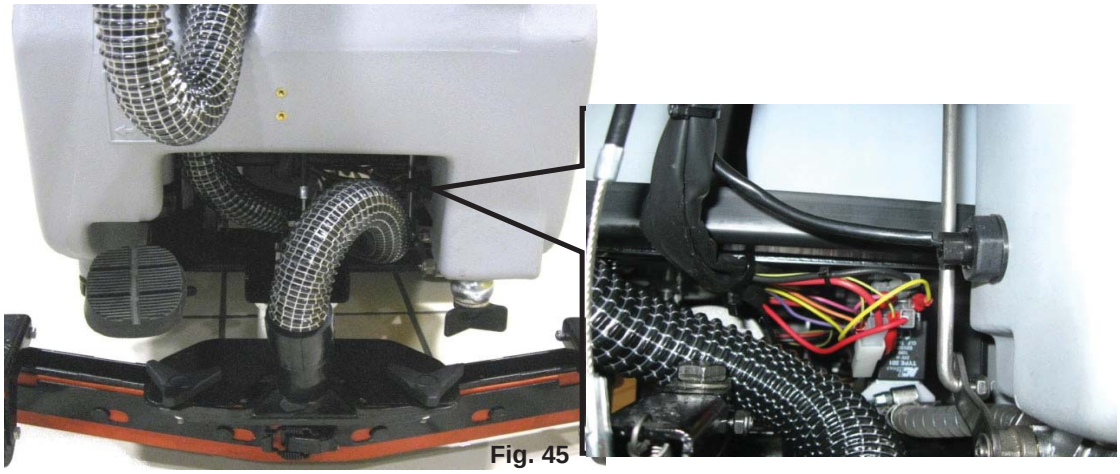


Fig. 45

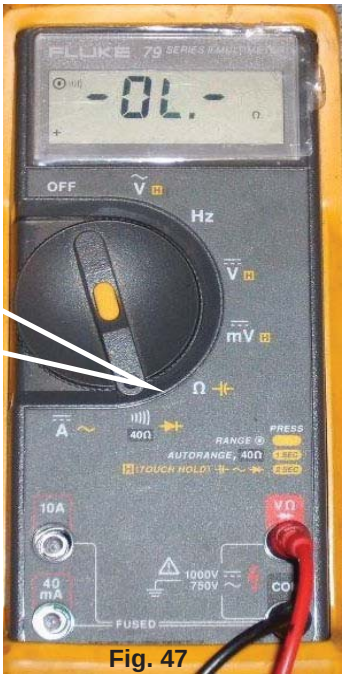


Fig. 47

Fig. 46


Fig. 48

B3.2 Replacing the solution tank float

Dismantling

1. Move the machine to the tank draining area, and completely empty the solution tank.
2. Move the machine onto flat and dry flooring.
3. Press the emergency switch (Traction) or switches into position "0" (Pad Assist).
4. Identify the point where the float is fitted, see paragraph B 3.1.
5. Unplug the connector **A** so as to allow replacement.
6. Cut the plastic clamp that holds the float cable to the main wiring.
7. Remove the float from the tank, holding the body of the float **B** and unscrewing the bolt **C**.
8. Remove the float from the solution tank.
9. Replace the float with a new one **D**.

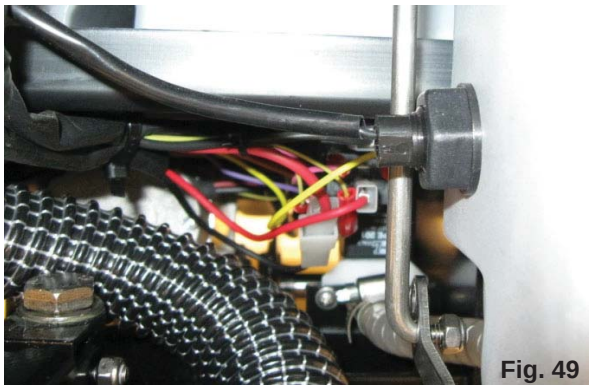


Fig. 49

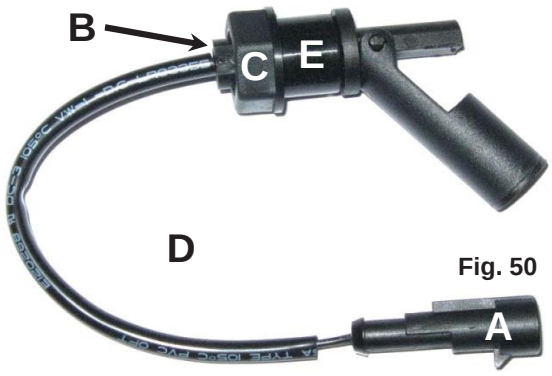


Fig. 50


Fig. 51

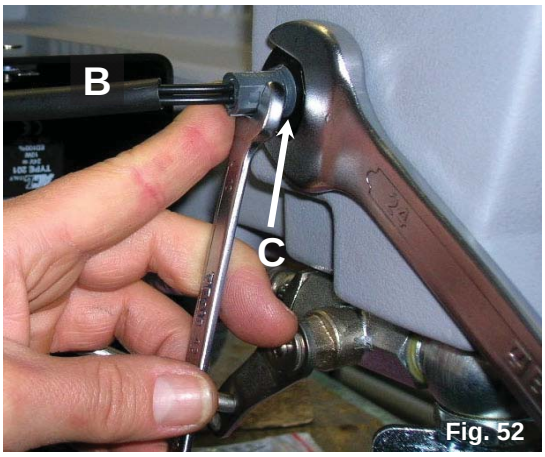


Fig. 52

Reassembly

1. Fit the new float performing the dismantling operations in reverse
2. Pay special attention to the position of the float in the tank, see Figure 45.
3. Pay special attention to the seal gasket **E** on the new float.
4. Tighten the float to the tank holding the body **B** and tightening the bolt **C**, making sure not to damage the thread on the body of the float **B** and the gasket **E**.
5. Use a 10 mm / 0,39 in (13/32) spanner to hold the body of the float and a 24 mm / 0,94 in (61/64) spanner to tighten the plastic nut, with moderate force.

B3.3 Checking operation of the dirty water tank float

1 Use a tester set to read resistance in **Ω** or check the diodes, see Figure 50.
2 Move the machine to the tank draining area, and completely empty the dirty water tank.
3 Move the machine onto flat and dry flooring.
4 Press the emergency switch (Traction) or switches into position "0" (Pad Assist).
5 Identify the point where the float is fitted on the dirty water tank.
6 Unscrew the three bolts **A** that fasten the instrument panel to the solution tank.
7 Identify the float connector **B**.
8 Unplug the connector **B** so as to be able to perform the check.
9 Connect the two tester probes to the pins on the float connector, the position is not important.
10 Keep the float raised by hand or hold it position with an elastic band, see Figure 49.
11 If the float is working correctly, the tester will emit a BEEP (if featured), or will display a value with just zeroes.
11a Plug the connector back in.
12 If the tester display does not change:
12a Check that the moving part of the float can come into contact with the fixed part.
12b Reposition the float.

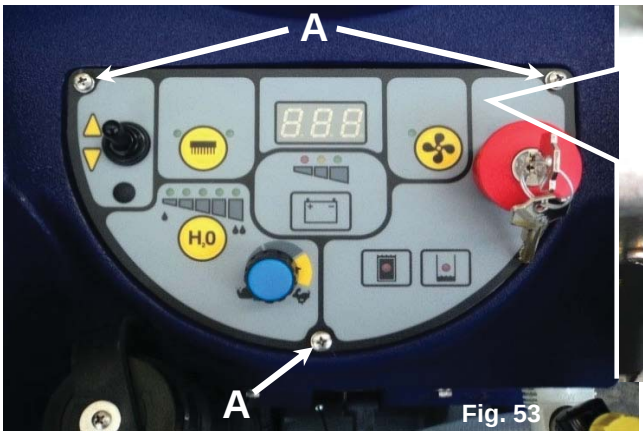
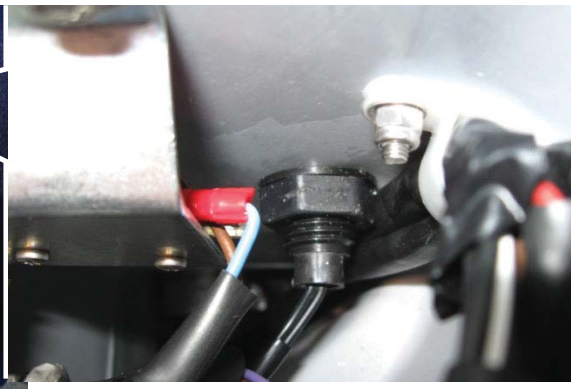


Fig. 53



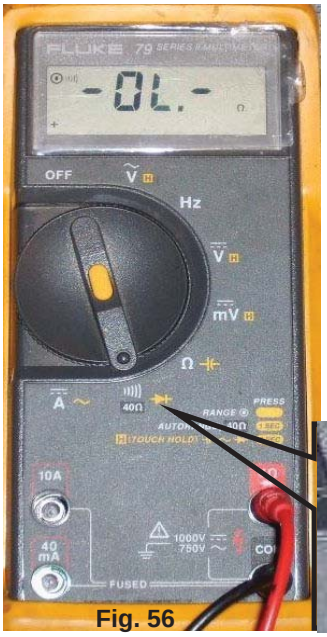


Fig. 56

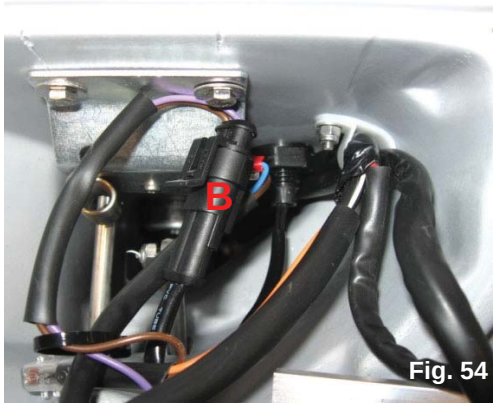


Fig. 54


Fig. 55


Fig. 57

B3.4 Replacing the dirty water tank float

Dismantling

1. Move the machine to the tank draining area, and completely empty the dirty water tank.
2. Move the machine onto flat and dry flooring.
3. Press the emergency switch (Traction) or switches into position "0" (Pad Assist).
4. Identify where the float is fitted on the dirty water tank, proceed as described in paragraph B3.3.
5. Identify the float connector **A** and unplug it.
6. Unscrew the nut **B** to release the white plastic clamp and remove the cable from the float.
7. Make sure not to lose the bolt and the washer **C** found inside the tank.
8. Remove the float from the tank, holding the body of the float **E** and unscrewing the bolt **F**.

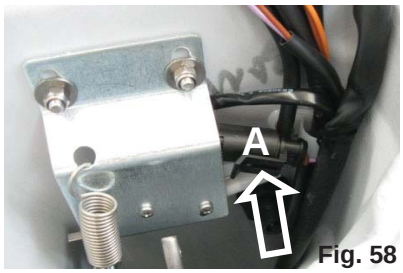


Fig. 58

Fig. 59

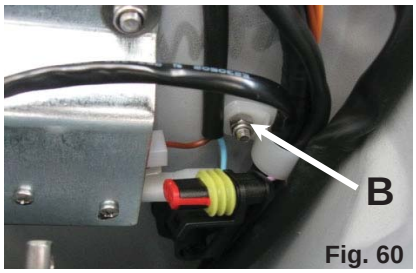


Fig. 60

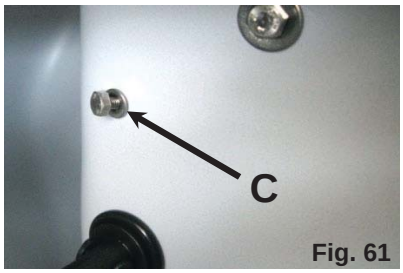


Fig. 61

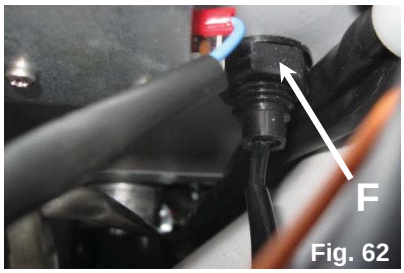


Fig. 62

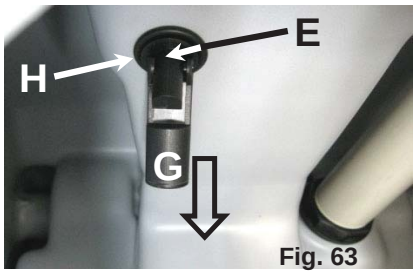


Fig. 63

8. Remove the float from the dirty water tank.
9. Replace the float with a new one **E**.

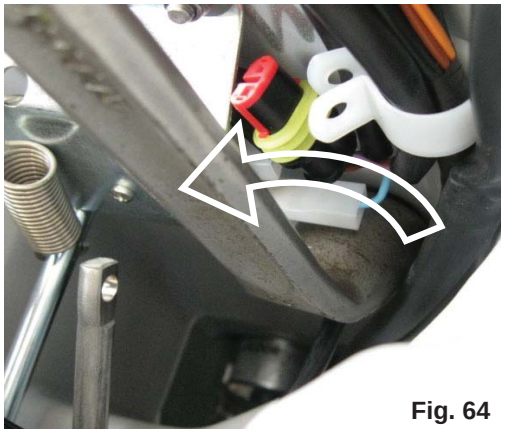


Fig. 64

Fig. 65

Reassembly

1. Fit the new float performing the dismantling operations in reverse
2. Position the float as shown in Figure 57, with the part **G** tilted towards the bottom of the tank.
3. Pay special attention to the seal gasket **H** on the new float when inserting it into hole.
4. Screw it onto the tank holding the body **E** and tightening the bolt **F**, making sure not to damage the thread on the body of the float **C** and the gasket **H**, tighten with moderation.

WARNING

Go to the designated draining area and empty the solution and dirty water tanks using the drain plugs and the hose provided.

Move the machine onto flat ground. If necessary, place chocks under the wheels.

Press the emergency switch, for the version with drive, or disable the functions by moving the switch to position “0” on all other versions.

Disconnect the battery from the machine’s electronics by simply disconnecting the negative pole only, for the battery versions, or unplugging from the mains power supply for the cable versions.

i INFORMATION

Indicates particularly important instructions.

In this Service Manual, the terms RIGHT and LEFT are used to indicate the sides of the machine.
These always refer to the direction of travel of the machine.

In this Service Manual, the machine version may be written in brackets (Traction, Pad Assist) or quotation marks "Traction - Pad Assist".
This note indicates that the instructions only refer to the version specified in brackets or quotation marks.

C1 INSTRUMENT PANEL ELECTRONIC BOARD

i ***On the "Traction" version, the board also comprises the circuits that deliver power the drive motor.***

TRACTION VERSION

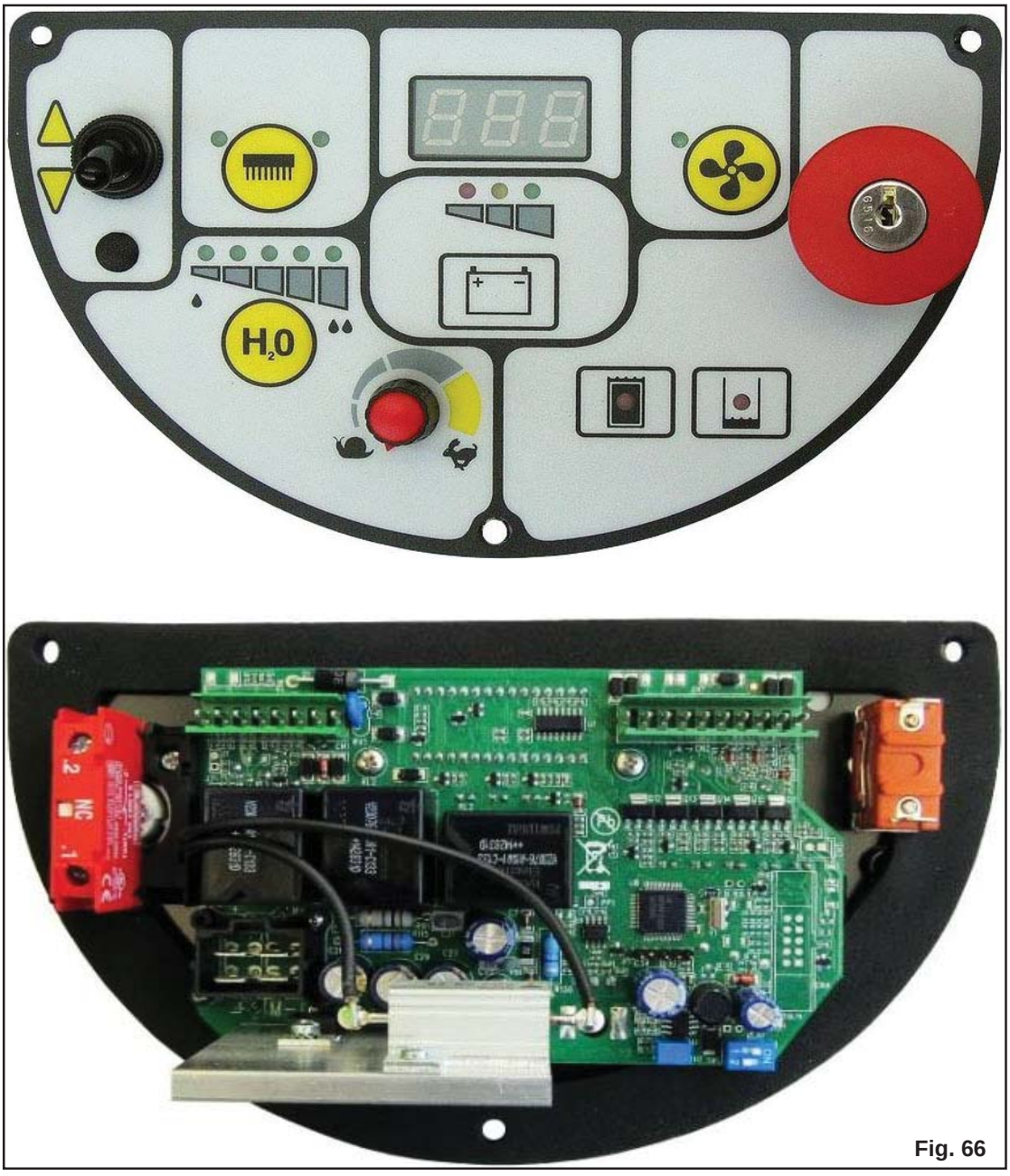


Fig. 66

C1.1 Instrument panel board, setting the type of batteries and EcoMode

Set the instrument panel board according to the type of batteries (Acid or Gel) fitted or to be fitted, for best performance.
The discharge voltage threshold for ACID batteries is 20.5 V.
The discharge voltage threshold for GEL batteries is 21.5 V.

Selection of the type of battery is very important, as an incorrect selection may affect battery life and operating autonomy.
The type of battery is marked on the battery casing.
The batteries can be divided into three categories: “Pb-Acd” lead-acid, “AGM” locked acid, and “GEL”, with the plates coated by gel.

Setting on "Traction" versions with drive

1 Turn the ignition key **A1** on the emergency button **A** to the right.

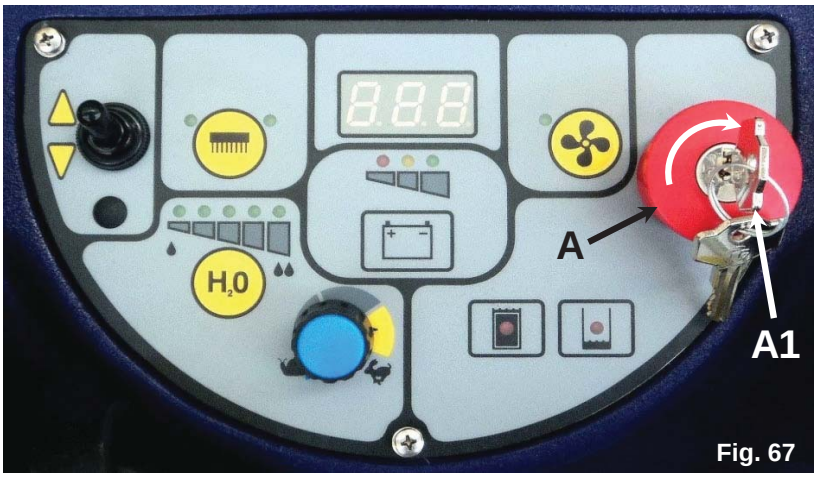


Fig. 67

2 Press and hold the brush button **B** and the suction motor button **C** together for around 5 seconds, and in any case until the display shows the type of batteries set.

Fig. 68

3 Use the button **C** to select the type of battery, between GEL and ACID.

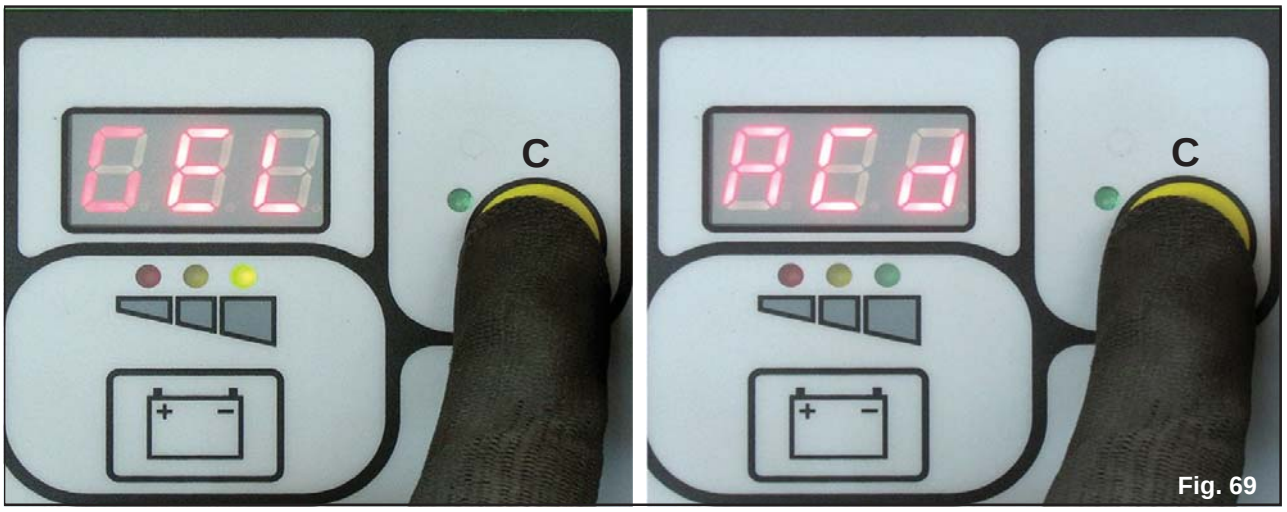


Fig. 69

Setting EcoMode on "Traction" versions with drive

4 Using the button **B**, choose whether to modify the setting of the type of batteries, or the water/solution metering mode.

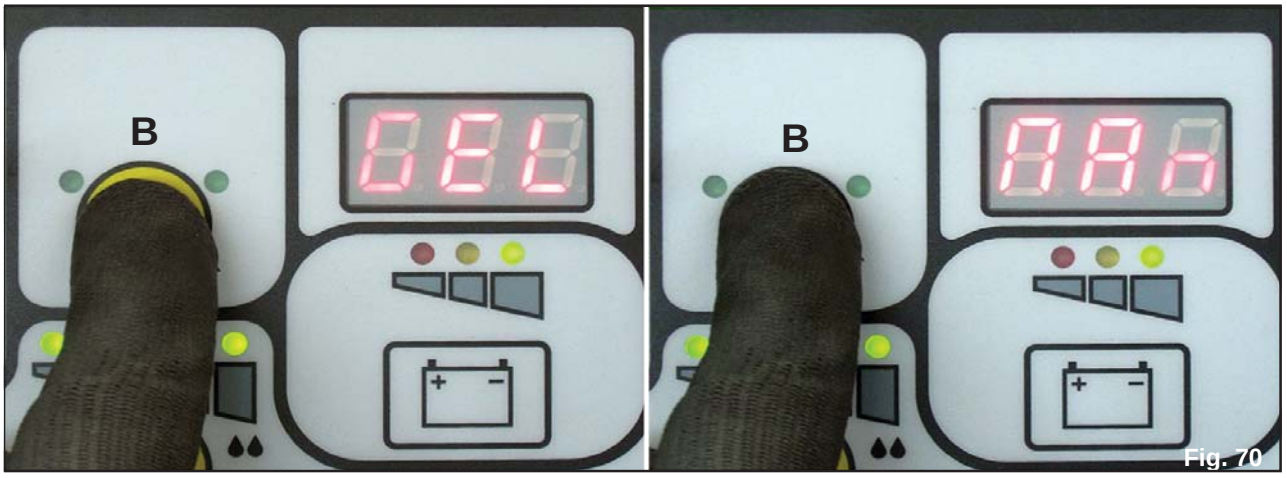


Fig. 70

i *Water/solution is indicated, as the "clean water" tank can be filled with either a solution of water and detergent, or water only, using the special Chem-dose kit that distributes the detergent to be mixed with water directly onto the brushes, thus avoiding waste.*

5 Pressing the button **C**, select whether to meter the water/solution manually, or automatically (EcoMode).

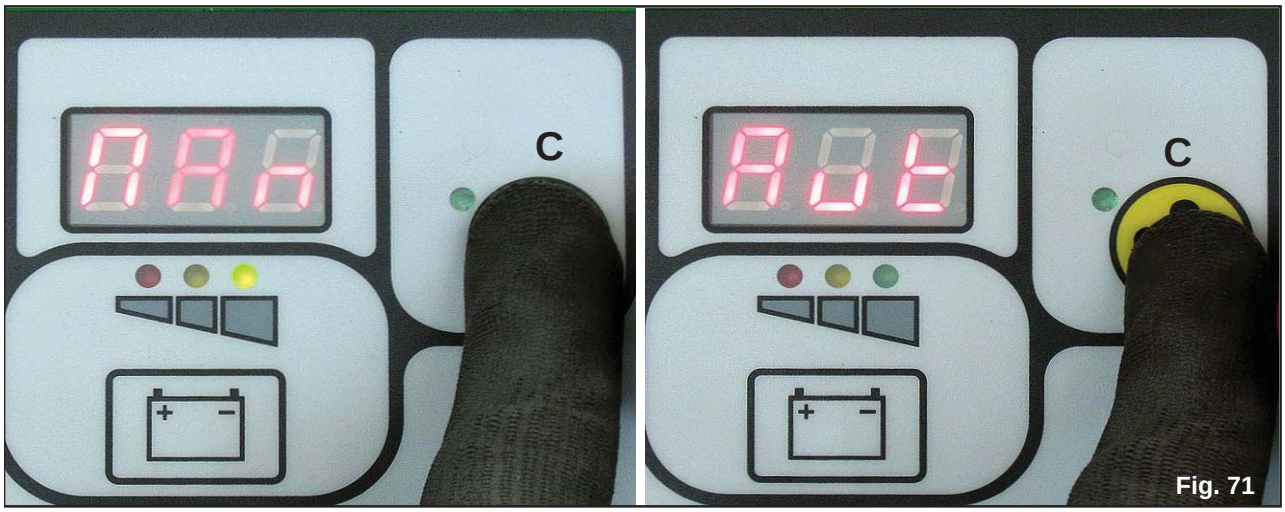
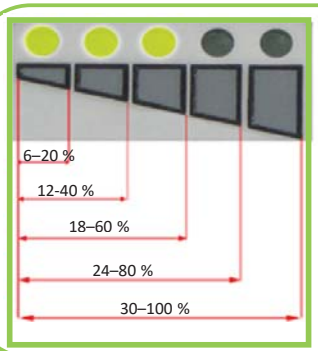


Fig. 71

i *The EcoMode function delivers water/solution in proportion to machine travel speed and one of the five programs selected on the instrument panel. In this way, when machine speed changes, there is no need to constantly and manually adjust the quantity of water delivered.*

6 To save the settings, simply switch the machine off using the emergency button **A** for machines with drive. For all other machines, press and hold the brush button **B** until the display switches off.

Fig. 72



ESS (Eco Solution System)

EcoMode, on models with electric drive, delivers a flow of solution that is proportional to machine travel speed, as is already currently available on our large ride-on machines.

- 5 different programs are available: each delivers from a minimum to a maximum amount of solution, based on machine travel speed.

(The percentages of water delivered are shown in the table on the side)

Setting on "Pad Assist" versions without drive

7 Switch the machine on using the brush button **B**.

Fig. 73

8 Press and hold the brush button **B** and the suction motor button **C** together for around 5 seconds, and in any case until the display shows the type of batteries set.

Fig. 74

9 Use the button **C** to select the type of battery, between GEL and ACID.

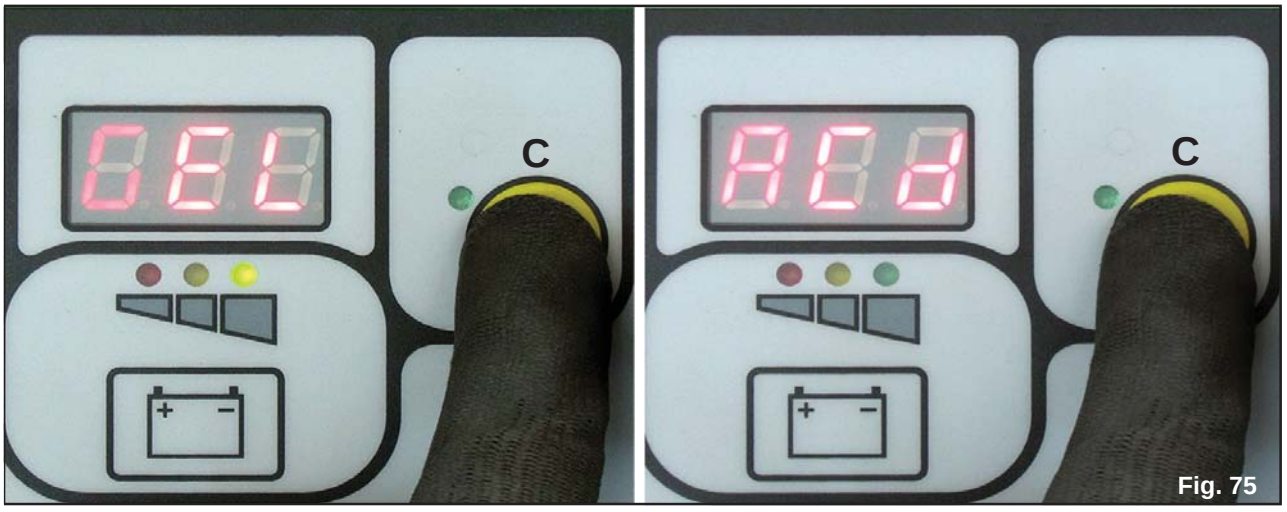


Fig. 75

10 To save the new setting, press the brush button **B** and the suction motor button **C** together for 5 seconds, or wait around 10 seconds, until the display shows the machine operating hours.

Fig. 76

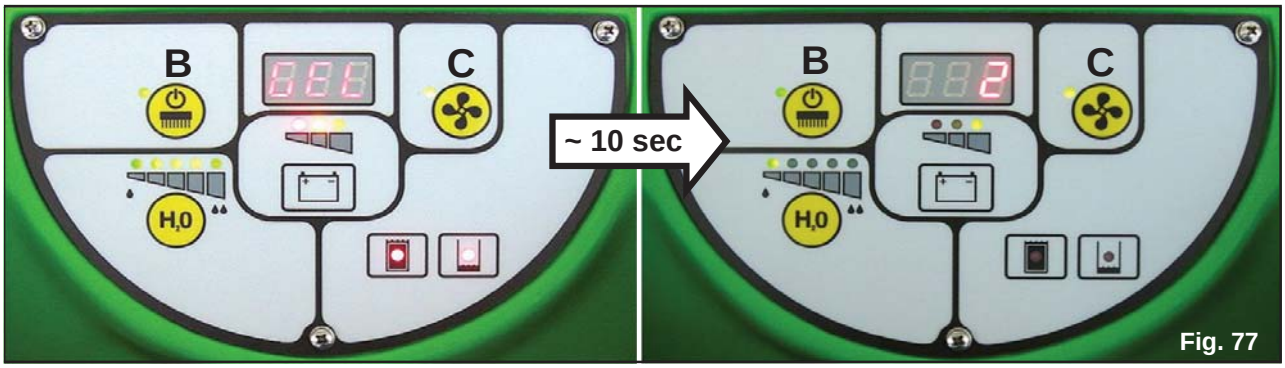


Fig. 77

11 Switch the machine off by pressing the brush-on/off button for more than 3 seconds.

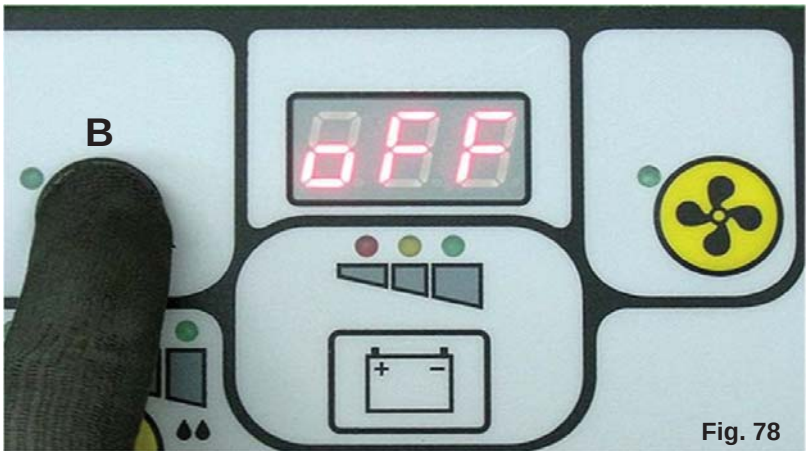


Fig. 78

C1.2 Dismantling the instrument panel board

Disassembly

1. Switch the machine off by pressing the emergency button **A** fully in.
2. Disconnect the batteries that power the machine, to avoid dangerous short circuits.
3. Unscrew the three screws **B** that fasten the instrument panel to the dirty water tank.
4. Lift the board and turn it over with care.

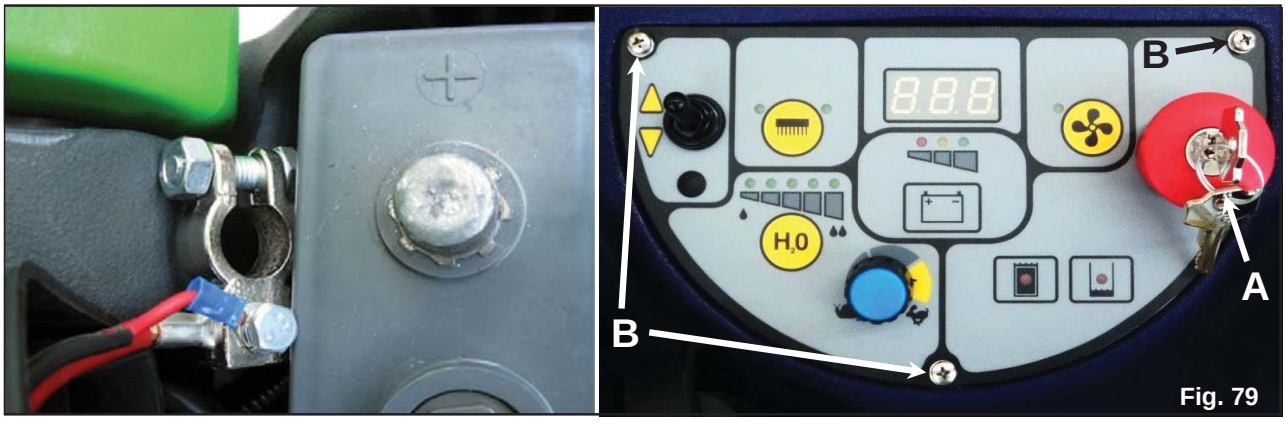


Fig. 79

5. Disconnect the multi-wire orientation-sensitive connectors**C, D,** from the electronic board with care.

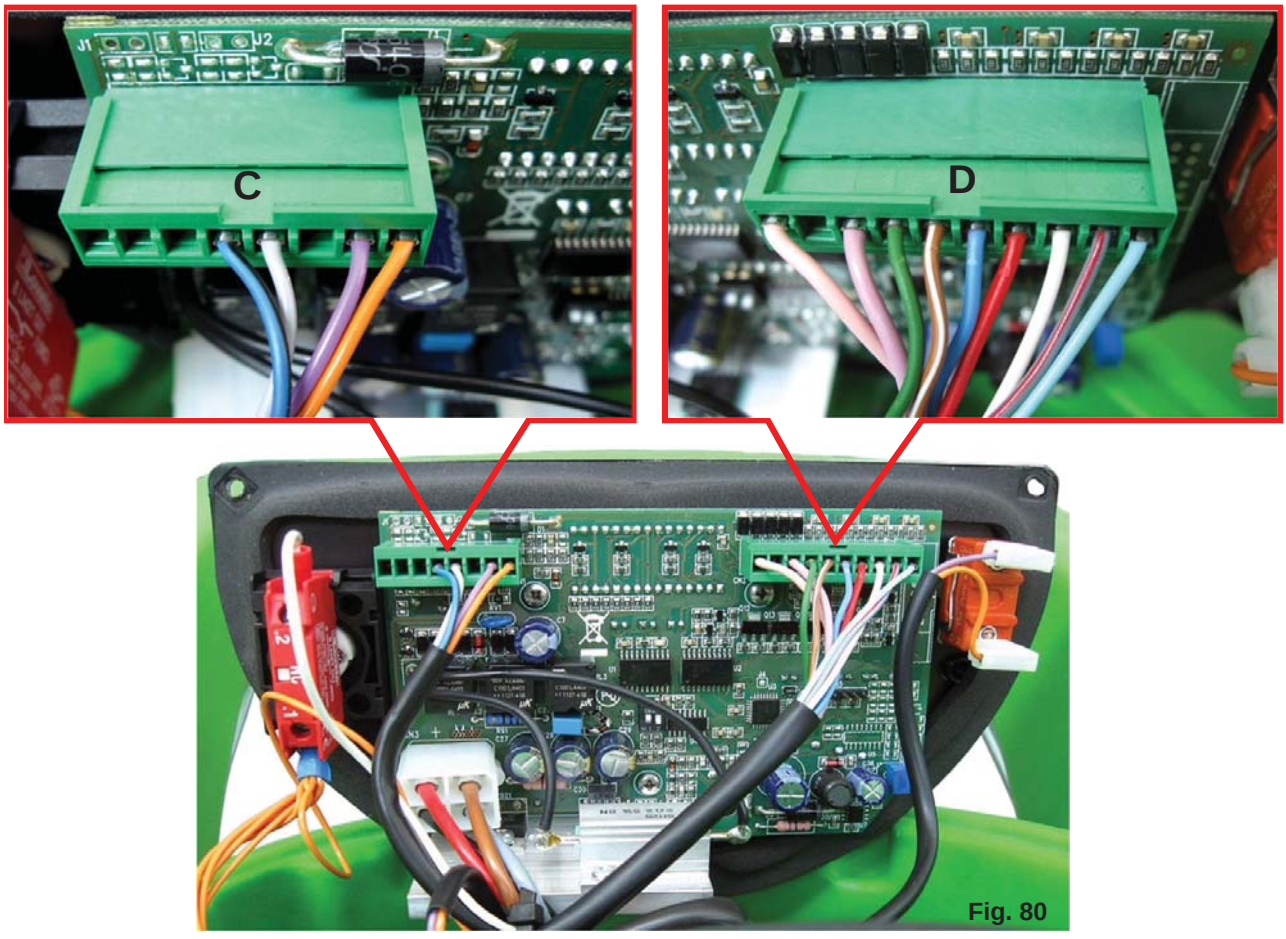


Fig. 80

6 To remove the contact **E** from the "mushroom" head or emergency button, use a flat-head screwdriver to slightly lift the tab until it detaches from the support. Being an ON/OFF switch, when reassembling, its orientation is not important.

7 Detach the two wires (orange and purple) connected to the forwards-reverse switch **F**, when reassembling, being an ON/OFF contact, the position of the wires is not important.

8 Disconnect the four-pin connector **G** dedicated to traction motor taking special care. Assembly is orientation-sensitive by the locking connector fitted on the instrument panel board.

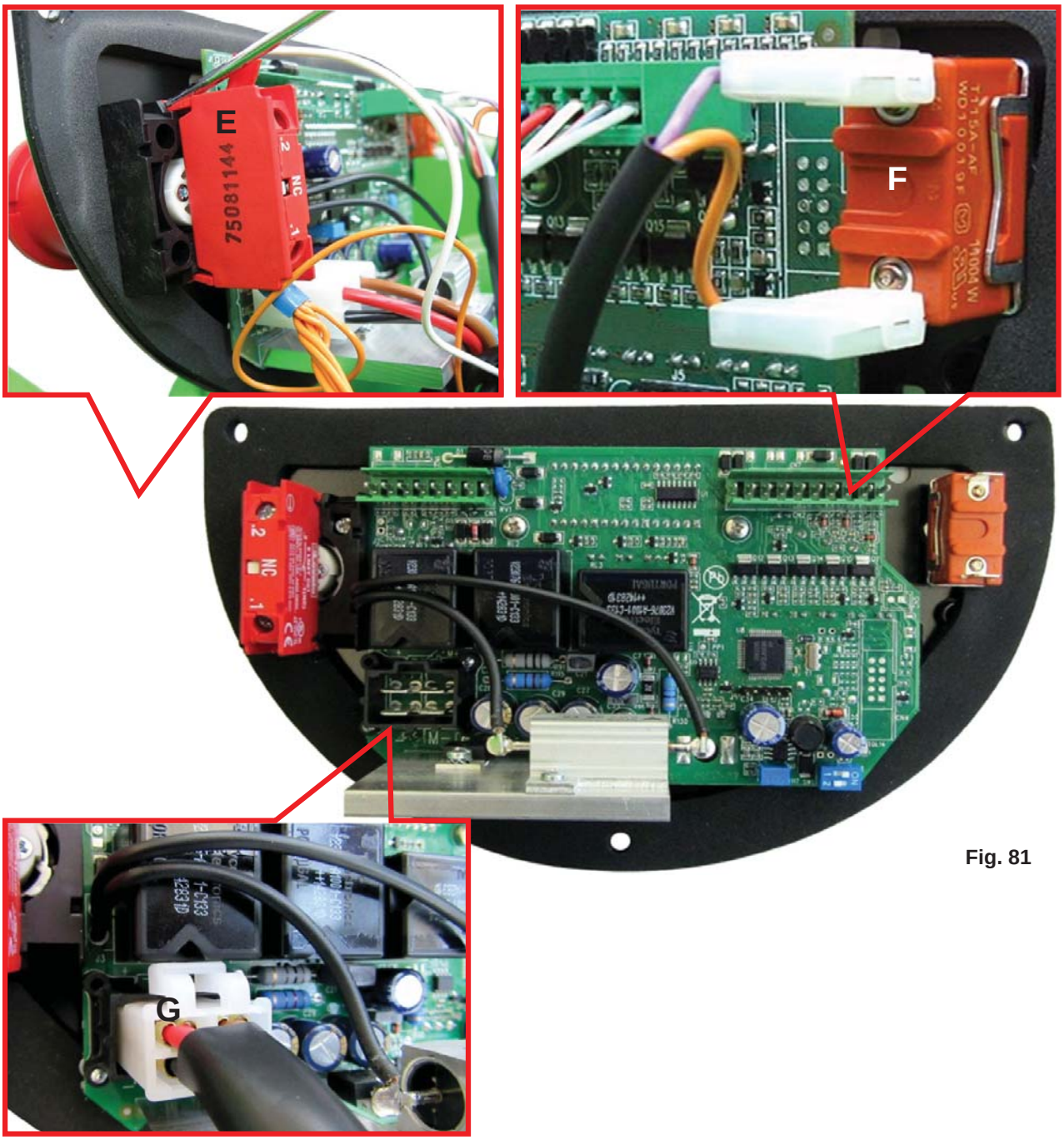


Fig. 81

Reassembly

1 To assemble the new instrument panel board, repeat the disassembly operations in reverse.

C2 DRIVE MOTOR, PARALLEL AXLES

The CT 70 BT version is fitted with a parallel axle drive reduction unit (the wheel axle is parallel to the motor shaft), with 200 W power at 24VDC.
The wheel axle speed increases to 150 rpm, the gear ratio between electric motor shaft and wheel axle speed is 21/1, while ingress protection against solids and liquids is IP44. The electric motor power wires are fitted with a ferrite so as to comply with the new European standards on electromagnetic compatibility. The lubricant used inside the reduction drive is ISO 150 PAO oil, a synthetic polyalphaolefin (PAO) based lubricant.

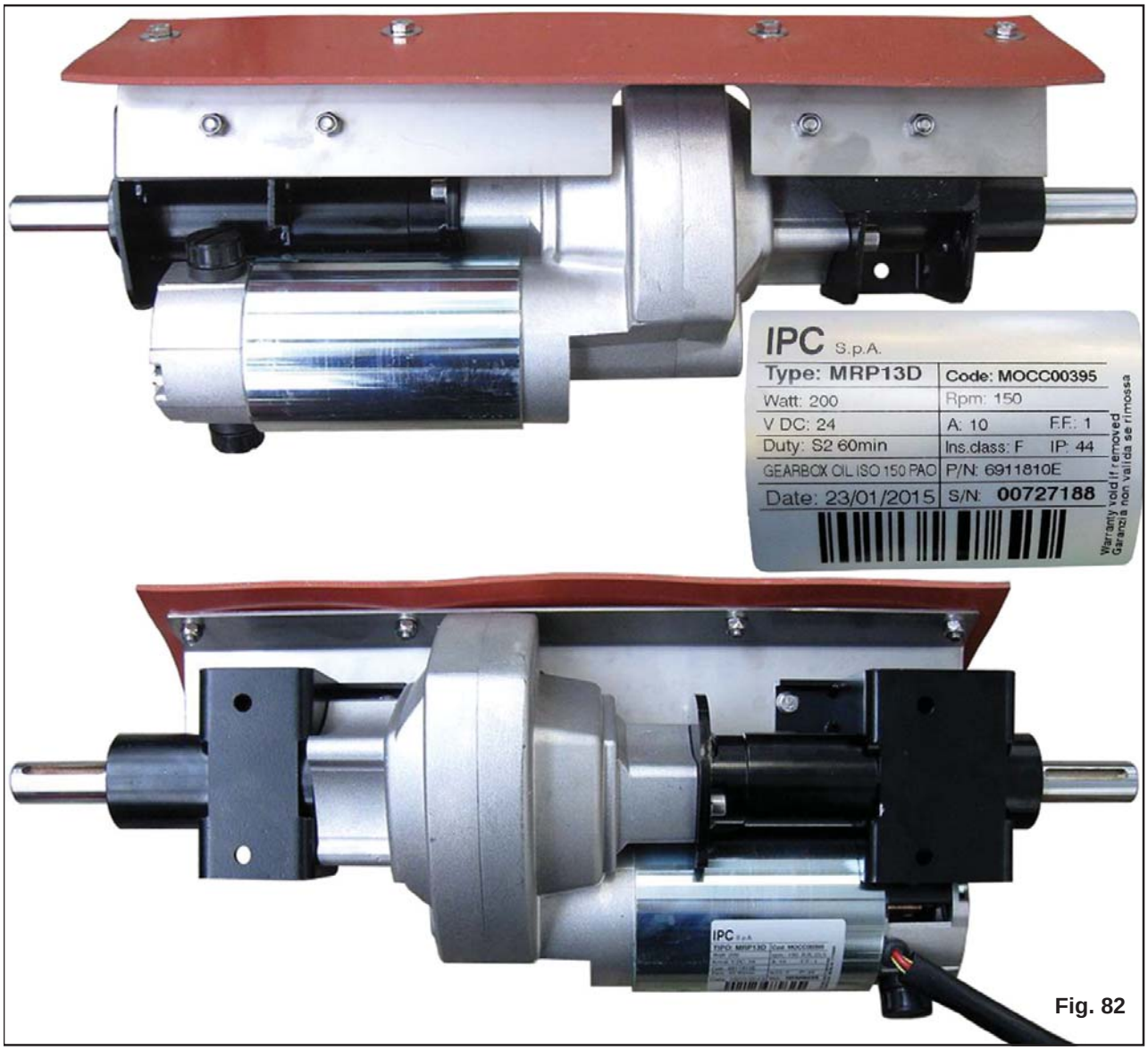


Fig. 82

C2.1 Checking the drive motor current draw

1. **Make sure that the batteries on the machine are charged.**
2. Move the machine to the tank draining area, and empty the solution tank and the dirty water tank.
3. Move the water delivery control to zero.
4. Move the machine onto flat and dry flooring.
5. Press the emergency switch fully in.
6. Use a clamp-on ammeter with a full scale reading of at least 200 amperes, as shown in Figure 339.
7. Lift the drive wheels, at least one of them, a few centimetres to check the current draw with no load.
8. Identify the drive relay located under the chassis, at the rear, on the right near the solenoid valve
9. Identify the red wire on the drive board connected to the drive relay, see paragraph C 4.2.
10. Connect the clamp to the red wire as shown in Figure 341.
11. Switch the ammeter to **Amperes** and **DC**
12. Turn the ignition key on the emergency switch clockwise.
13. Turn the speed controller on the instrument panel completely clockwise, see Figure 340.
14. Select forwards gear using the button on the instrument panel and press the enable brush lever.
15. Read the **CURRENT** with the motor at no load (without the machine operating).
16. Lower the wheels back to the ground and read the **CURRENT** with the machine in drive, with the tanks empty, the brush lifted and all the functions off.
17. Compare the values measured against the chart below
18. If all the values are normal, remove the clamp-on ammeter.
19. If the values do not correspond to those specified (higher):

19a. Check that the reduction unit is intact and that there is nothing to impede the rotation of the wheels.

19b. Check the condition of the motor carbon brushes, and then make sure the rotor turns freely, see par. C2.10.

19c. Replace the complete reduction unit.


Fig. 83


Fig. 84


Fig. 85

Current draw A (amperes)	*Min*	*Max*
No-load (wheel raised)	*2.0 A*	*2.5 A*
Load (on the floor, drive only)	*6.0 A*	*10.0 A*

C2.2 Checking and replacing the drive motor carbon brushes

i *The 200 W drive unit is identifiable by the position of the electric motor, fitted in line with the transmission shaft, called " parallel axles". Also, the reduction unit and differential are fitted in the same aluminium housing.*

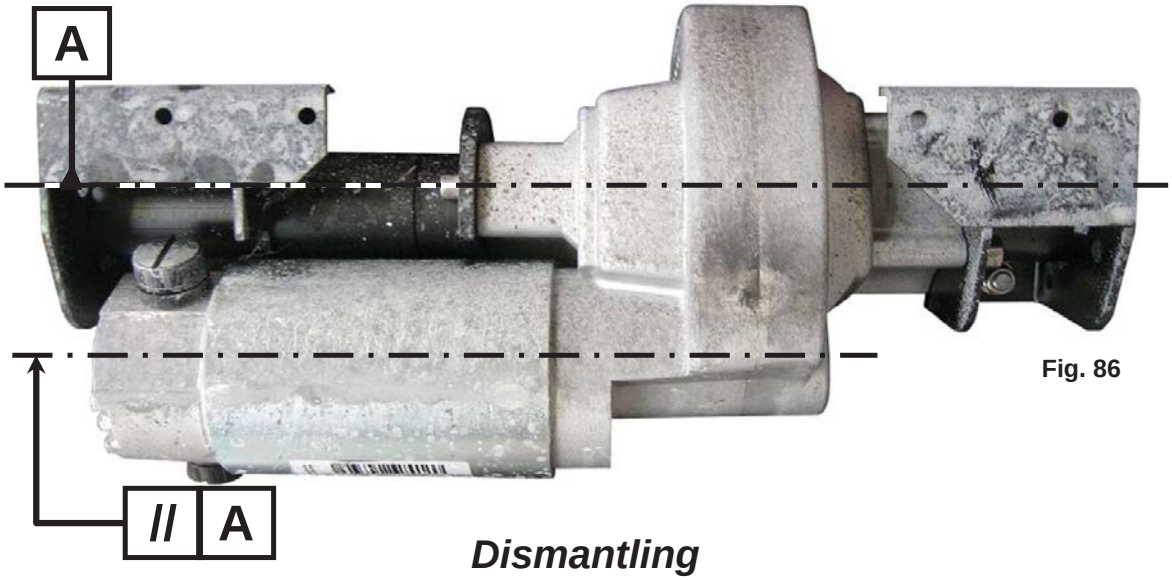


Fig. 86

Dismantling

1. Move the machine to the tank draining area, and empty the solution tank and the dirty water tank.
2. Move the machine onto flat and dry flooring.
3. Press the emergency key switch until it is held in the bottom position.
4. Remove the squeegee from the mount.
5. Disconnect the batteries from the wiring and each other and remove them from the battery compartment.
6. Tilt the machine over until it rests on the left side.
7. It is recommended to lay something soft between the floor and the side, to avoid damaging the side.
8. Identify the two caps **A** holding the carbon brushes, and unscrew them.

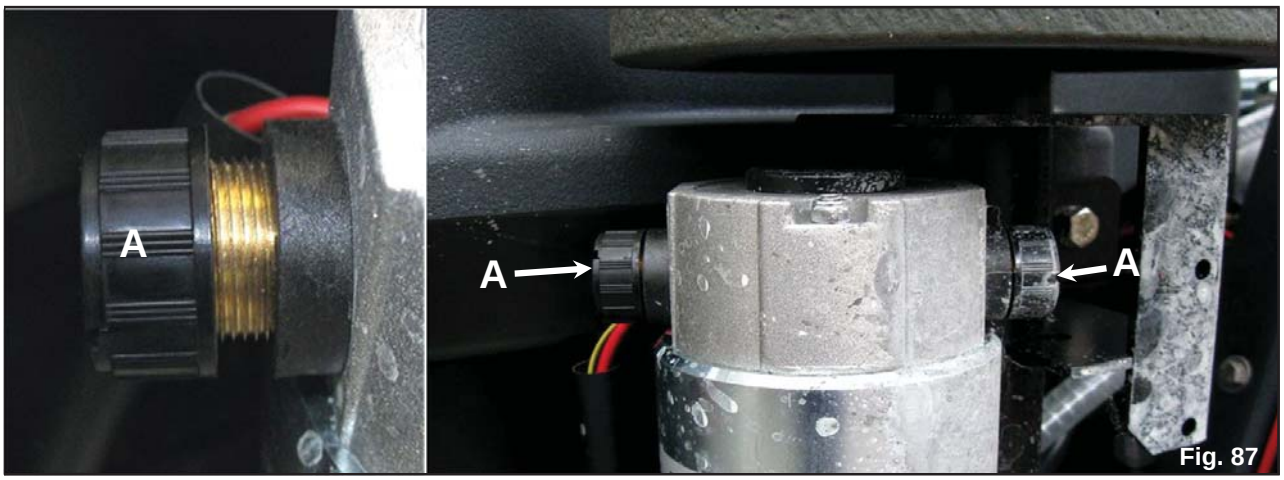


Fig. 87

9. Remove the carbon brushes **B** from their seat.
10. Check that the carbon brushes **B** are intact, and are not excessively worn.

Checks

11 Measure both carbon brushes **B** to check wear. The minimum acceptable length is 12 mm / 0,47 inc., if less, replace the carbon brushes with new ones of the same type.

Always replace both carbon brushes at the same time.

12 When fitting new carbon brushes, compare the new ones with the old ones, or check them against the dimensions shown below. Only the length must be different.

13 If the carbon brush measurements are still within the tolerance, visually check for any abnormal wear of the sliding surface **B1**.

14 Before fitting new carbon brushes or repositioning the existing ones, check rotor wear through hole in the carbon brush seat; make sure this is not excessive.

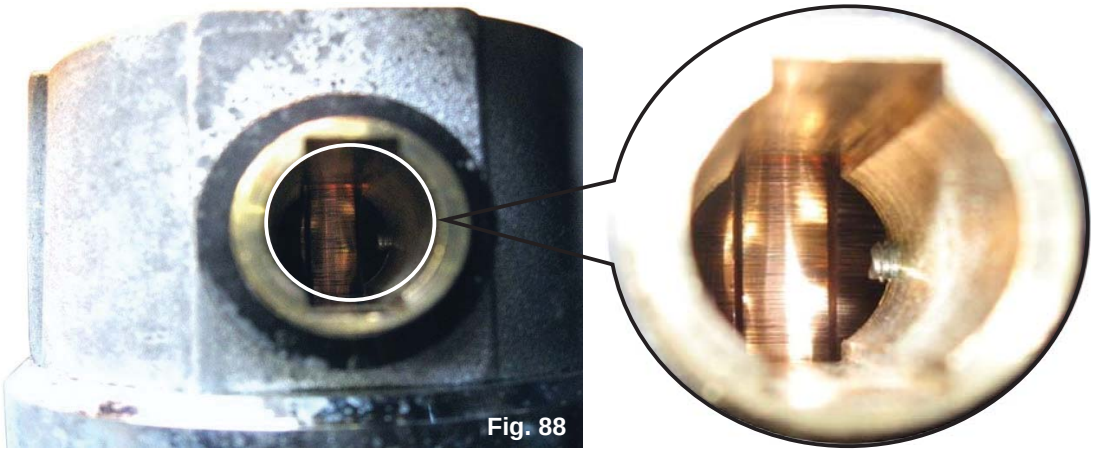


Fig. 88

Always make sure that the carbon brushes slide freely in their seats.

Carbon Brush Dimensions

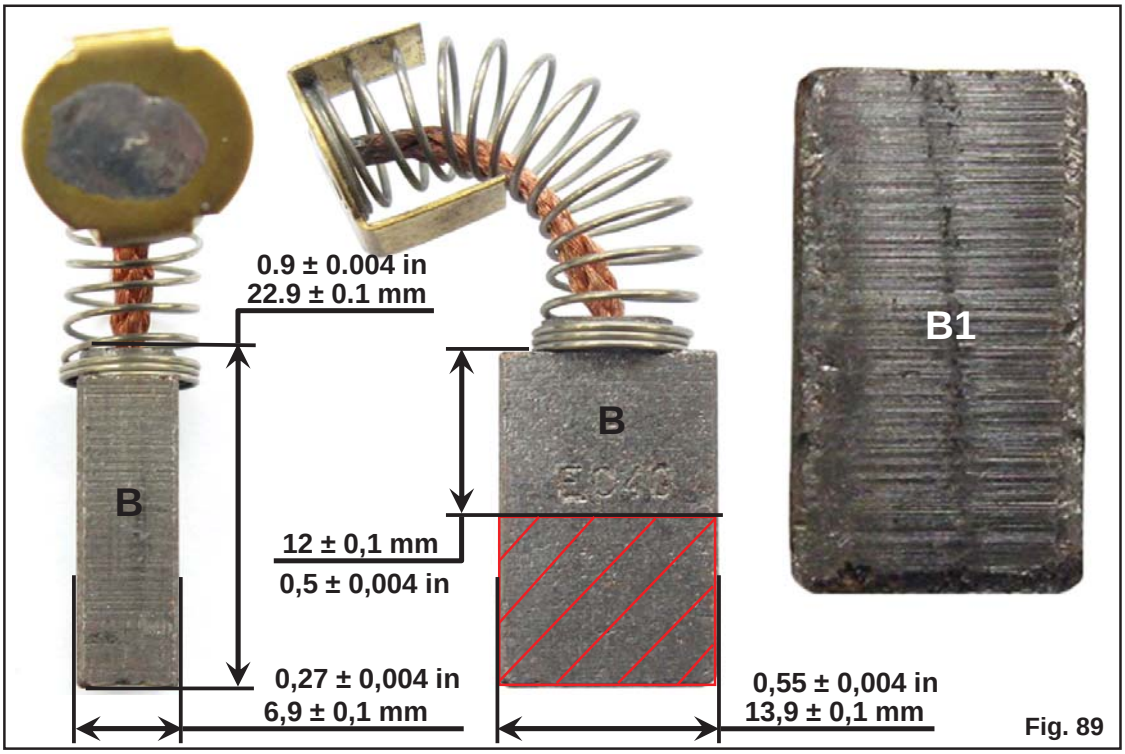


Fig. 89

Reassembly

1 To assemble the new carbon brushes, repeat the disassembly operations in reverse order.
2 Take care when inserting the carbon brushes in their seat, and check the spring support.

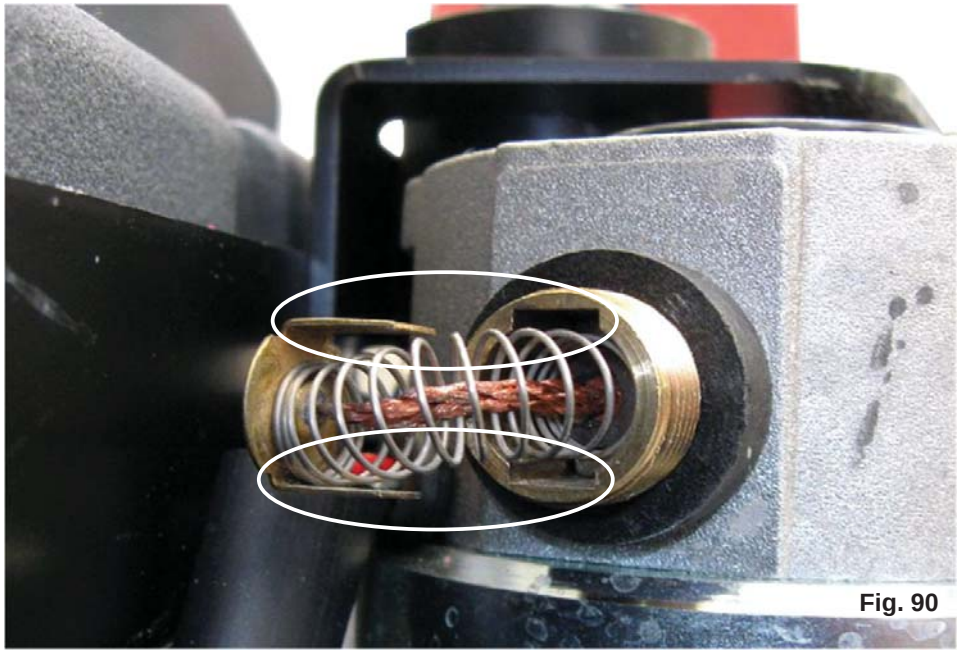


Fig. 90

C2.3 Replacing the complete drive unit (motor + reduction unit)

Dismantling

1. Move the machine to the tank draining area, and empty the solution tank and the dirty water tank.
2. Move the machine onto flat and dry flooring.
3. Press the emergency key switch until it is held in the bottom position.
4. Remove the squeegee from the mount.
5. Disconnect the batteries from the wiring and each other and remove them from the battery compartment.
6. Tilt the machine over until it rests on the left side.
7. It is recommended to lay something soft between the floor and the side, to avoid damaging the side.
8. Unscrew the two screws and remove the two drive wheels from the drive motor axle.
9. Electrically disconnect the drive motor, both the thermal cutout **A** and the power supply **B**.

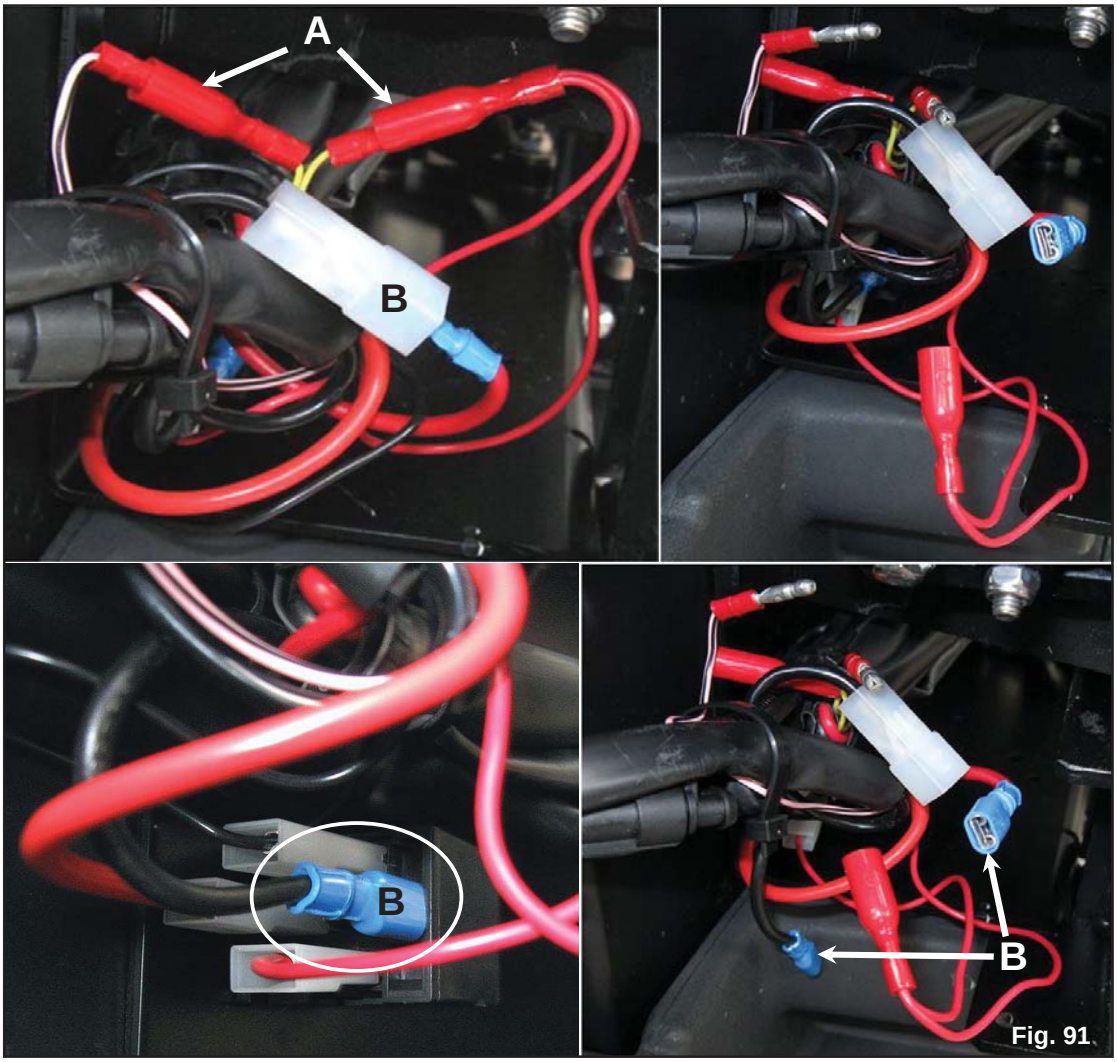


Fig. 91

10 Unscrew the four nuts **C** that fasten the drive motor support to the machine's chassis, taking care not to lose the washers **C1**.

11 Remove the drive motor, complete with the two half-supports, right **D** and left **E**.

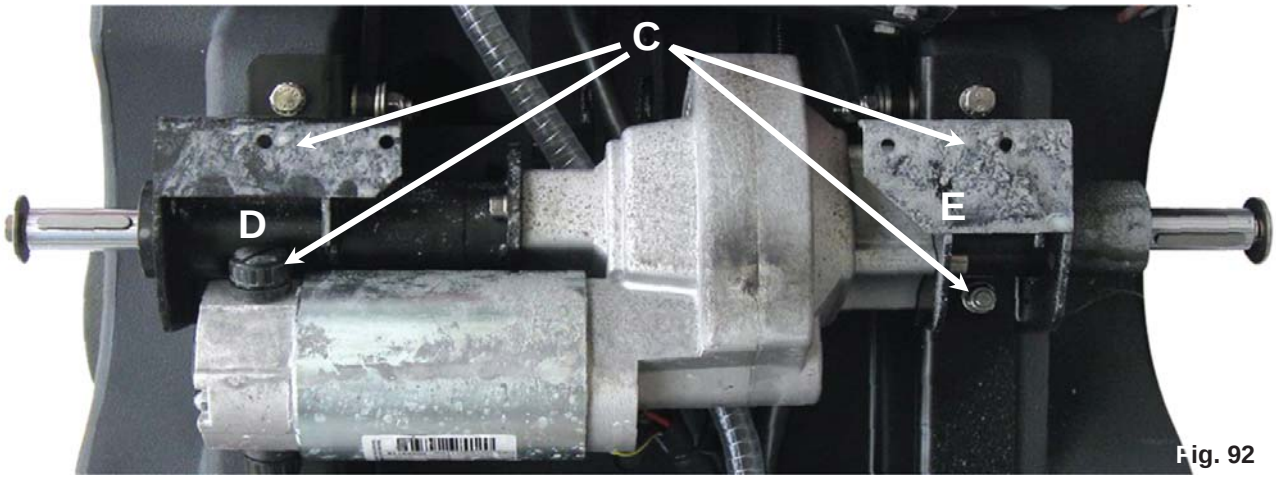


Fig. 92

Replacing the complete Drive Unit

12 Remove the two Seeger rings **F** from the drive axle.

13 Remove the two half-supports from the drive motor, the right one **D** fastened by the two screws **D1** and the left one **E** fastened by the three screws **E1.**

14 Replace the drive motor with a new one and then reassemble the half-supports on the reduction unit.

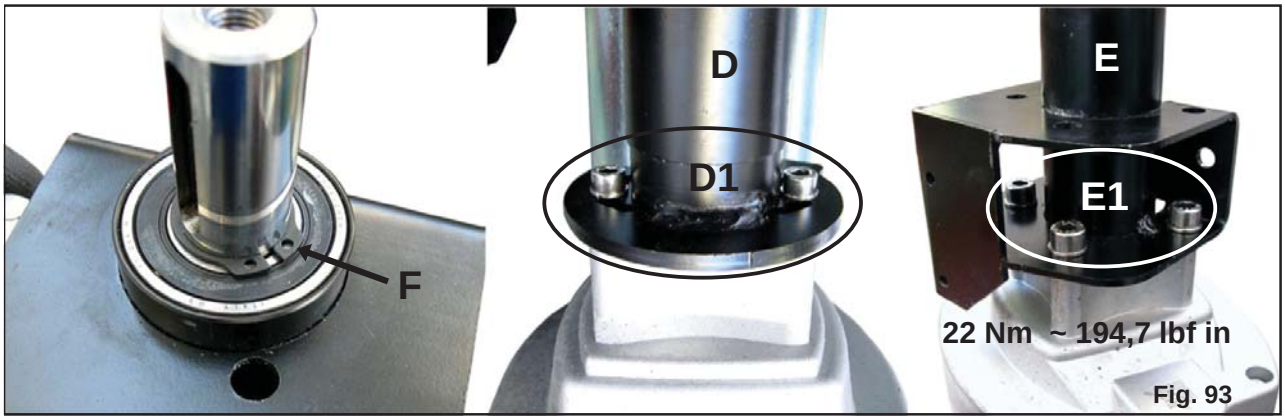


Fig. 93

Reassembly

1 Fit the left support E on the reduction unit, tightening the three screws **E1** to a maximum torque of 22 Nm ~ 194,7 lbf in.
Place the Seeger rings **F** on the shaft, making sure they are fitted correctly.

2 If possible, remove the bearing from the half-support **D** to simplify insertion.

Fig. 94

3 Fit the support **D** to the machine's chassis, tighten the nuts **C** manually until reaching the self-locking ring.
4 Assemble the drive motor, inserting the drive shaft into the half-support **D**.

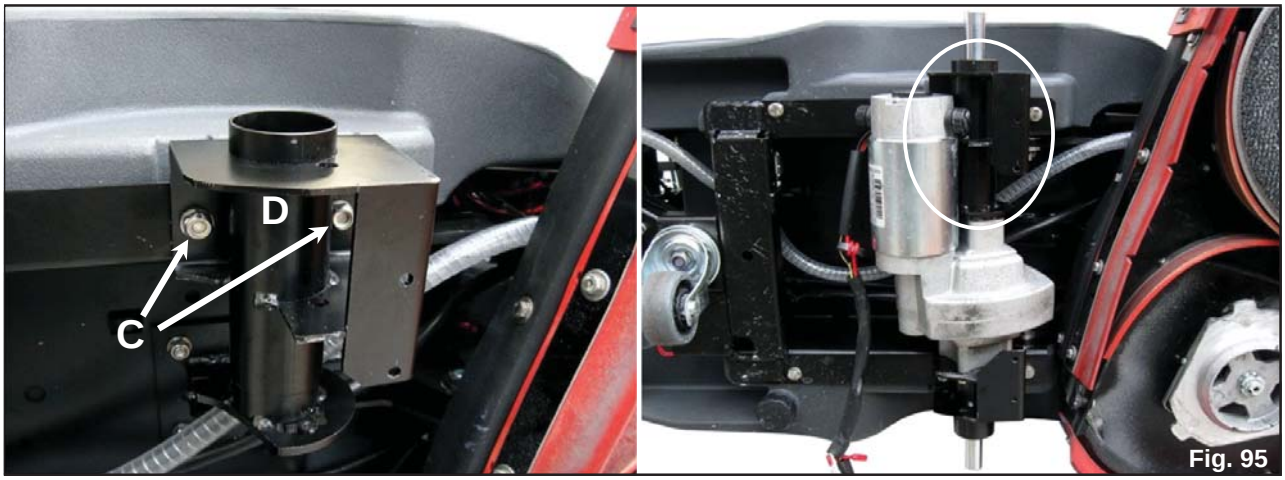


Fig. 95

5 Tighten the nuts **C** that fasten the half-support **E** to the machine's chassis; do not tighten completely.
6 Tighten the screws **D1** that fasten the half-support **D** to the reduction unit on the drive motor; do not tighten completely.

Fig. 96

7 Carefully insert the bearing onto the support **D** and replace the Seeger rings **F** on the shaft, from the correct side.

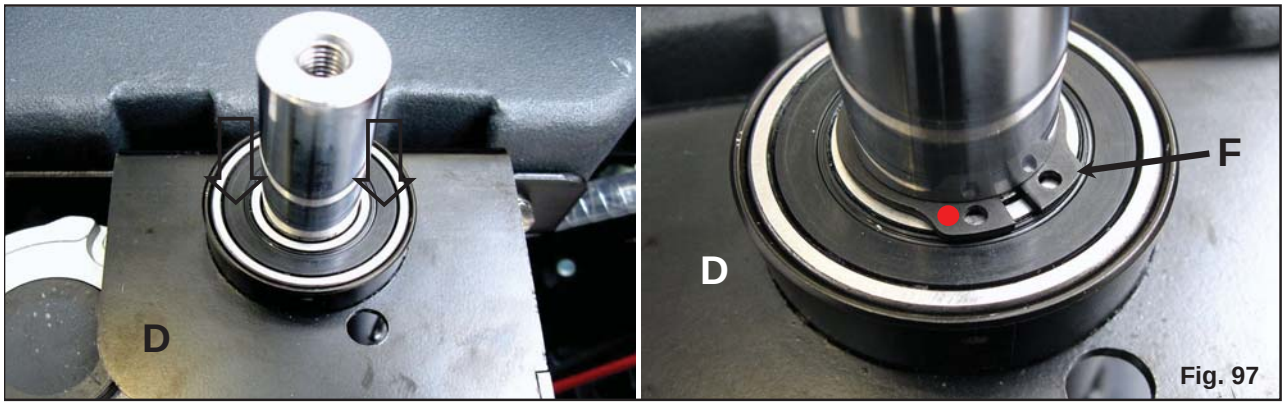


Fig. 97

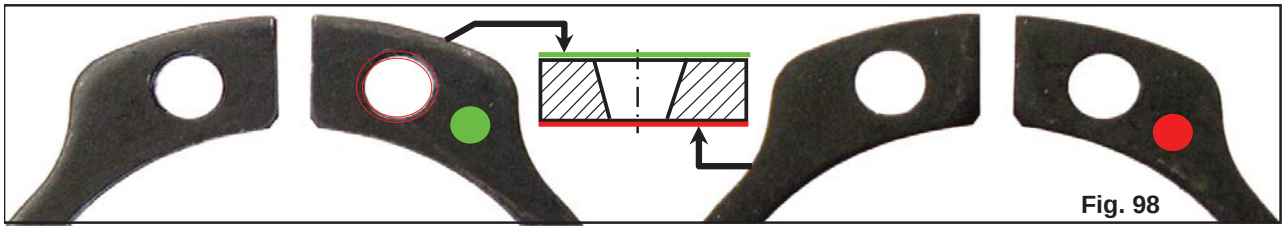


Fig. 98

8 Tighten the screws **D1** to a maximum torque of 9.5 Nm ~ 84,1 lbf in.

Fig. 99

9 Tighten the nuts **C** to a maximum torque of of 23 Nm ~ 203,6 lbf in.

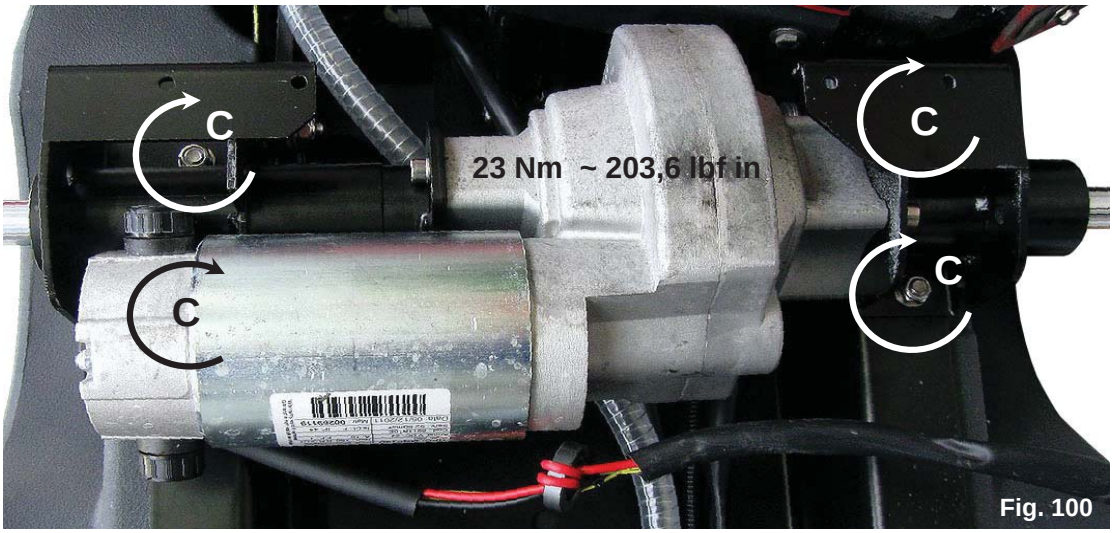


Fig. 100

10 Make the electrical connection to the drive motor, performing the dismantling operations in reverse, making sure the connections are correct.

11 Replace the wheels, tightening the screws to a maximum tightening torque of 23 Nm ~ 203,6 lbf in.

12 Complete the assembly of the machine, repeating the dismantling operations in reverse.

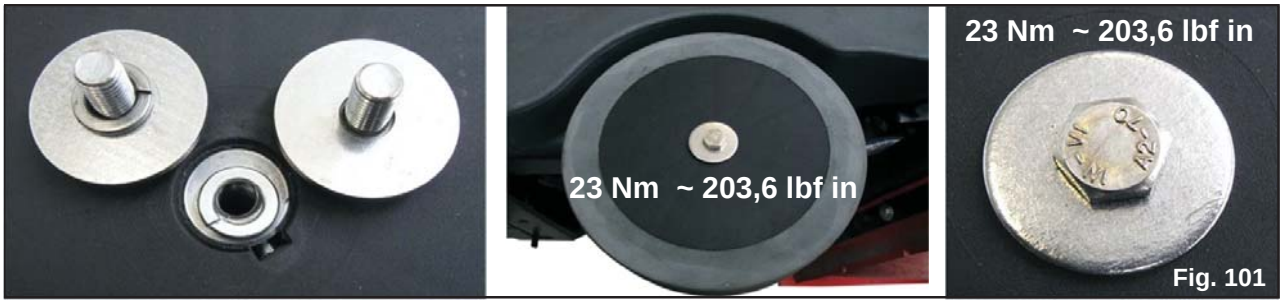


Fig. 101

C2.4 Replacing the drive unit components

i *To keep maintenance costs down, the drive unit has been divided into several spare parts. If repairs are required, only the damaged component needs to be replaced. The following drive unit components can be replaced: the cap* **A***; the carbon brushes* **B***; the rotor* **C***; the stator* **D***; the reduction unit-differential* **E***.*

For replacement of the carbon brushes B, see paragraph C2.10

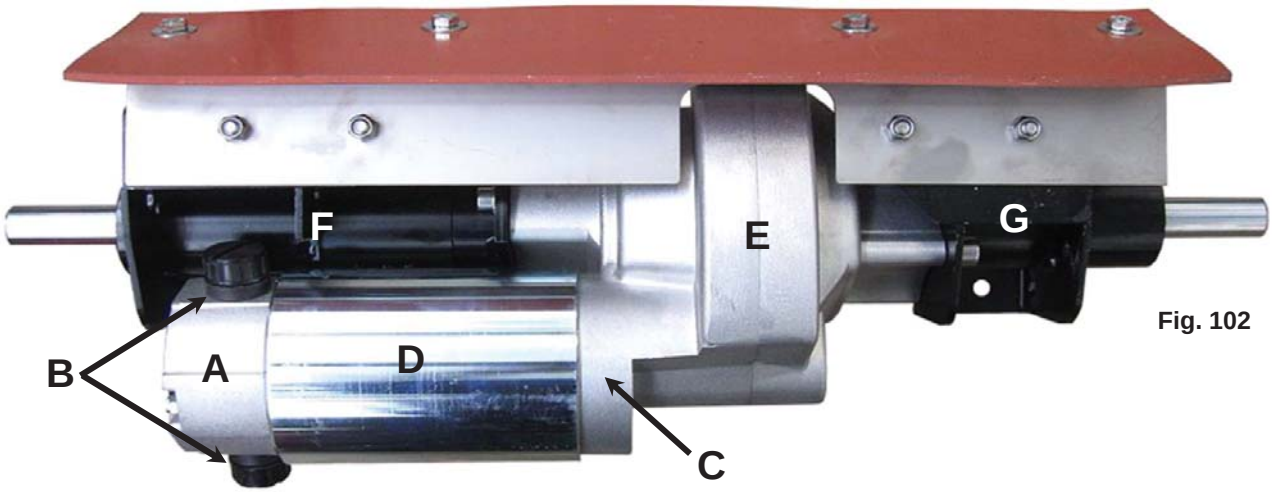


Fig. 102

Dismantling

Replacing the cap A, rotor C, stator D.

1 Remove the drive unit from the machine's chassis, as described in paragraph C2.11.
2 Remove the right half-support **F** as described in paragraph C2.11.

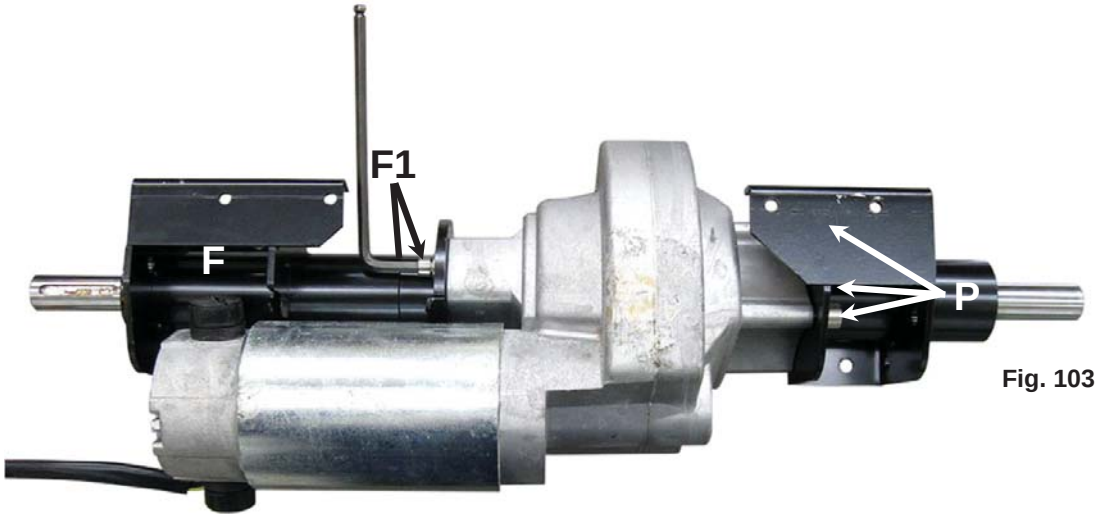


Fig. 103

3 For convenience, position the motor vertically, using one of the two wheels that has been removed.
4 Remove the carbon brushes **B** from the drive motor, as described in paragraph C2.10.
5 Remove the cap **A,** unscrewing the two nuts **A1.** If these are stuck, tap them lightly with a plastic mallet.

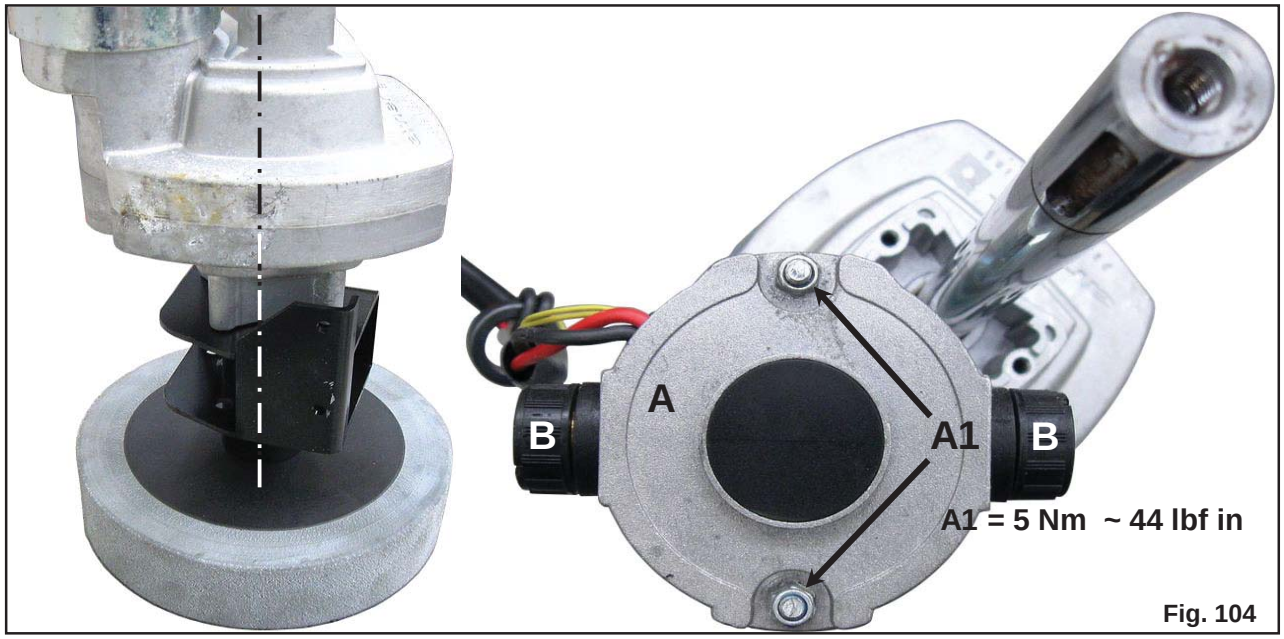


Fig. 104

6 Make sure the bearing **H** is intact, if the outside steel ring turns purple in colour, this indicates the bearing has started overheating.
Turn it by hand to make sure that it is not worn, as indicated by irregular or particularly noisy rotation.
7 If replacing the bearing **H,** use a puller to remove it from the shaft.

Always replace the bearing H with another of the same type (NMB 608Z).

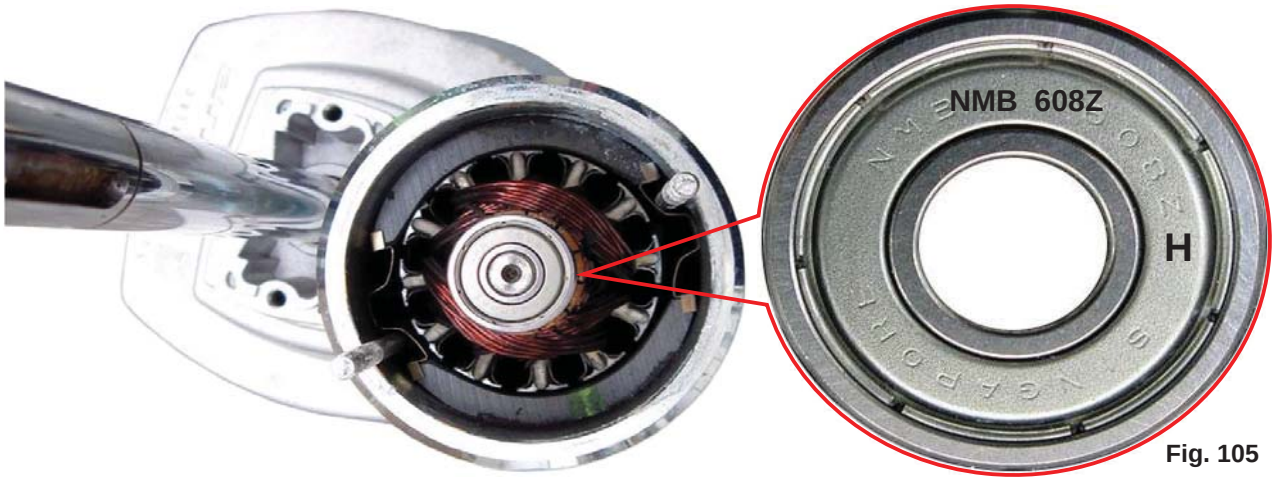


Fig. 105

8 To assist reassembly, mark the position of the stator on the reduction unit **E.**
9 By hand, press the rotor **C** onto the reduction unit **E**, and at the same time remove the stator **D**, removing it from the studs. If necessary, to assist removal, tap it with a plastic mallet.
10 Then remove the rotor **C** by pulling it upwards vertically.

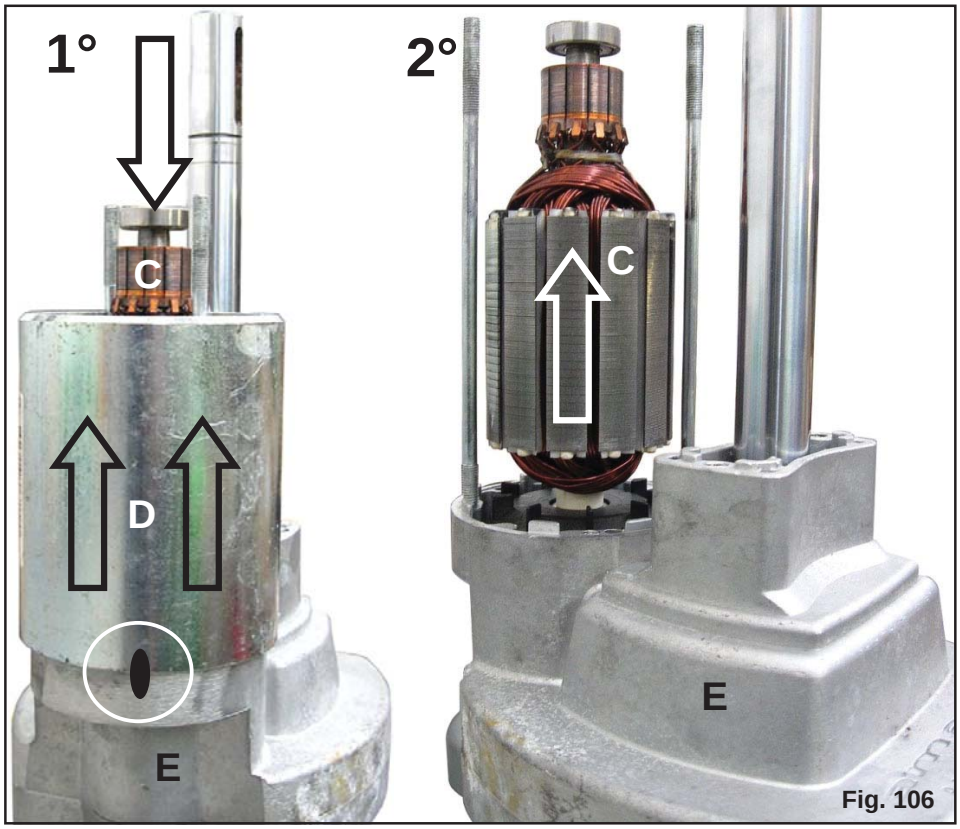


Fig. 106

11 Check tightness of the oil seal (or gasket) **I** fitted on the reduction unit-differential **E.**
12 Check that the corrugated washer **L** is on the bearing support base **M**, and remove it.

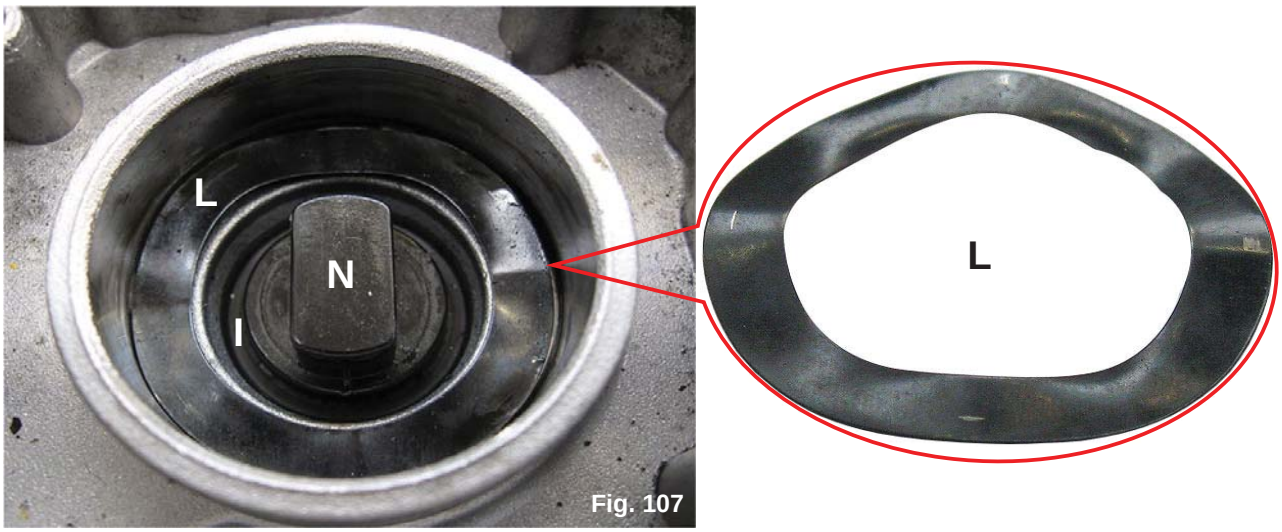


Fig. 107

13 Remove the plastic joint **N** splined onto the shaft of the reduction unit-differential.

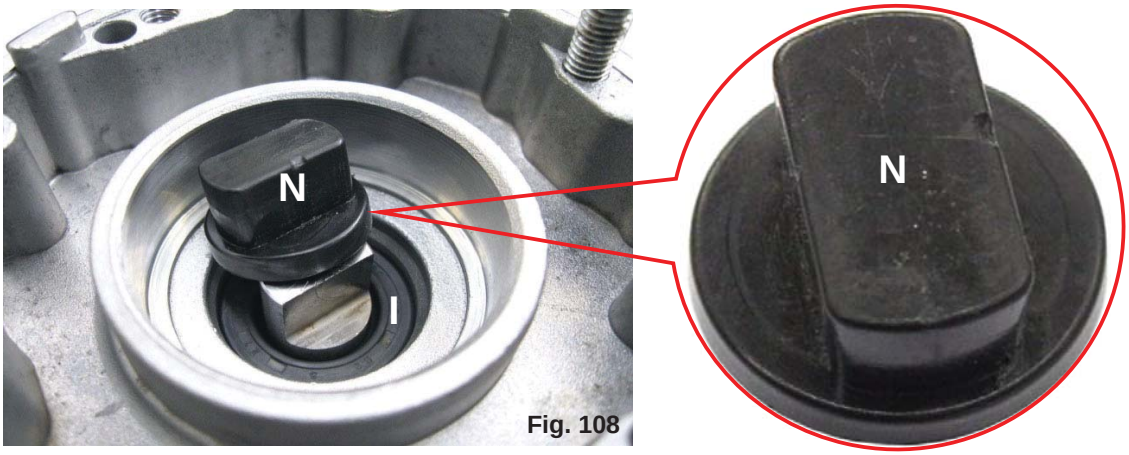


Fig. 108

14 Check tightness of the oil seal **I**, the shaft must be dry, without any traces of oil, otherwise replace the seal.

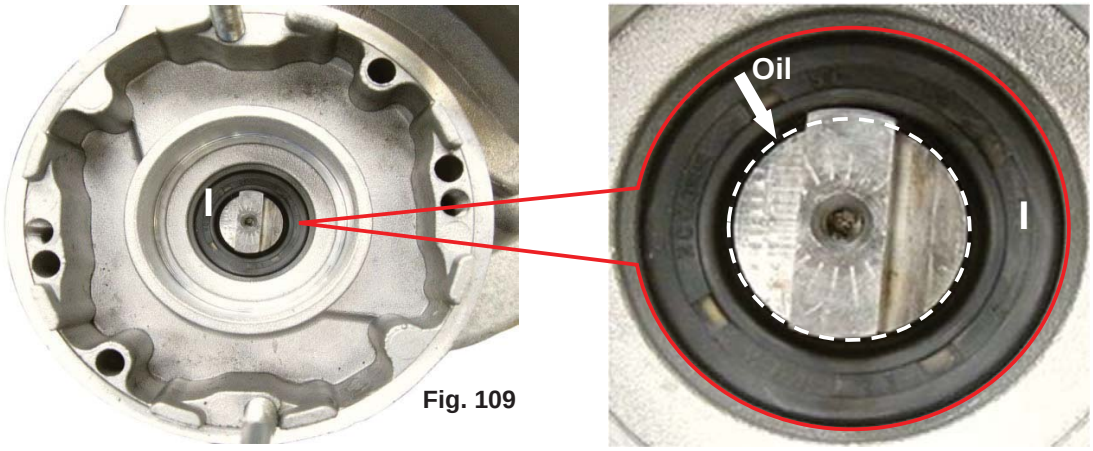


Fig. 109

15 If replacing the oil seal **I**, use a new one of the same type and size. **SC 12 22 5**
Type: **SC** (without dust lip)
Size: **12** mm / 0,47 in (inside diameter) x **22** mm / 0,87 in (outside diameter) x **5** mm / 0,20 in (height).

16 Remove the oil seal **I** from its seat, using a sharp tool to perforate it, and a hook to pull it out, otherwise remove the reduction unit-differential **E**.

17 Before fitting the new oil seal, cover the sharp edges of the shaft, to avoid cutting the lip on the oil seal.

18 Fit the new oil seal **I** fully onto the reduction unit-differential **E**, for convenience use a special ring installer, or a wrench socket, max OD 22 mm / 0,87 in.

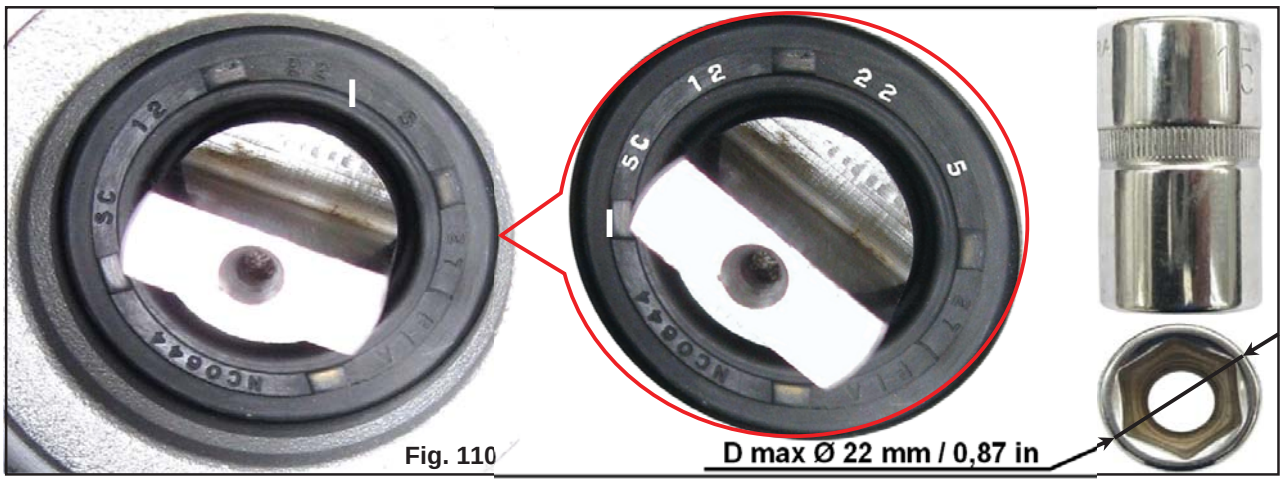


Fig. 110

19 If a lot of oil has leaked from the reduction unit-differential **E**, check the oil level before assembling the unit on the machine.
20 To check the oil level, remove the reduction unit in two parts.
21 Place it vertically, as shown in Figure 358.
22 Unscrew the four screws **O** that join the two halves of the reduction unit-differential **E** housing.
23 Lift the top half-housing (opposite the screws O), and remove the half-axle, complete with planetary gearing.

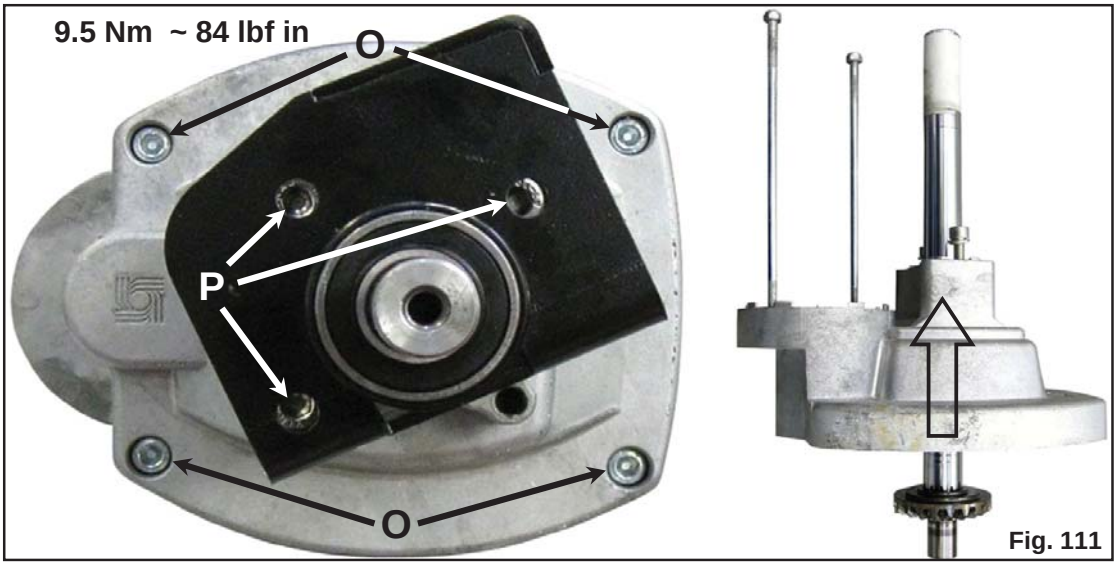


Fig. 111

24 Use callipers to check the height of the oil level in the reduction unit. The oil level is correct if the distance between the oil level and the edge of the reduction unit is between 12.5 mm / 0,5 in and 13.0 mm / 0,52 in.
25 If needing to top up, use AGIP BLASIA 150 or equivalent oil.
26 If on the other hand need to change or completely refill with oil, always use AGIP BLASIA 150 oil, quantity 170 cc ± 10%.

It is strongly recommended not to exceed the specified level (or quantity) of oil, as due to heating the oil seal may be damaged, with causing oil leaks.

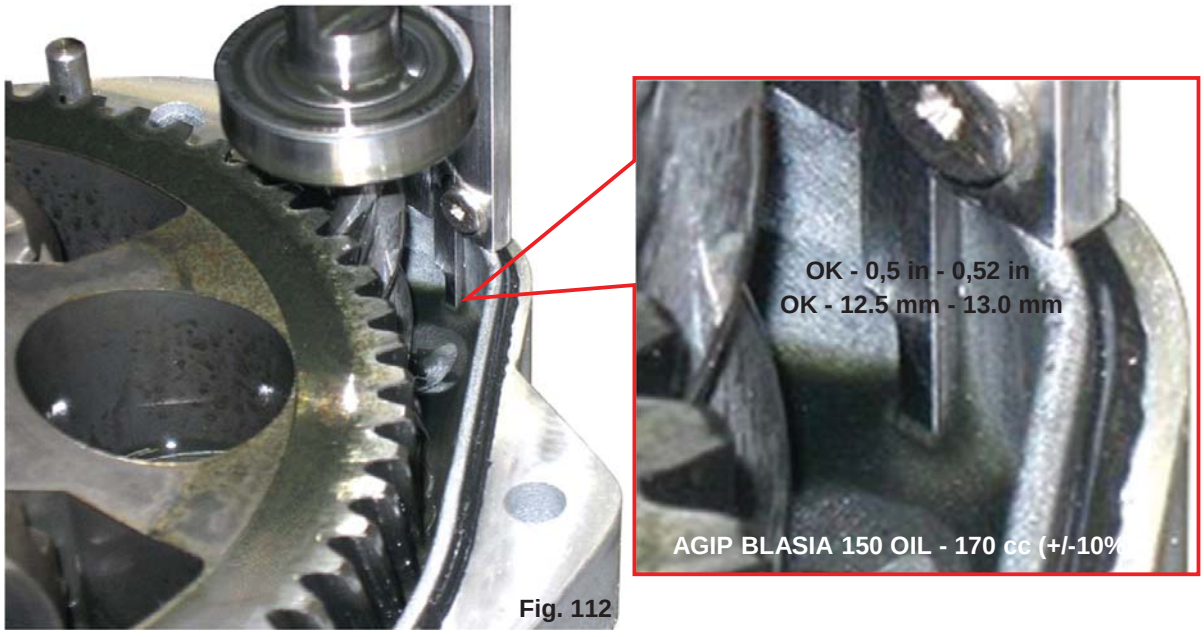


Fig. 112

Reassembly

1 When the oil level has been checked and topped up if necessary, replace the oil seal or gasket **I**.
2 To remove the oil seal, push it outwards from its seat on the half-housing E.

Make sure that the new oil seal is the same type and size as specified in point 14

3 Fit the oil seal **I** on the half-housing **E,** pushing it fully into its seat. Use a special ring installer or a suitable wrench socket, as shown in point 18.
4 Once having fitted the new oil seal I, before reassembling the half-housing **E**, wrap adhesive tape or rubber-coated paper around the reduction unit-differential shaft, to avoid damaging the oil seal.

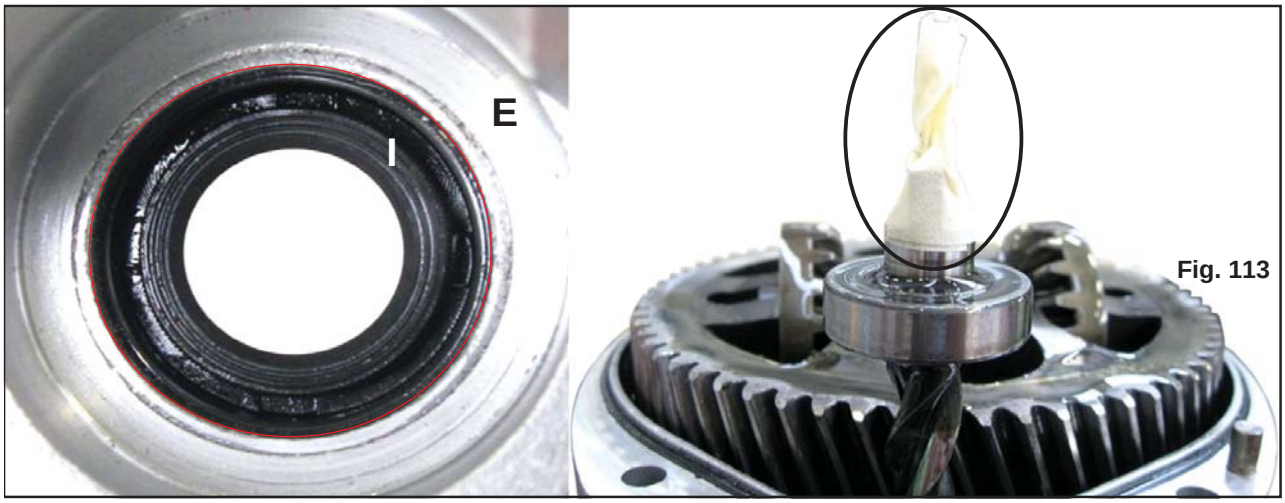


Fig. 113

5 Apply lubricating grease onto the adhesive tape or rubber-coated paper.
6 Assemble the half-housing **E**, first inserting the half-axle into the differential, and then the shaft, taking care not to damage the oil seal.
7 Centre the two reference pins on the other half of the housing, and couple the two halves of the housing together by hand.
8 Tighten the four M6 screws **O** to a maximum torque of 9.5 Nm ~ 84 lbf in.
9 Spline the plastic joint **N** onto the reduction unit-differential shaft and insert the corrugated washer **L**.
10 Before assembling the rotor **C**, check wear of the two bearings **H** and **M**, making sure they are not noisy or purple in colour, otherwise replace them.
11 Continue by checking the wear on the rotor switch **C1** (where the carbon brushes slide), if dirty, clean by blowing with compressed air, if slightly damaged clean using an abrasive cloth, while if there is excessive wear replace the entire rotor **C**.

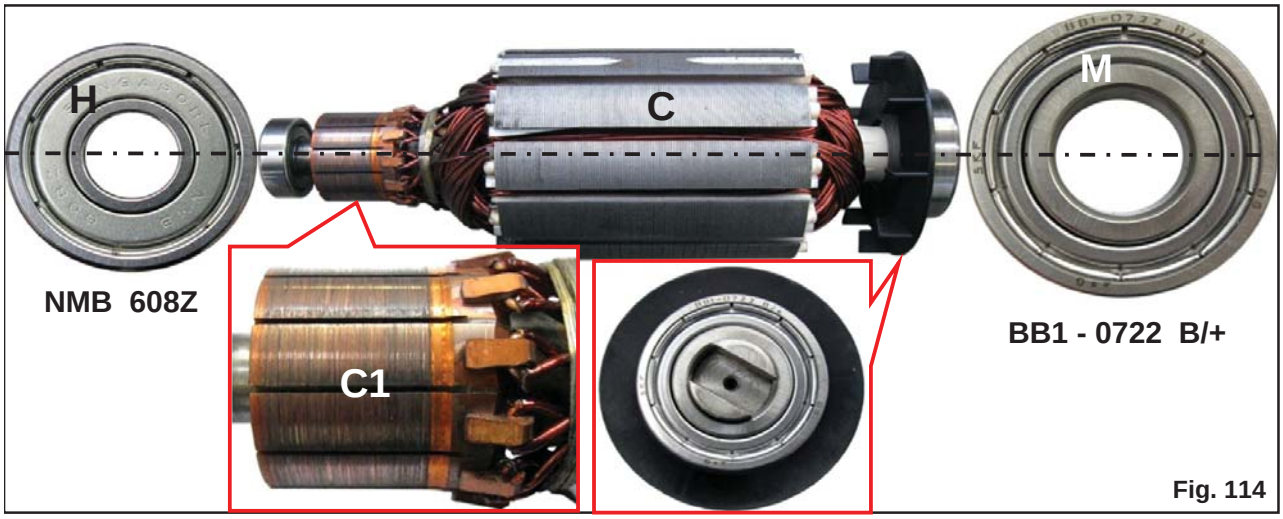


Fig. 114

12 Reassemble the stator **D** and then the rotor **C** on the reduction unit **E**, repeating the dismantling operations in reverse, as described from point 9 to point 12 in the previous paragraph.
13 Observe the mark made on the stator **D** and the reduction unit E before dismantling.
14 Make sure the cables that power the carbon brushes B are intact and the corresponding screws **B1** that fasten them to the carbon brush supports and the latter to the cap **A** are tight.
15 Check operation of the thermal cutout **B2**, and make sure it is secure.

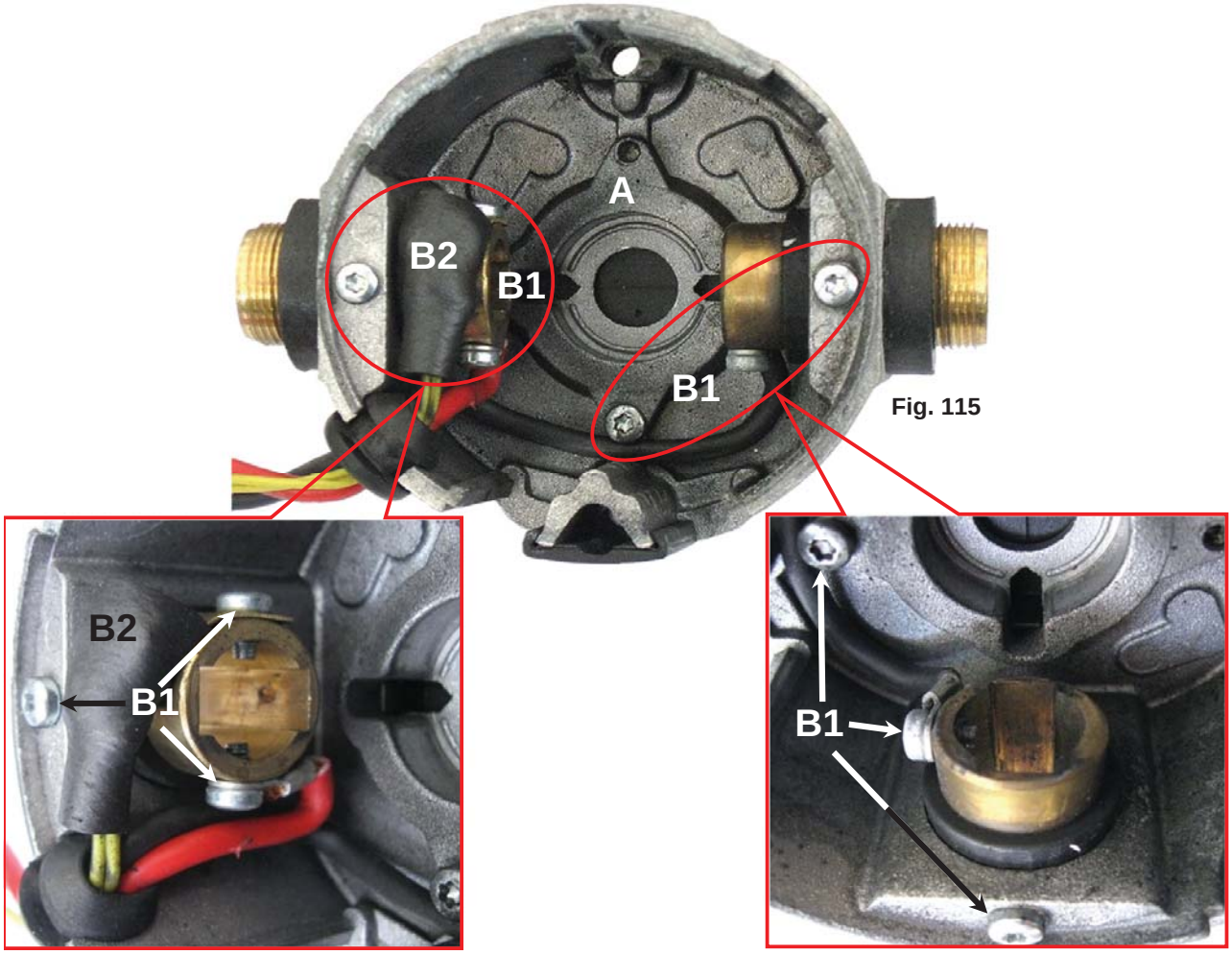


Fig. 115

15 If everything is OK, complete assembly of the motor, fitting the cap **A**, otherwise resolve the problems and then complete assembly.
16 Tighten the two nuts **A1** that fasten the cap **A** to the motor-reduction unit. Tighten to a maximum torque of 5 Nm ~ 44 lbf in.

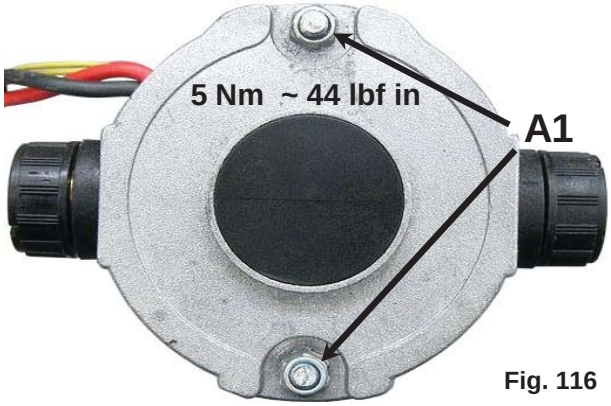


Fig. 116

17 The drive unit is now ready to be fitted on the machine, however first check its electrical operation, as described in "Testing"
18 To assemble the drive unit on the machine's chassis, see the instructions in the previous paragraph.

Replacing the reduction unit-differential E.

19 Remove the drive unit as explained above, including dismantling of the half-support **G**.
20 Unscrew the three screws **P** and remove the half-support **G** from the half-axle on the reduction unit-differential **E**.
21 Replace the reduction unit-differential **E** with a new one, and reassemble as illustrated in the previous points.
22 Tighten the screws **P** to a maximum torque of 22 Nm ~ 194,7 lbf in.
23 The drive unit is now ready to be fitted on the machine, however first check its electrical operation, as described in "Testing"
24 To assemble the drive unit on the machine's chassis, see the instructions in the previous paragraph.

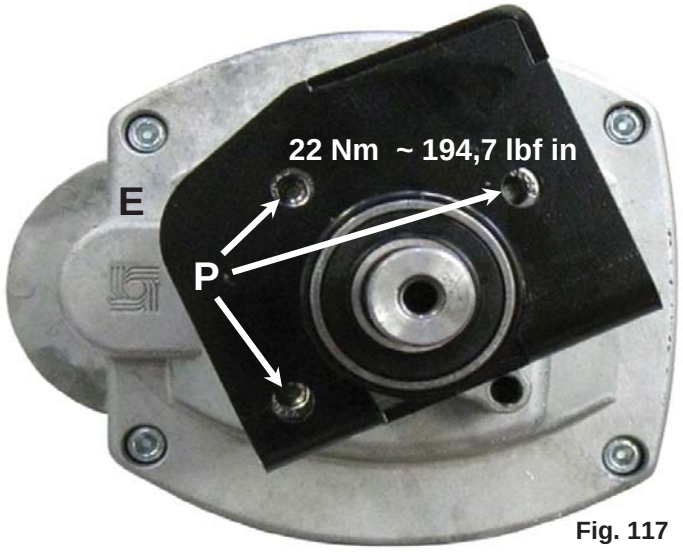


Fig. 117

Testing

1 If replacing or dismantling the electrical parts of the drive unit, before reassembling the unit on the machine, functional testing should be performed.
2 Connect the ends of the wires (red wire and black wire) to the poles of a 12V - 24V ≥ 10 A battery or a 24V ≥ 5 A power supply, and run for a few minutes.
3 If testing shows the drive unit is working properly, assemble the unit on the machine as described in the previous paragraph.

C2.5 Replacing the drive wheels

Dismantling

1. Move the machine to the tank draining area, and empty the solution tank and the dirty water tank.
2. Move the machine onto flat and dry flooring.
3. Press the emergency key switch until it is held in the bottom position.
4. Lower the brush head using the pedal control.
5. Push the side of the machine to tilt it on one side.
6. Place a block of wood between 90 mm / 3,54 in and 150 mm / 5,9 in high under the machine's axle.
7. Using a 13 mm - 1/2 in spanner unscrew anticlockwise the bolt **A** that locks the wheel to the shaft.
8. To assist the operation, tap the end of the spanner lightly yet firmly with a hammer.
9. Make sure not to lose the Grover washer **B** located behind the flat, wide washer.
10. Remove the old wheel, if necessary use a rubber mallet.
11. Position the tab **E** in place on the shaft, if necessary, to fit the new wheel.
12. Fit the new wheel and push it in fully, using a rubber mallet.

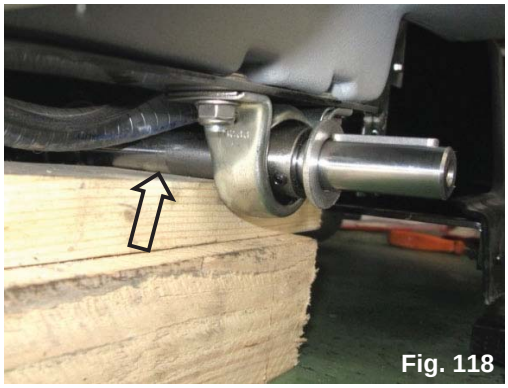
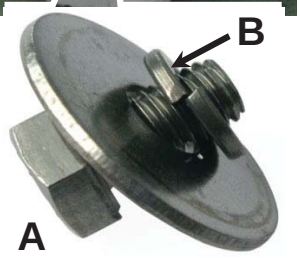


Fig. 118


Fig. 119



Checks

1. Check that the Seeger ring **C** is intact and check the position.
2. Check that the two dowel pins **D** fastening the position of the drive shaft are fitted and tightened correctly.

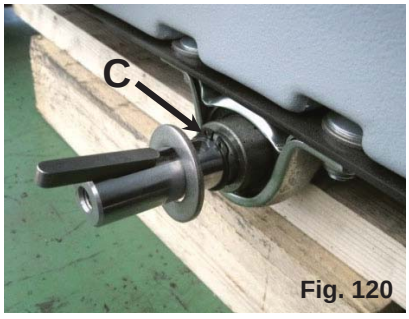


Fig. 120

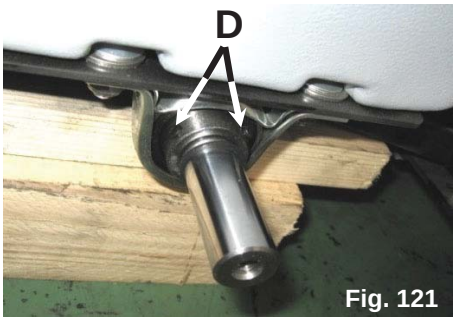


Fig. 121


Fig. 122

Reassembly

1. To assemble the new drive wheels, complete the dismantling operations in reverse.
2. Tighten the bolt **A** using an air-driven tool or tap the end of the spanner lightly.

C3 RELAY AND DRIVE MOTOR ELECTRICAL CONNECTIONS

C3.1 Checking and replacing the drive relay

☝ WARNING
ONLY MACHINES WITH TRACTION MOTOR

The drive relay is fitted to make the machine lighter to push, when the drive cannot be used (no batteries, flat batteries or off).

Problem / Fault

When the machine is on, the dash board does not show any errors, the traction does not work and the machine looks like with the wheels free, the problem could be the drive relay.

Checking operation of the drive relay

1 Move the machine onto flat and dry flooring.
2 Press the emergency switch fully in.
3 If possible, lift the machine by forklift.
4 The relay is fitted under the machine's chassis, at the rear, on the right, near the solenoid valve.
5 Disconnect the brown wire **A** and the black wire **B** and join them together, using a piece of wire.
6 Check if the relay is working correctly:
6a If the machine moves, check if there is voltage (+24V) at the wires **C** and **D .**
6b If the machine moves and there is voltage at the wires **C** and **D**, replace the relay.
6c If the machine does not move, check if there is power supply to the motor or the motor carbon brushes.

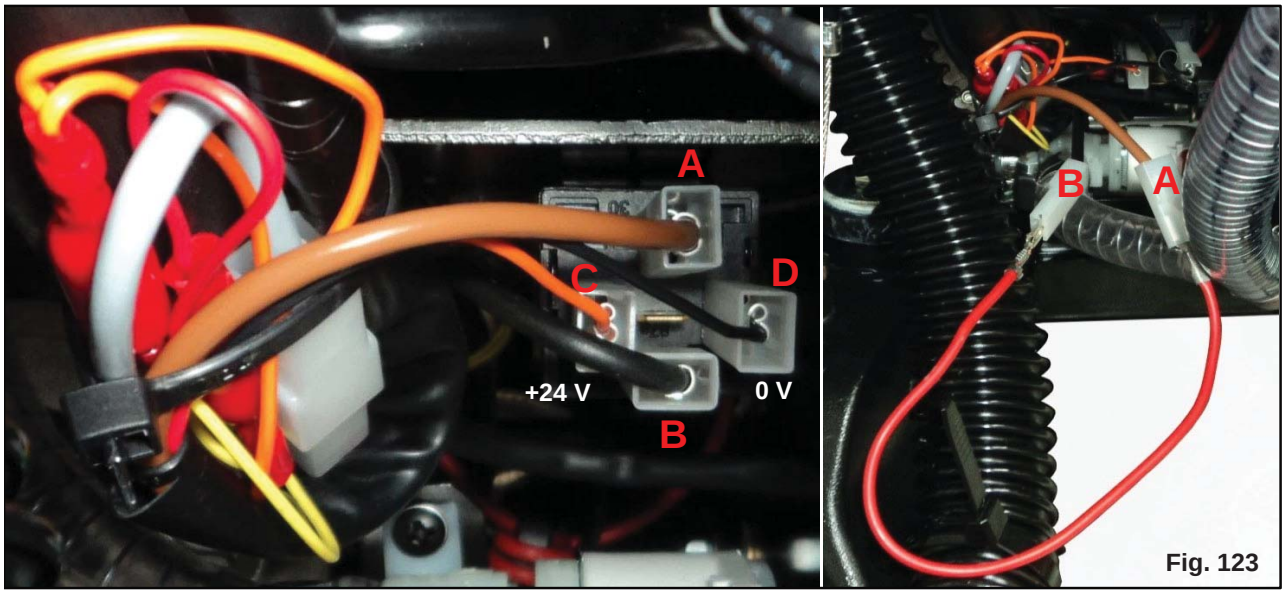


Fig. 123

Reassembly

1 If the relay works correctly, restore the connection, otherwise replace it.

Dismantling

1. Move the machine to the tank draining area, and empty the recovery tank.
2. Move the machine onto flat and dry flooring.
3. Press the emergency key switch until it is held in the bottom position.
4. Disconnect the batteries from the wiring and each other and remove them from the battery compartment.
5. Remove the bettery plate.
6. Identify the crosshead screw closest to the relay .
7. Unscrew the screw and proceed to replace the relay.
8. Proceed with the electrical connection shown below.

Fig. 124

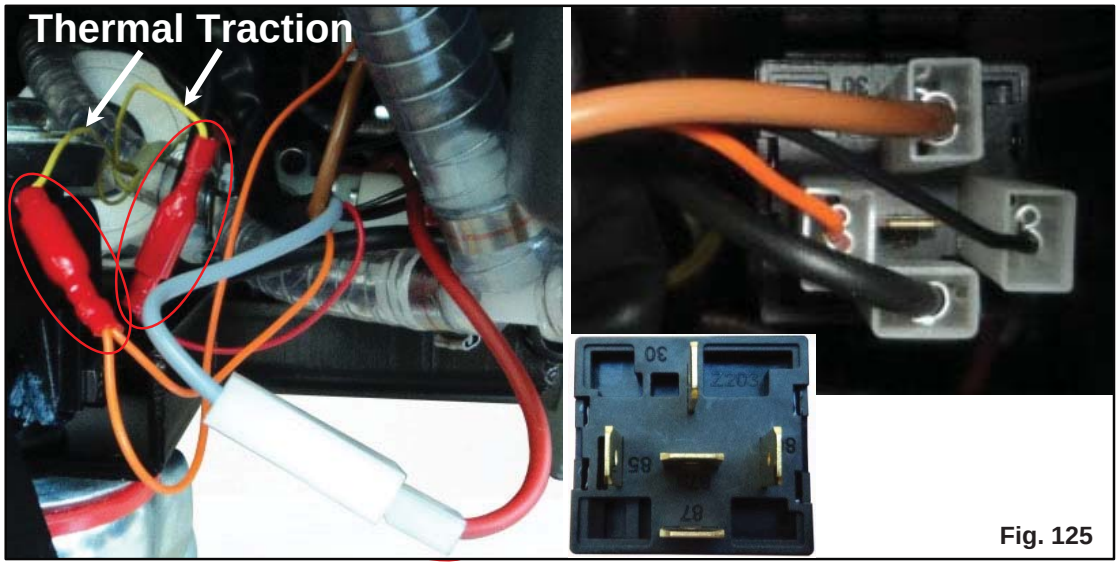


Fig. 125

Reassembly

1. To assemble the new relay, complete the dismantling operations in reverse.
2. Pay attention to the connection to the relay, the other connections are with obligated connections.

WARNING

Go to the designated draining area and empty the solution and dirty water tanks using the drain plugs and the hose provided.

Move the machine onto flat ground. If necessary, place chocks under the wheels.

Press the emergency switch, for the version with drive, or disable the functions by moving the switch to position “0” on all other versions.

Disconnect the battery from the machine’s electronics by simply disconnecting the negative pole only, for the battery versions, or unplugging from the mains power supply for the cable versions.

i INFORMATION

Indicates particularly important instructions.

In this Service Manual, the terms RIGHT and LEFT are used to indicate the sides of the machine.
These always refer to the direction of travel of the machine.

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This note indicates that the instructions only refer to the version specified in brackets or quotation marks.

D1 *MACHINE'S MAIN WIRING*

The machine's main wiring has been modified, moving the brush contactor to the electronics mounting plate, and eliminating the general one. The board is made using an automated process, with the components or sockets soldered on top, eliminating the interconnection wires. The board includes the 2 A fuse for the functions, the board and the solenoid valve. The 30A drive fuse. The 40A suction motor fuse and 50A brush motor fuse. There are some variants to the wiring, such as the cable to power the current reading board used for the rollers, the wiring to power the Chem-dose pump, if featured, and the connector to assemble the on-board battery charger. The connector with safety catch has been added to the drive motor power supply cable.

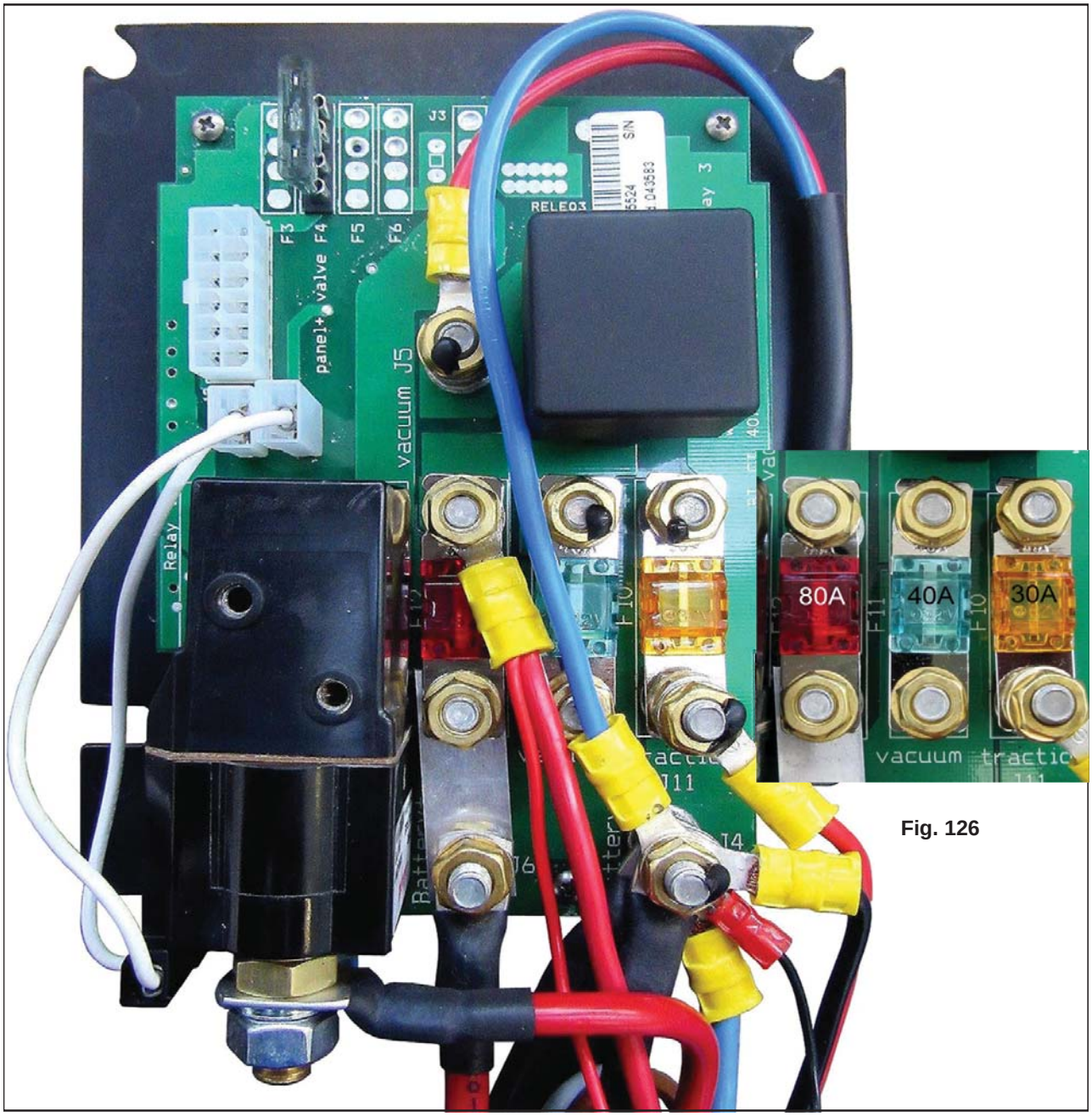


Fig. 126

D1.1 Main wiring board components, “Traction” version

A **Instrument panel board and solenoid valve fuse**
B **Main wiring board connector**
C **Suction motor relay**
D **Contactor brush motor**
E **Brush motor fuse**
F **Suction motor fuse**
G **Drive motor fuse**
H **Positive isolator switch**
I **Negative isolator switch**

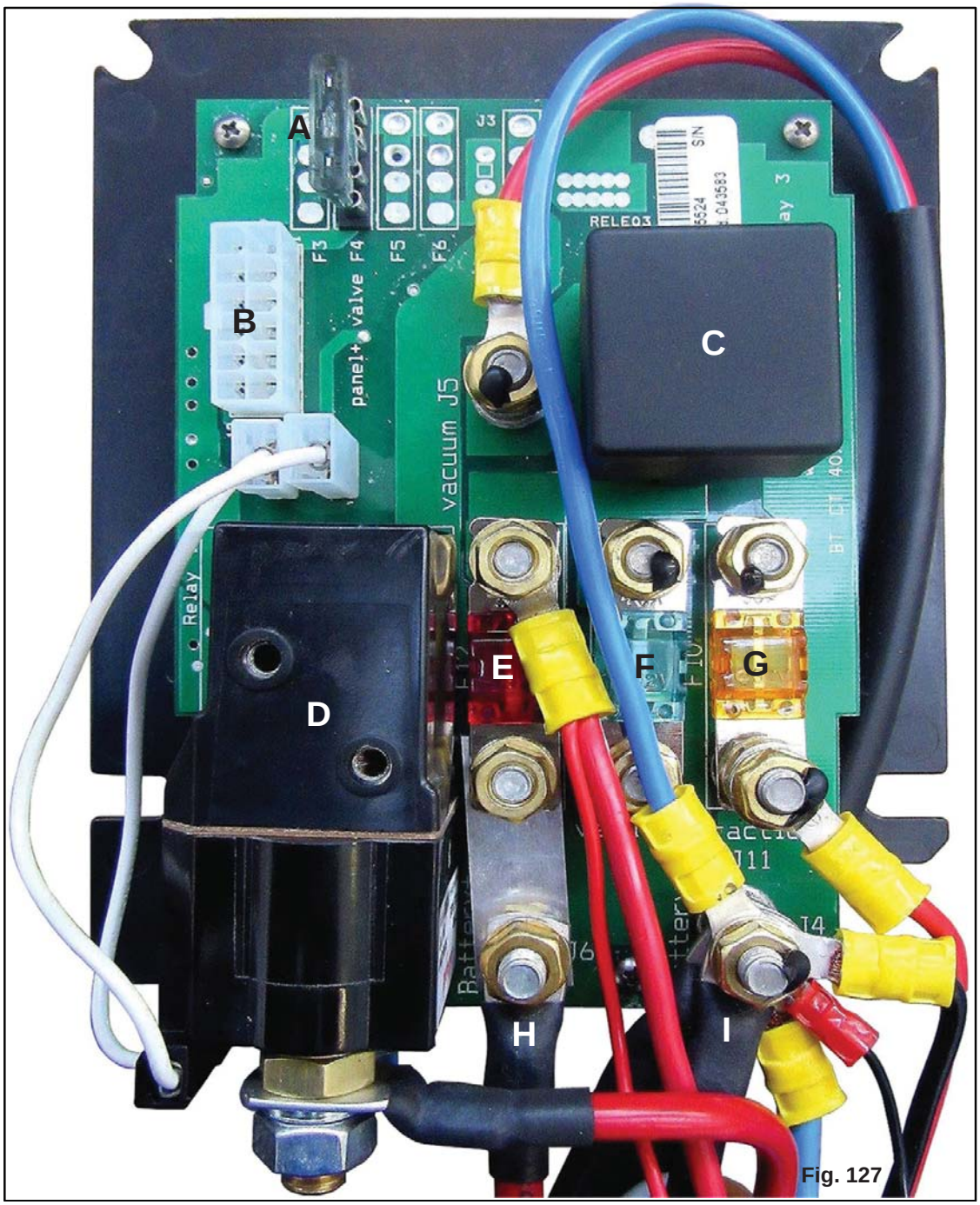


Fig. 127

D1.2 Machine's main wiring connections, "Traction" version

A MULTI-PIN CONNECTOR ON PANEL BOARD

If replacing the machine's main wiring, or there are electrical problems on the machine, check that the connector is correctly plugged onto the board.

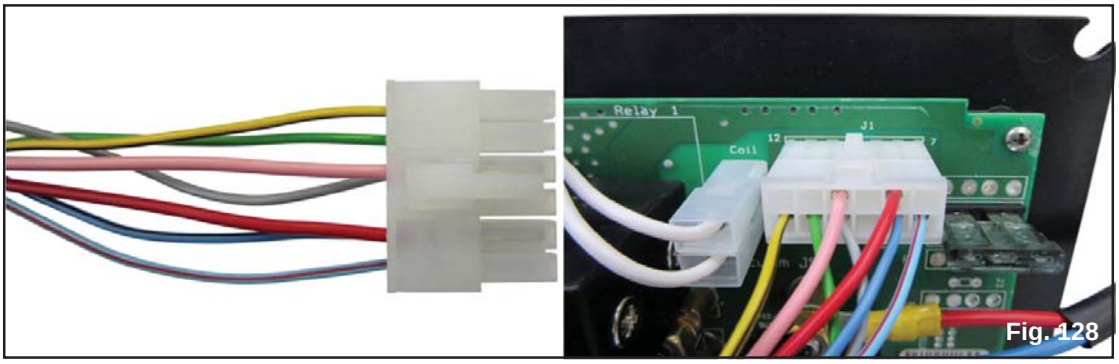
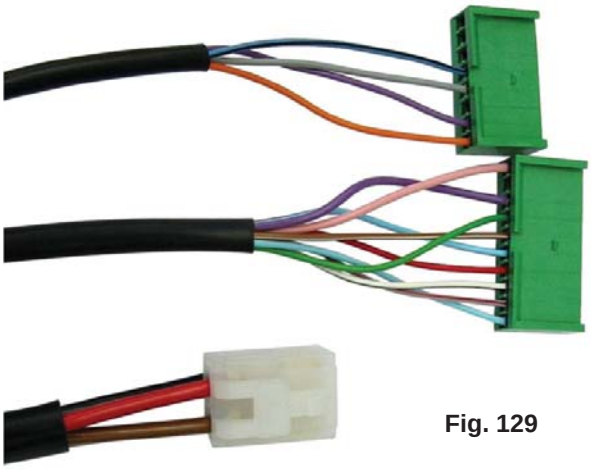


Fig. 128

B CONNECTORS ON THE INSTRUMENT PANEL BOARD



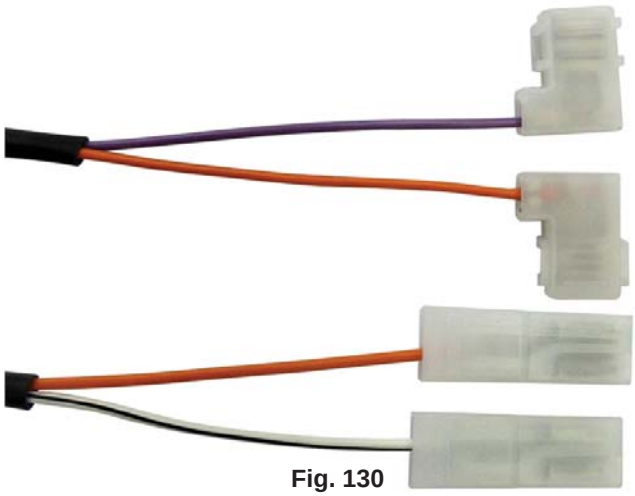
Board power connector, +24 V forwards/reverse signal, +24 V start suction motor control signal, +24 V start brush motor control signal.

Electric motor and function management connector.

Drive connector, red power wire +24 V protected by fuse.

Fig. 129

C FAST-ON TERMINAL CONNECTOR FOR GEAR SELECTOR AND ACTIVATION LEVER



Fast-on terminal for forwards/reverse travel selector. Purple wire and orange wire +24 V.

Fast-on terminal for drive control lever and brush actuator microswitch connection. Black/white wire and orange wire +24 V.

Fig. 130

D FAST-ON TERMINAL CONNECTOR FOR IGNITION KEY / EMERGENCY BUTTON

Fig. 131

White wire with spade lugs to connect to the mushroom-head button with key, carries +24 V signal from the batteries.

Orange wire with spade lugs to connect to the mushroom-head button with key, carries +24 V signal to the functions.

Orange wire with tubular cable lugs, roller version only, powers the current reading board.

E SUCTION MOTOR CONNECTOR

Fig. 132

Suction motor connector, red wire +24 V protected by fuse and blue negative wire.

F BATTERY TERMINALS

Fig. 133

Battery terminals and terminal covers. Red wire on the positive pole "+", black wire on the negative pole "-".

G SEALED CONNECTOR FOR LEVEL SENSORS

Sealed connector for dirty water tank level sensor. Grey-red wire and orange wire +24 V.

Fig. 134

Sealed connector for solution tank level sensor. Blue wire and orange wire + 24V.

H SOLENOID VALVE FAST-ON TERMINAL CONNECTOR

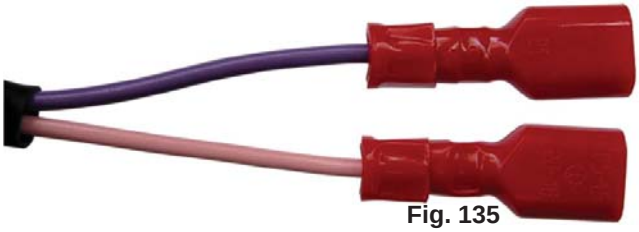


Fig. 135

Solenoid valve fast-on terminal connector. Purple wire and pink wire +24 V.

I DRIVE MOTOR, DRIVE MOTOR PROTECTOR AND RELEASE RELAY CONNECTOR

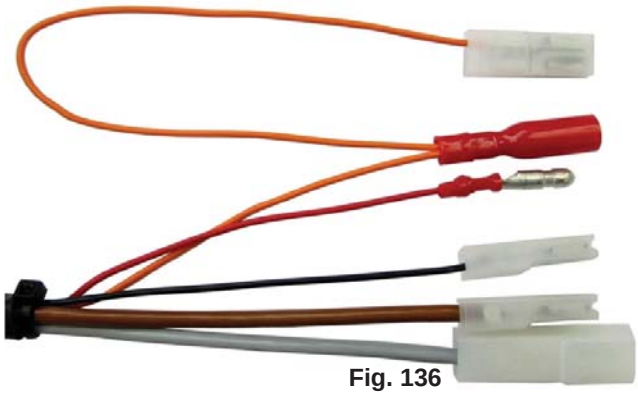


Fig. 136

Relay coil connector, fast-on terminal orange wire +24 V.

Drive motor protector connector. Male tubular cable lugs for red wire, female tubular cable lugs for orange wire +24 V.

Relay coil connector, fast-on terminal black wire connected directly to the negative isolator switch +0 V.

Drive motor connection. Fast-on terminal brown wire and fast-in terminal grey wire.

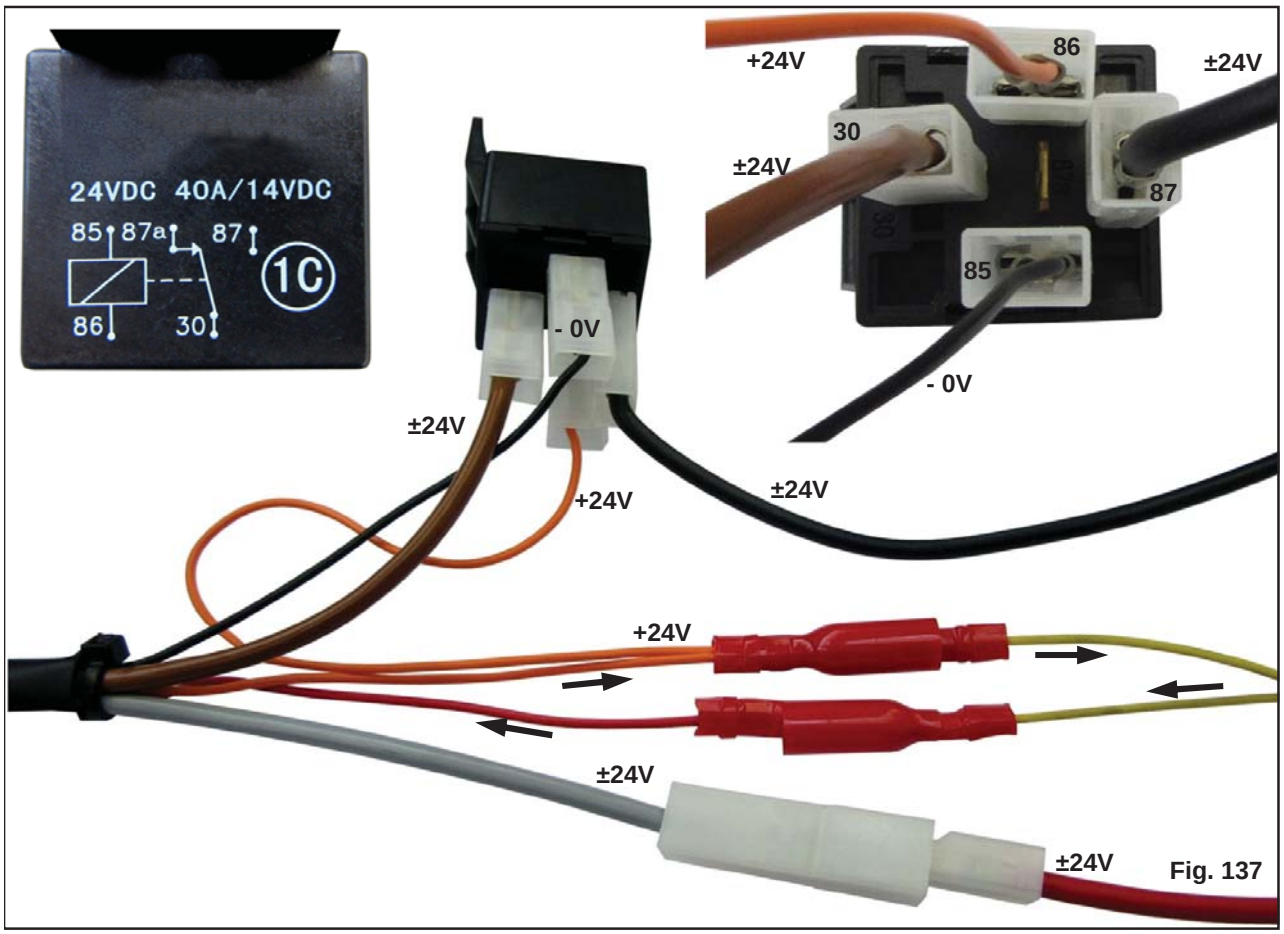


Fig. 137

I BRUSH MOTOR AND MOTOR PROTECTOR CONNECTOR

Fig. 138

Brush motor connector. Ø 6 mm cable eyelet, red wire +24 V from the contactor, black wire +0 V from the negative isolator switch.

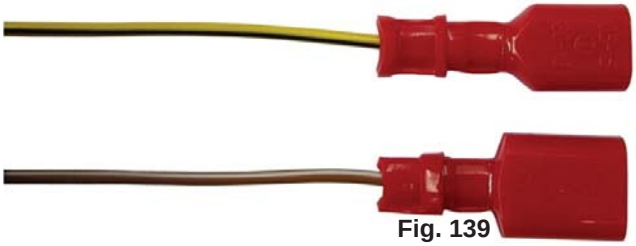


Fig. 139

Brush motor protector fast-on terminal connector. Yellow-black wire and brown-white wire +0 V.

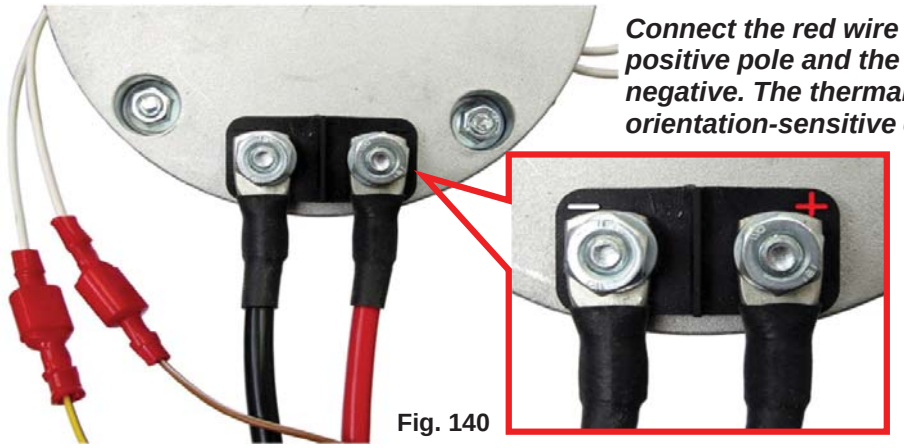


Fig. 140

Connect the red wire to the motor's positive pole and the black wire to the negative. The thermal protector has orientation-sensitive connectors.

M OPTIONAL CHEMICAL PUMP CONNECTION

Fig. 141

Two-pin connector for connecting the Chem-dose pump.
Pink wire +24 V, yellow-black wire +0 V, in series with the brush motor thermal protector

N EXTERNAL BATTERY CHARGER CONNECTOR

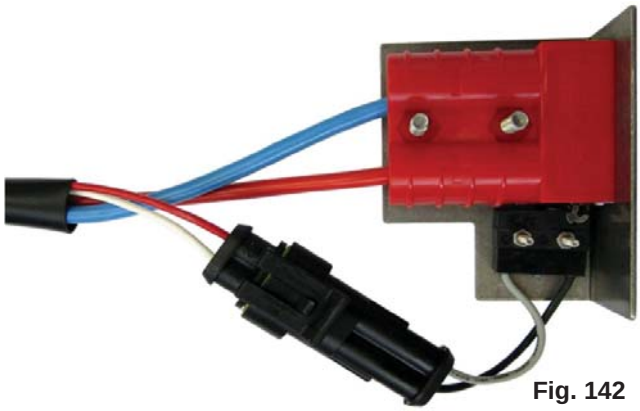
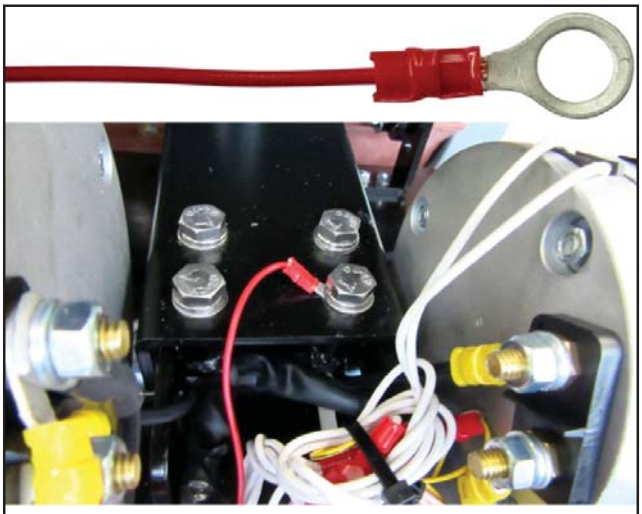


Fig. 142

Connector for recharging the batteries using an external battery charger. Alongside is a microswitch that detects when the recharging connector is plugged in. When activated, the microswitch cuts off the power supply to the electronic board, thus preventing machine operation. The sealed connector provided for the on-board battery charger must be detached from the microswitch and connected to the microswitch on the battery charger.

"R" MACHINES WITH ROLLER HEAD ONLY

O ROLLER VERSIONS ONLY, CONNECTOR FOR ELECTROMAGNETIC COMPATIBILITY



Connection via Ø 8 mm cable eyelet. Only used on machines with roller head, not used on the others. Red wire +24 V coming directly from the positive isolator switch. Connected directly to "ground" on the brush head arm, the purpose is to ensure machine compliance with European standards on electromagnetic compatibility.

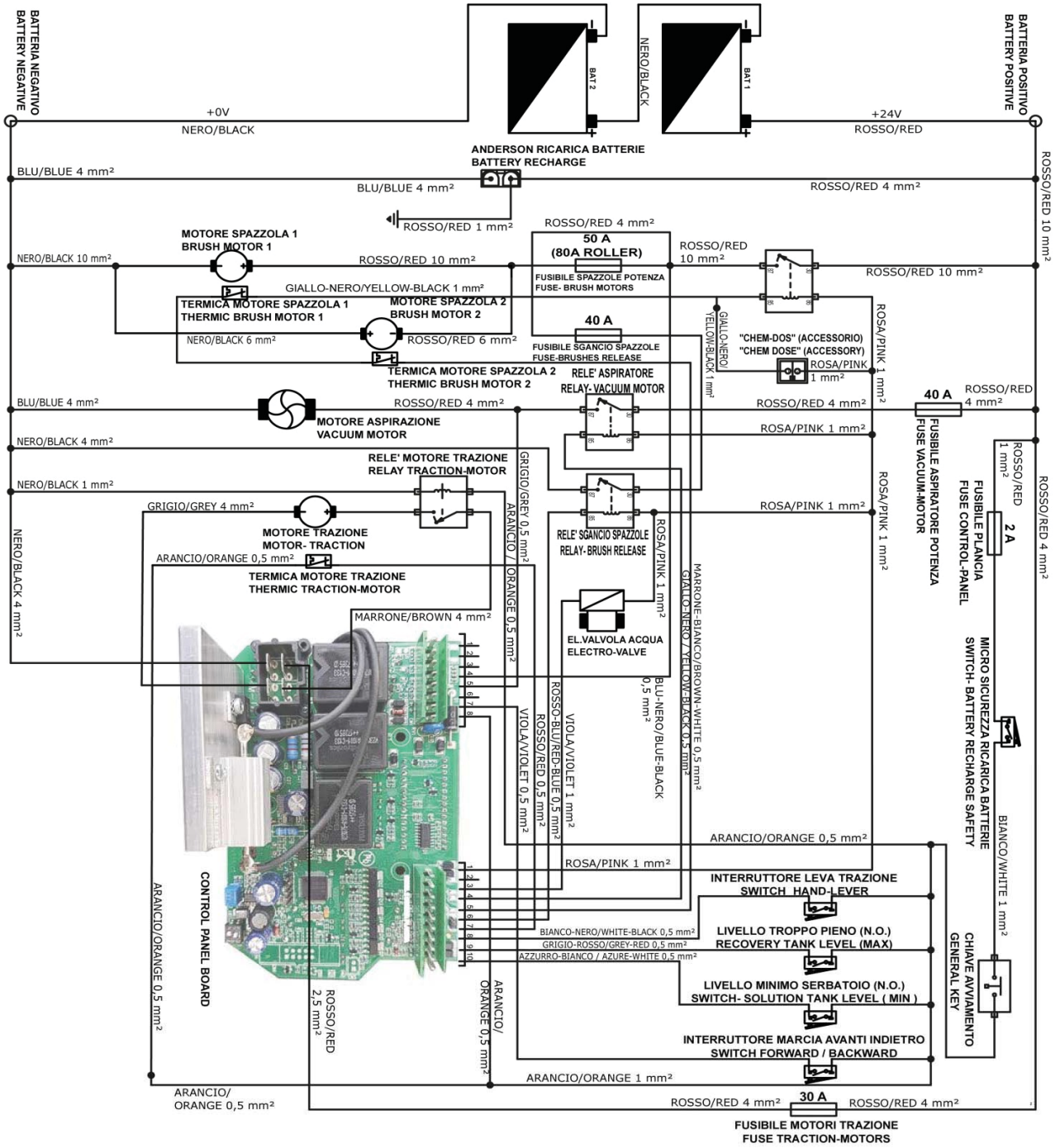
NO TRACTION DISK VERSIONS

Fig. 143

Do connect on versions with disk brushes.
Cut off the eyelet terminal and insulate the wire.

D2 *ELECTRICAL WIRING DIAGRAMS*

D2.1 Wiring diagram Traction version



E ERROR CODES - TROUBLESHOOTING

WARNING

Go to the designated draining area and empty the solution and dirty water tanks using the drain plugs and the hose provided.

Move the machine onto flat ground. If necessary, place chocks under the wheels.

Press the emergency switch, for the version with drive, or disable the functions by moving the switch to position “0” on all other versions.

Disconnect the battery from the machine’s electronics by simply disconnecting the negative pole only, for the battery versions, or unplugging from the mains power supply for the cable versions.

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E1 *ERROR CODES*

E1.1 Alarm messages on the instrument panel board display

i ***The instrument panel boards with display include verification of LED operation; turning the key for around 2 seconds, all the LEDs and the display will switch on. Immediately after this, the display will be show, in sequence, the firmware loaded on the electronic board "F05" (Firmware 05), the hardware version of the instrument panel board "r01" (Release 01), type of electronic board "o09" (Option 09) and finally total machine operating hours, which remain displayed until the machine is shut down.***

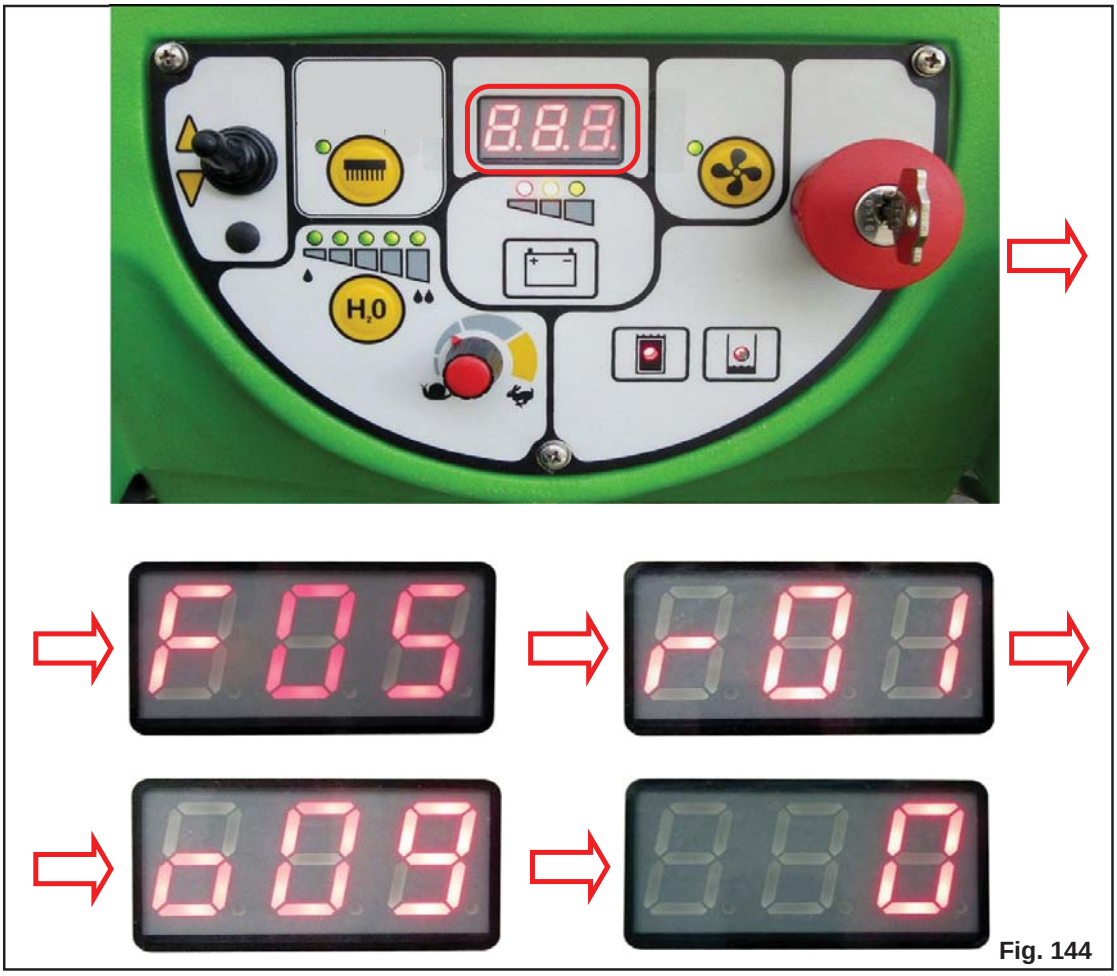

Fig. 144

ACA	**Suction relay control fault**	Check the relay, disconnected or power contacts stuck in “closed” position. Instrument panel board fault
ACC	**DRIVE LEVER already pressed when starting or after emergency**	Release the drive lever and activate it again.
ACH	**Anomaly control solenoid valve water**	Check wiring, connection or short-circuit solenoid valve water.
ACS	**Brush contactor control fault**	Check the contactor, power contacts stuck in “closed” position. Contactor disconnected. Control signal fault from instrument panel board.
BLT	**Drive shutdown due to low battery voltage**	Recharge the batteries
CLH	**Clock - electronic board fault**	Replace the instrument panel board.
FUP	**Main fuse blown**	Check correct closing of the main contactor, replace if necessary. Internal control fault on instrument panel board, replace the board.
HOM	**Board MOSFET protector activated**	Wait for the thermal protector to cool down. Check drive motor current draw. Replace the instrument panel board.
HOT	**Drive motor protector activated**	Wait for the drive motor to cool down. Check motor current draw and continuity of the thermal protector. Replace the carbon brushes or thermal protector.
LIM	**Board (MOSFET) power limited**	Release the drive lever and activate it again. Switch the machine off for a few minutes to let it cool down. Faulty board, replace.
MAN	**DRIVE LEVER already pressed when starting or after emergency**	Release the drive lever and activate it again.
MOF	**Drive MOSFET open**	Check that the drive motor cable is not interrupted. Replace the instrument panel board.
MOS	**Electronic board MOSFET short-circuited**	Check correct operation of the main contactor, brush contactor, suction relay and drive relay. Replace the electronic board.
POT	**Drive speed knob faulty**	Drive disabled. Replace the instrument panel board.

E2 TROUBLESHOOTING

E2.1 Troubleshooting

E2.1.1 The machine won't start

1	Check battery voltage (B, BT).	If there is voltage, go to point 2
		Recharge the batteries.
2	Check the key contact, "BT" only, see paragraph C 4.2, C 4.3.	If OK, go to point 3
		If there is no continuity replace the key contact.
3	Check the instrument panel fuse on the wiring board, see paragraph D 5.1, D 6.1.	If the fuse is intact go to point 4.
		Otherwise replace the fuse.
4	Check the main contactor, see paragraph D 5.1, D 6.1.	If working correctly go to point 5.
		Otherwise replace the main contactor.
5	Check the continuity of the wiring.	

E2.1.2 The brush doesn't rotate

1	Check whether the display on the instrument panel shows error code MOS.	If shown, check that the contactor contact has not remained closed see D5.
		Otherwise go to point 2
2	Check the brush motor fuse E paragraph D 5.1.	If OK go to point 3.
		If blown, replace them.
3	Check continuity of the brush motor protector.	If there is continuity, go to point 4.
		Otherwise replace the protector or the motor.
4	Check operation of the brush actuator microswitch, see paragraph D 2.1.	If the microswitch is working go to point 5.
		Otherwise adjust it or replace it.
5	Check operation of the brush contactor, see chapter D5.	If it is working correctly, go to point 6.
		Otherwise replace or adjust the microswitch.
6	Check the brush actuator, refer to the wiring diagram.	If it is working correctly, go to point 7.
		Replace the brush switch.
7	Check the brush motor carbon brushes, see chapter A2.	If the carbon brushes are intact go to point 8.
		Otherwise replace the carbon brushes.
8	Check continuity of the wires.	If there is continuity go to point 9.
		Otherwise restore continuity.
9	Check the brush motor.	If the motor is intact go to point 10.
		Replace the brush motor.
10	Replace the instrument panel board, see paragraph C4.2, D6.1, D8.1.	

E2.1.3 No suction on the machine

1	Check that the suction hose is clean and intact B 3.2, B 3.4.	If the hose is dirty or damaged, clean it or replace i
		Otherwise go to point 2
2	Check that the squeegee blades are clean and intact.	If everything is OK, go to point 3.
		Otherwise replace the blades.
3	Check that squeegee the is clean and intact	If the squeegee is clean and intact, go to point 4.
		Replace the squeegee.
4	Check the lid gasket, see paragraph B 5.1.	If intact, go to point E 1.3.4
		Otherwise replace it.

E2.1.4 The suction motor isn't working

1	Check whether the display on the instrument panel shows error code "AcA".	If shown, check the suction relay C paragraph D5.1 and its wiring.
		If not shown go to point 2.
2	Check if the "tank full" light on the instrument panel board is on.	If on, empty the dirty water tank.
		If off, go to point 3.
3	Check the fuse F, see paragraph D5.1.	If still intact go to point 4.
		Otherwise, replace it with a new one.
4	Check the connection of the suction motor.	If the connection is intact go to point 5.
		Otherwise restore the connection / connector.
5	Check operation of relay C, see paragraph D5.1.	Doesn't switch, replace or check wiring.
		If it switches, go to point 6.
6	Check the suction motor actuator, see the wiring diagram.	If it is working, go to point 7.
		Otherwise replace the instrument panel board, C4.
7	Check the motor carbon brushes or replace the brush motor, see chapter B1.	Check the carbon brushes or the motor, chapters A
		If everything is OK go to point 8.
8	Instrument panel board, chapter C1.	Check connections to the instrument panel.
		Replace the instrument panel board.

E2.1.5 No water is released

1	Check that all the LEDs on the instrument panel come on and that the solenoid valve opens.	The solenoid valve opens, go to point 2.
		The solenoid valve remains closed, go to point 3.
2	Check that the filter is not blocked, see paragraph B3.1.	If blocked, clean it and reassemble.
		If not blocked go to point 4.
3	Check that the solenoid valve is working correctly, power it at 24 V. Check that there is a voltage of 24 V at the ends of the solenoid valve wires.	If the checks on the solenoid valve are positive, check the wiring output voltage.
		If the output voltage is not 24 V, check the wiring, replace the instrument panel board.

E2.1.6 The machine doesn't move forwards

1	Check the error codes on the instrument panel board display, see chapter E 1.1.	If a code is shown, check which one.
		If no codes are shown, go to point 2.
2	Check the connections under the instrument panel, see paragraph C 4.2, C 4.3.	If the connections are OK, go to point 3
		Otherwise restore the connections.
3	Check operation of the brush actuator microswitch, see paragraph D 2.1.	If the microswitch is working, go to point 4.
		Otherwise adjust it or replace it.
4	Check the voltage reaches the coil and the drive relay power contact, see chapter C3.	If there is no voltage go to point 6.
		If there is voltage, go to point 5.
5	Check the motor carbon brushes and wiring.	If everything is OK, go to point 6.
		Replace the carbon brushes or restore the wiring.
6	Replace the instrument panel board, see paragraph C 4.2, C 4.3.	

REVISION No.	DATE
REVISION 00	December 23, 2020

Drafting of the manual and release date.

REVISION 01