

**Dismantle and assemble electrical parts of various electrical appliance e.g cooking range, geyser, washing machine and pump set**

**Objectives:** At the end of this exercise you shall be able to

- **dismantle the cooking range, geyser, washing machine and pump set**
- **assemble the dismantled electrical appliances**
- **test them for their working**
- **replace the faulty parts with good ones where ever necessary.**

**Requirements**

**Tools / Instruments**

- Electrician Tool Kit - 1 Set
- Spanner set 6 to 22 mm ( 6 Nos) - 1 Set
- Megger 500 V - 1 No.
- Multimeter - 1 No.
- Test lamp 60 w / 240 V - 1 No.
- Pulley puller 3 leg 150 mm - 1 No.

- Washing machine ordinary or semi automatic types 240 V / 50 Hz - 1 No.
- Pump set coupled with single phase motor 240V /50Hz - 1 No.

**Equipment / Machines**

- Cooking range 1500 W / 240 V - 1 No.
- Geyser 1500W/240 V - 15 liters - 1 No.

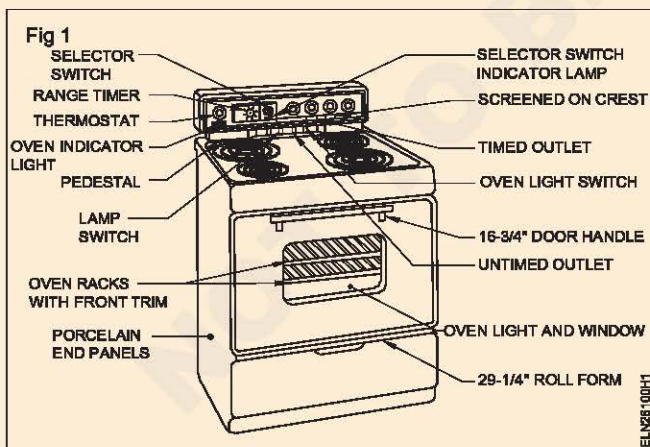
**Materials**

- Service manual - 1 No.
- Cleaning brush - 2.5 cm dia - 1 No.
- Cotton waste - as reqd.
- Kerosine - as reqd.
- Grease - 200 gms

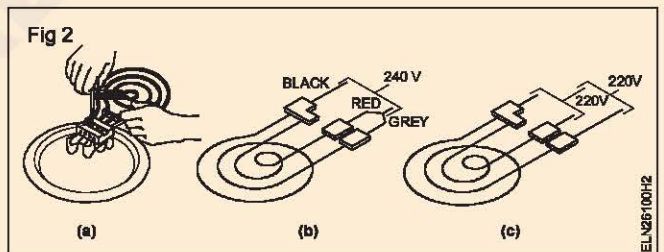
**PROCEDURE**

**TASK 1 : Dismantle and assemble the cooking range**

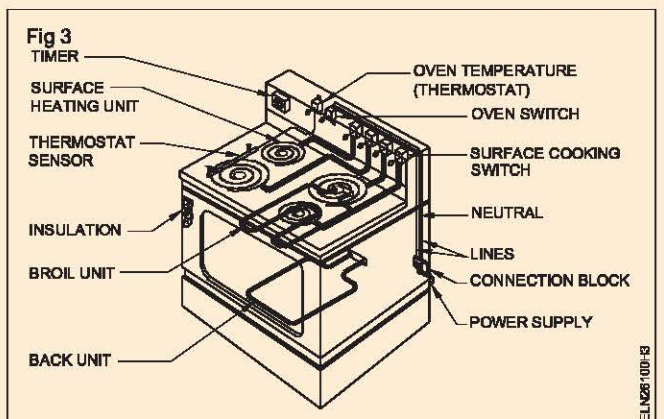
- 1 Note the name plate details of the electric cooking range in Table 1.
- 2 Disconnect the power supply from the cooking range
- 3 Open the terminal connection box (Refer Fig 1)



- 4 Check the proper tightness of the screw at selector switch, indicator lamp, range timer and thermostat.
- 5 Remove the cooking range and check the continuity of the surface heating unit element one by one.
- 6 Check the correct shape, wattage and voltage of the element (Refer Fig 2)
- 7 Open the porcelain end panel which is at bottom of the cooking range.

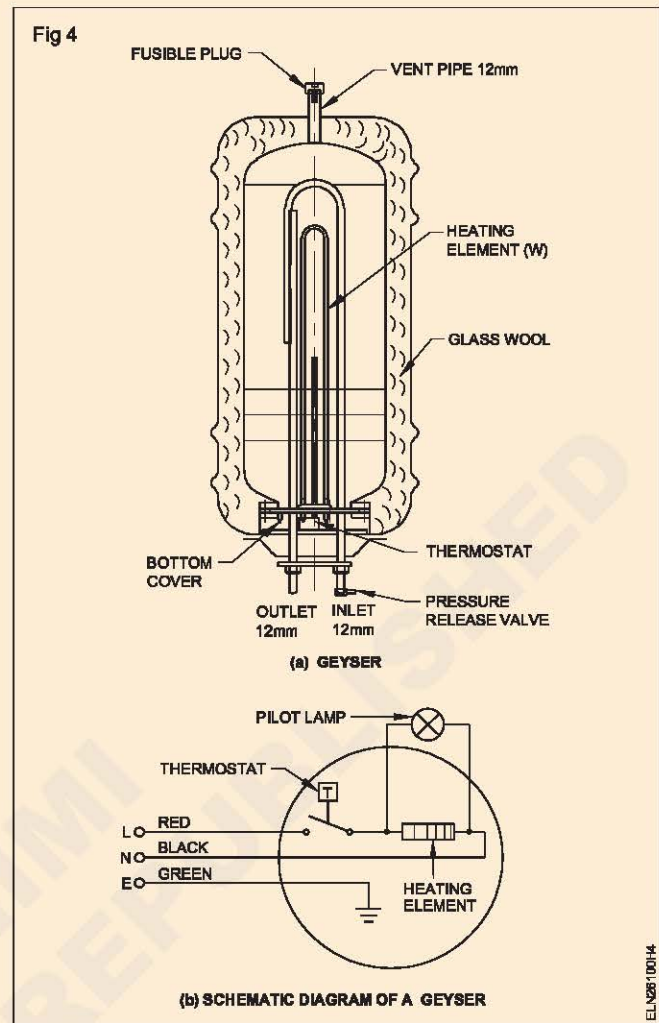


- 8 Check the condition of the oven racks (Fig 1)
- 9 Measure the insulation value between the all terminals to body of the cooking range.
- 10 Assemble and connect the electric cooking range to the supply (Fig 3)



## TASK 2 : Dismantle and assemble the geyser

- 1 Note down the name plate details of the geyser in a separate Table similar to table 1
- 2 Disconnect the power supply from the geyser
- 3 Open the inspection cover for Power terminals connection and thermostat installation. (Refer Fig 4)
- 4 Check proper tightness of the screw at thermostat, pilot lamp, and heating element
- 5 Conduct visual examination of the power cord pin terminals and termination of appliance.
- 6 Conduct insulation test between the leads, lead and earth and record in a separate Table
- 7 Measure the insulation resistance between element and body and record in a separate Table
- 8 Assemble and connect the geyser to the supply.



## TASK 3 : Dismantle and assemble washing machine

- 1 Note the name plate details of the washing machine in a separate Table (Fig 5)

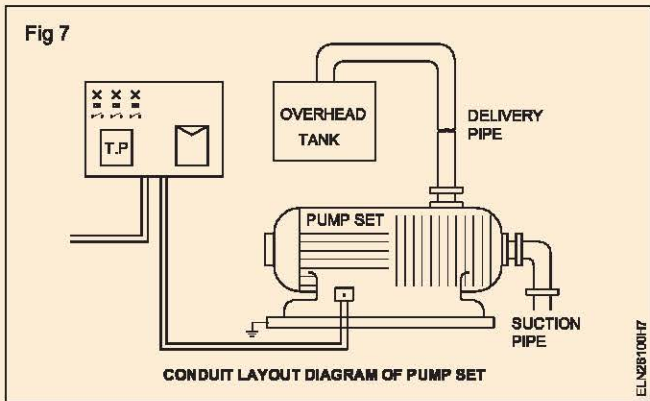


- 2 Disconnect the power supply from the washing machine.

- 3 Open the terminal connection panel and check the proper tightness of the screws
- 4 Remove the washing drum from the washing machine.
- 5 Check the inlet pipe and out let pipe
- 6 Check the outgoing valve
- 7 Check the tightness of shaft pulley / drum belt
- 8 Check the rubber bushings that are used is the machine for absorbing mechanical vibration
- 9 Conduct insulation test to the motor by using a megger.
- 10 If every thing is ok, place the drum and close the inspection hatch/cover.
- 11 Connect the machine to the supply for its working

**TASK 4 : Dismantle and assemble pumpset**

- 1 Note the name plate details of the pumpset in separate Table.
- 2 Disconnect the supply from the pumpset
- 3 Dismantle the pumpset (Fig 6)
- 4 Check the shaft for smooth running, carbon seal, motor adaptor, Drive collar, impeller, casing gasket, bearings (refer Fig 6)
- 5 If every thing is satisfactory, assemble the pumpset
- 6 Connect the pumpset to the supply for its working . (Fig 7)



**Fig 6**

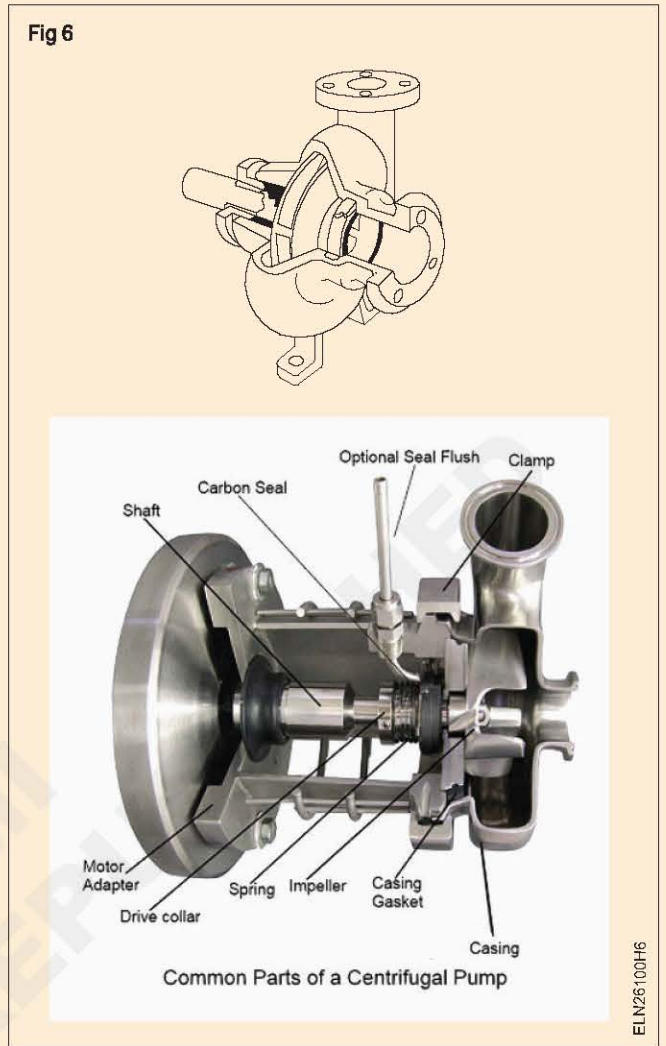


Table 1

Name of the appliance : .....		Serial No : .....	
Voltage : .....		Current : .....	
Supply : .....		Wattage : .....	
Capacity : .....		Make : .....	
Cord Insulation	Between line	Between line/body	Date of servicing
	..... Megohm	..... Megohm	
Element insulation	Between terminal and body / thermostat		Recommended Repair Replacement if any
	Cold		
	Hot		

## Service and repair of electric iron, electric kettle, cooking range and geyser

**Objectives:** At the end of this exercise you shall be able to

- connect and test the given automatic iron for its working
- dismantle the automatic iron and reassemble it
- trace and identify (or) locate the faults in an automatic iron
- replace the faulty parts with good one
- test the electric kettle element and identify the defect
- replace the old element with a new one
- assemble the kettle and test for its working
- dismantle the suspected parts of the cooking range
- test the continuity of heating element
- replace the burn out heating element and worn out selector switch
- reassemble, connect and test the cooking range
- test the line cord for continuity
- dismantle a geyser
- trace identify and locate faults in a geyser
- replace faulty parts with good ones
- assemble the geyser and test for its working.



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### Requirements

#### Tools/Instruments

- Screwdriver 150mm - 1 No.
- Spanner set 6 to 22mm (6 Nos) - 1 Set
- Megger 500 V - 1 No.
- Multimeter - 1 No.
- Electrician tool kit - 1 Set
- Cutting plier 150mm - 1 No.
- Tester 500 V - 1 No.
- Nose plier 150 mm - 1 No.

#### Equipment/Machines

- Automatic electric iron box 750W 250 V - 1 No.
- kettle (sauce pan type) 500W/ 250V - 1 No.
- Electric cooking range 1500W/250 V - 1 No.
- Geyser 1500W 250V 25 liters - 1 No.

- Megger 500 V - 1 No.

#### Materials

- Kettle Element 500W/250V - 1 No.
- Asbestos sheet and fibre washers - as reqd.
- Test lamp 100W/240V - 1 No.
- Element suitable for available Cooking range 1500W, 250 V - 1 No.
- Geyser heating element 1500W, 240V - 1 No.
- Geyser thermostat - 1 No.
- 3-core flexible cord (48/0.2 with 15A, 3 pin plug) - 1 No.
- Insulating material such as asbestos and mica sheets Suitable for electric Iron - as reqd.

## PROCEDURE

### TASK 1 : Service and repair of electric iron

- 1 Conduct a visual examination of the power cord and plug, after interpreting the name plate details
- 2 Conduct preliminary test for
  - short circuit, continuity & insulation
  - earth fault
  - defective element circuit
- 3 Replace the cord, if necessary
- 4 Check for the insulation resistance between line terminal of the iron and the body of the iron (Fig 1) and record in Table 1.

**Disconnect the indicator bulb if any before the short, open and IR test.**

**Always disconnect the iron from supply while testing with insulation tester / Megger.**

- 5 Check for insulation resistance between the neutral terminal and earth.
- 6 Connect the electric iron to the mains and check for its working

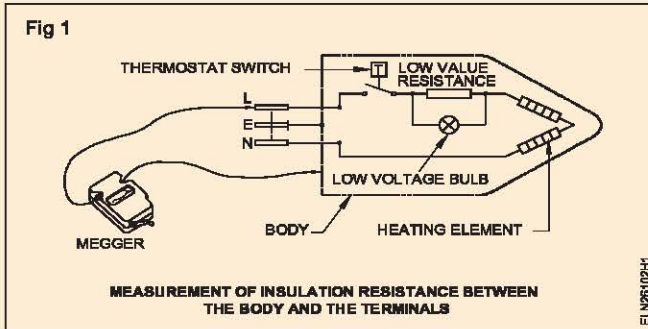


Table - 1

Terminals	Value in Megohms
L & Body	
N & Body	
E & Body	
Plug pin L & Body	
Plug pin N & Body	
Plug pin E & Body	

7 Check the presence of dangerous voltage existing between the body and earth of the supply with a neon tester or voltmeter.

**In case of earth fault**

8 Disconnect the electric iron from the supply, dismantle it. Visually inspect and test with a multi-meter/megger for any contact of live wire with the body

- insulation failure
- broken parts
- damaged thermostat/actuating leaf porcelain
- switch actuator.
- Check for continuity of thermostat and heating element.

9 Rectify the fault by replacing the defective part (element, thermostat etc.) Fig 2 (A & B).

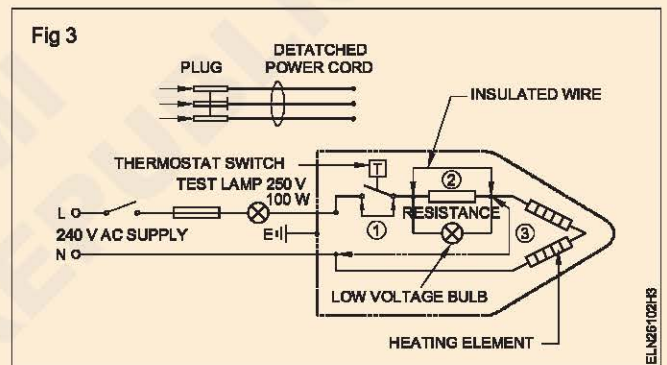
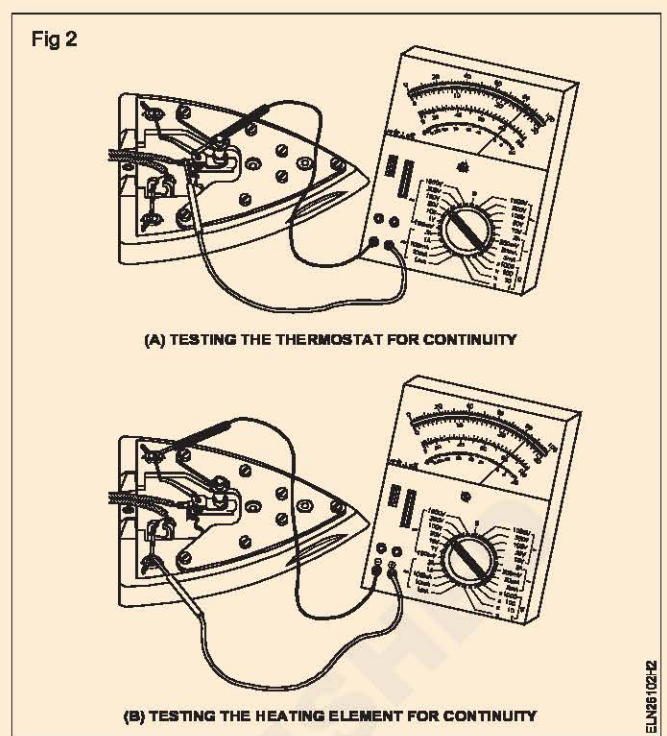
**In case of open in element circuit**

10 Remove the cover to check the thermostat, indicator bulb circuit and element

- Connect the series test lamp to the element circuit shorting the contacts of the thermostat indicated by 1 in Fig 3. If the test lamp glows the thermostat is defective.
- Connect the terminals of the indicating bulb by a piece of insulating wire, shown by 2 in Fig 3. If the test lamp glows the trouble is in this section.
- Short the terminals of the element shown by 3 in Fig 3. If the lamp glows the element is open. Replace the element.

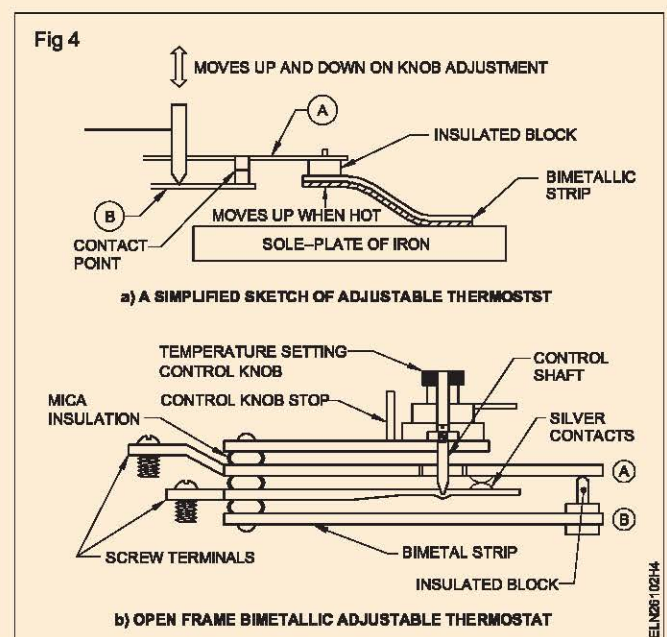
**Failure of temperature setting controller**

- 11 Check the adjusting knob for proper fixing and actuation of shaft. (Fig 4)
- 12 Open the contacts of the thermostat and inspect them visually.
- 13 Clean the pitted or burnt out contacts.



14 Check for the actuating mechanism. (Heat the thermostat by a suitable external heating device.)

15 Assemble the iron and test for good working.



## TASK 2 : Service and repair of a Kettle

- 1 Record the name-plate details of the appliance.

Name-plate Details

- 2 Disconnect the power cord and check the power cord for continuity of the cable, soundness of the terminal connection and insulation resistance between the line, neutral and earth terminals.

**If found defective, either repair or replace the power cord.**

- 3 Check the continuity of the kettle heating element either by using a test lamp or a Megger without opening the kettle.

**If there is no continuity, the element is assumed to be open and it has to be replaced**

- 4 Check the insulation resistance between the appliance socket terminals and the body of the kettle.

**If the insulation resistance is less than one Megohm, the kettle element needs to be replaced.**

- 5 Read the assembly diagram in the instruction book of the kettle and dismantle the parts in the sequence recommended by the manufacturer.

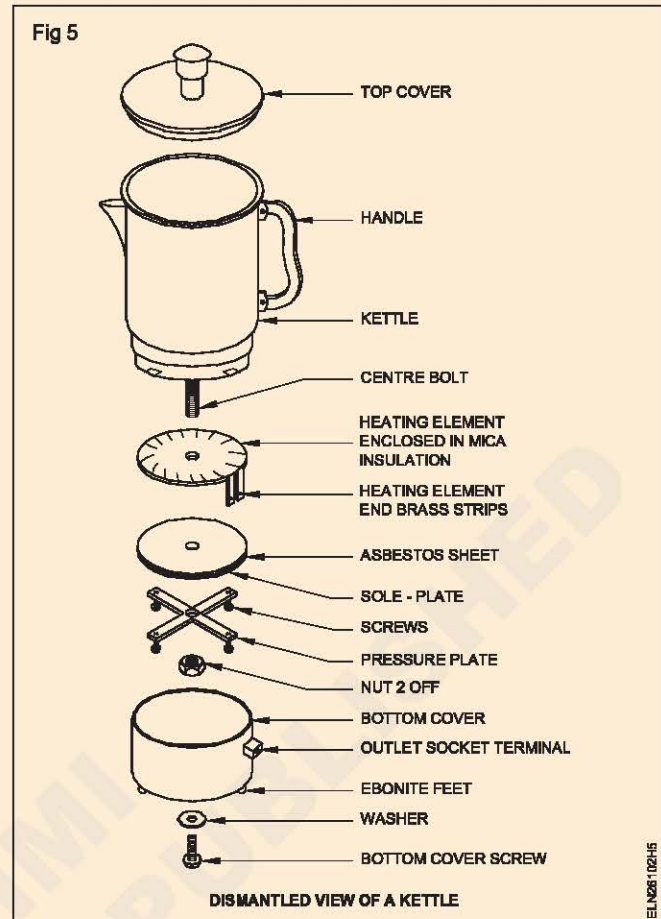
- 6 In the absence of the manufacturer's recommended sequence diagram of the assembly, the following parts may be removed observing the correct procedure as shown in the exploded Fig 5.

- Bottom cover
- Pressure plate
- Sole-plate with asbestos insulation
- Element

- 7 Obtain a suitable element of the right shape, wattage and voltage and necessary mica and asbestos sheets of the same type and quality.

## TASK 3 : Service and repair of a cooking range

- 1 Note the name plate details of the electric cooking range.
- 2 Disconnect the power supply from the appliance.
- 3 Study the connection diagram, given by the manufacturer or trace the connections of the cooking range (Fig 6).
- 4 Check the continuity of the surface unit element one by one.



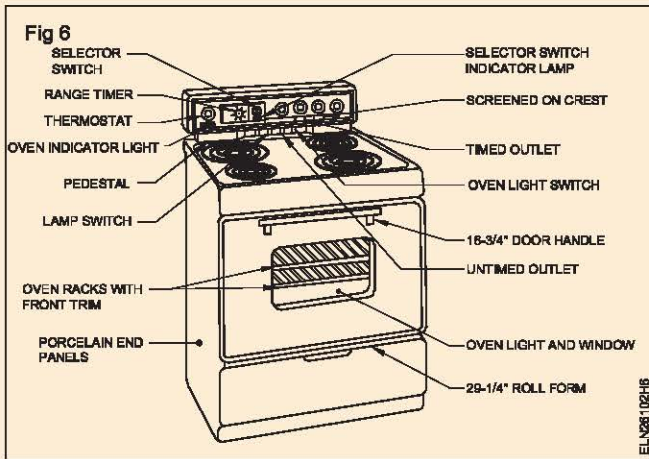
- 8 Check the element for its continuity and ohmic value.
- 9 Replace the new element in position.
- 10 Assemble the parts in proper order and connect the appliance.

**Take care to fit the asbestos sheet and the sole plate at the sole plate housing in the correct order.**

- 11 Measure the insulation resistance between the body of the appliance and its terminals before and after connecting the power cord.

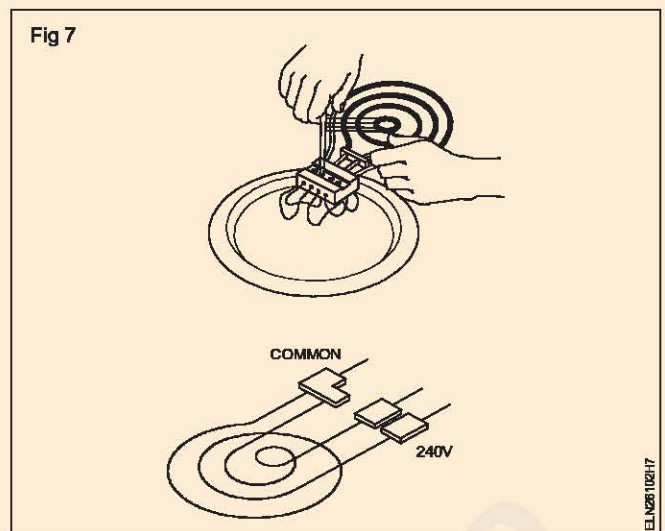
**Switch 'ON' the kettle only after filling water in it.**

- 12 Test the appliance with supply for its working.



**Insulation resistance value should be more than one Megohm.**

- 8 Check the appliance with the supply for its working condition.



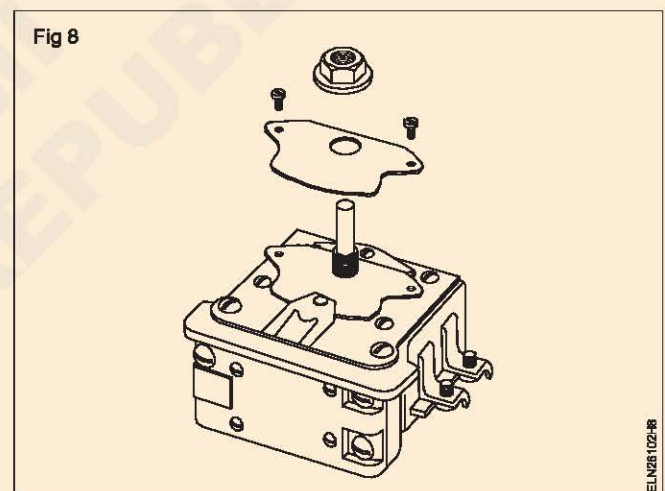
**TASK 4 : Replace the wornout selector switch of cooking range**

- 1 Open the cover of the defective switch, trace the connections and note down the position and column of cables.
- 2 Open the connections of the switch from the terminals.
- 3 Check the continuity of input and output of the selector switch.
- 4 Confirm the condition of the contacts. If found wornout, then remove the switch from the appliance. (as shown in Fig 8).

**Take care to fix the screws, washers at the complete housing of the selector switch.**

- 5 Replace the new selector switch in position.
- 6 Connect the cables as per made in step 1.
- 7 Measure the insulation resistance between line terminals and the body of the cooking range at various positions of all the switches. Measured insulation resistance should be above one megohms.

- 8 Test the assembled switch with the supply for its working.



**TASK 5 : Service and repair of a geyser**

- 1 Record the details of the appliances in Table 2
- 2 Open the inspection cover for Power terminals connection and thermostat installation in the geyser after removing the power plug. (Fig 9)

**Check and ensure that the switch is off before removing the power plug.**

- 3 Connect a visual examination of the i) power cord ii) plug pin termination and iii) termination at appliance.
- 4 Check for proper tightness and good Power contact at terminations. Replace the plug pin if found pitted.

- 5 Conduct the insulation test on the cord - between the leads, lead and earth. Enter in Table 1
- 6 Measure the insulation resistance between the element and the earth/body and record in Table 1. The minimum value of the insulation resistance should be one megohm. If it is less than one megohm, send the geyser for repair and rectification.
- 7 Connect the geyser to the supply and switch on the appliance, keeping the inspection/bottom cover of the Power connections open.

**The geyser should be switched on only with water in the container.**

- 8 Observe that the heating process is cut off by the actuation of the thermostat. (The time depends on the capacity of the geyser and the thermostat setting).
- 9 Switch off the supply. Remove the plug. Measure the insulation resistance value between the terminals and the body of the heater/thermostat while it is hot and record the value in Table 1
- 10 Replace the thermostat if unit in the insulation value is less than one megohm.
- 11 Refit the inspection cover. If the insulation value is normal (i.e. above one megohm) apply grease over the screw before fitting.

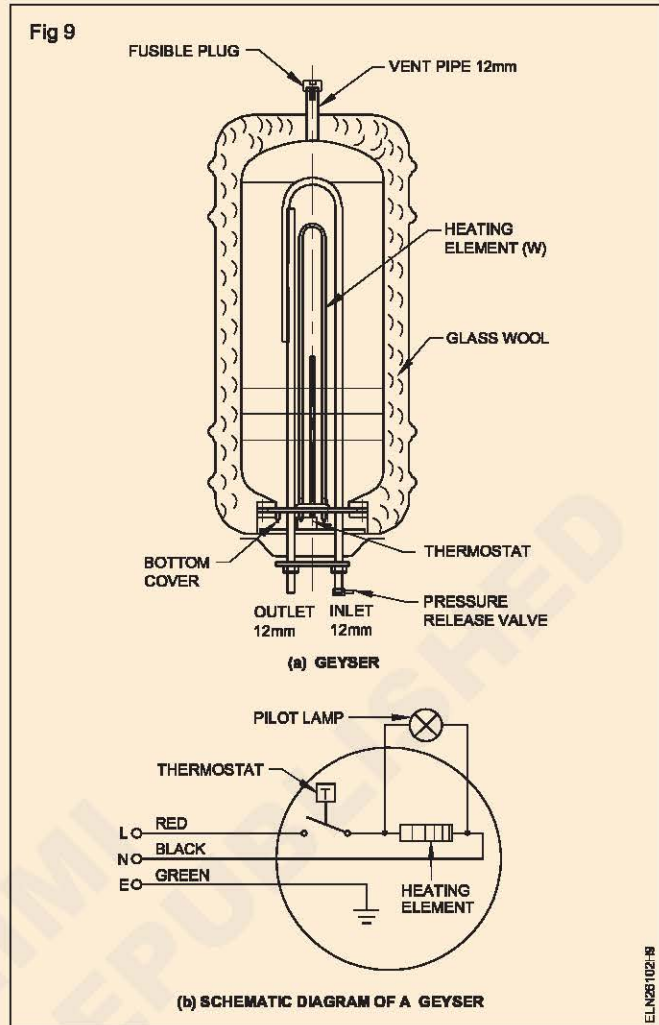


Table 2

Name of the appliance : .....		Serial No : .....	
Voltage : .....		Current : .....	
Supply : .....		Wattage : .....	
Capacity : .....		Make : .....	
Cord Insulation	Between lines	Between line/body	Date of servicing
	..... Megohm	..... Megohm	
Element insulation	Between terminal and body / thermostat		Recommended Repair Replacement if any
	Cold		
	Hot		

**Service and repair of induction heater and oven**

**Objectives:** At the end of this exercise you shall be able to

- **dismantle the induction heater and identify or locate the faults**
- **replace the faulty parts with good ones**
- **dismantle the oven and identify or locate the faults**
- **replace the faulty parts with good ones**
- **assemble the induction heater and oven and test for its working.**



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**Requirements**

**Tools / Instruments**

- Electrician Tool Kit - 1 Set
- Screwdriver 250 mm - 1 No.
- Connector screwdriver 150mm - 1 No.
- Electrician Knife 150 mm - 1 No.
- Metal brush - 1 No.
- Soldering iron 60W, 230V - 1 No.
- Tile cutter - 1 No.
- Multimeter - 1 No.

**Equipment / Machines**

- Induction heater 1 kW, 250V - 1 No.
- Electric oven 1 kW, 250V - 1 No.

**Materials**

- Cotton waste - as reqd.
- Thinner - as reqd.
- Resin core solder - as reqd.

**PROCEDURE**

**TASK 1 : Perform service and repair of induction heater**

- 1 Note the name plate details of the induction heater and record them in the Table.

Name Plate Details	
SL No. _____	Power _____ kW
Make _____	1 $\phi$ / 3 $\phi$
Voltage _____ V	
Current _____ A	

- 2 Disconnect the power supply from the induction heater.
- 3 Check the power cord for continuity of the cable

**If found defective, replace the power cord**

- 4 Open the induction heater.
- 5 Do a thorough cleaning of PCB and other parts.
- 6 Remove the mainboard for visual inspection and trouble shooting.
- 7 Check whether PCB is covered by varnish.
- 8 Apply thinner and rub with metal brush and scrap with a knife and expose the dry solder points. (Fig 1)
- 9 Retouch all the points with fresh solder.

Fig 1



DRY SOLDER

ELN2612SH1

- 10 Check whether any capacitor cracked in the PCB (Fig 2). If so remove it from the PCB with the help of tile cutter (Fig 4).
- 11 Check the electrolytic capacitors on the board and replace with a new one if they are found at the brim.

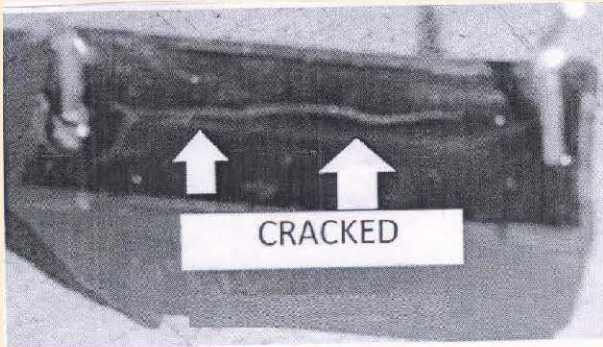
12 Press the switches on the control board and if they show resistance, it may be due to improper contact.

13 Replace all the Press-to-on button switches.

**If buttons are slightly longer than the one on the board, nip the extra length with tile cutter tool**

14 Defective switch is shown below (Fig 5)

Fig 2



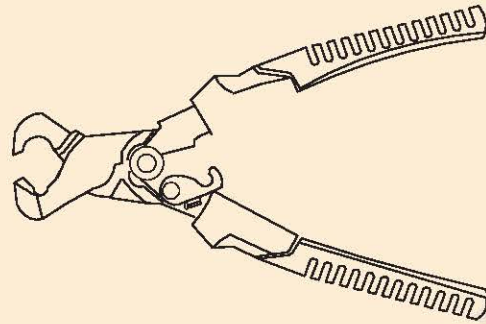
0.27/1200V CAP

ELN26103H2

15 After completing the work put the PCB and other parts back into the cabinet, (Fig 3). Fig 6 shows the cook top of induction heater.

16 Test the appliances with supply for its working.

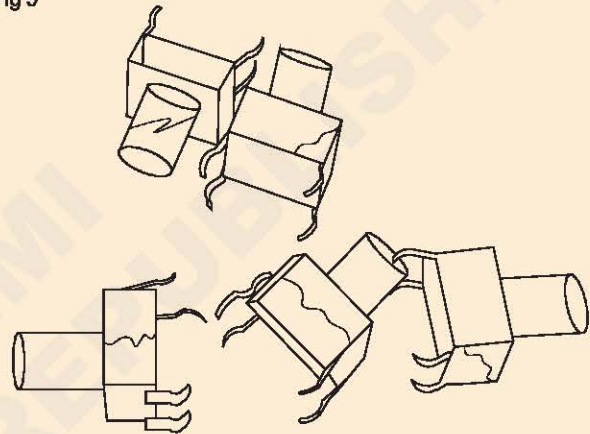
Fig 4



TILE CUTTER

ELN26103H4

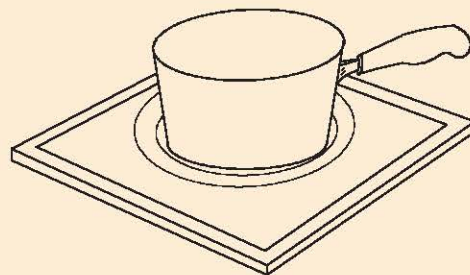
Fig 5



DEFECTIVE SWITCH

ELN26103H5

Fig 6



INDUCTION COOK TOP

ELN26103H6

## TASK 2 : Service and repair of oven

1 Identify the oven model number or part number on the element

**The package (Fig 8b) of the new element will list the manufacturers, model numbers and part numbers for which it serves as a replacement**

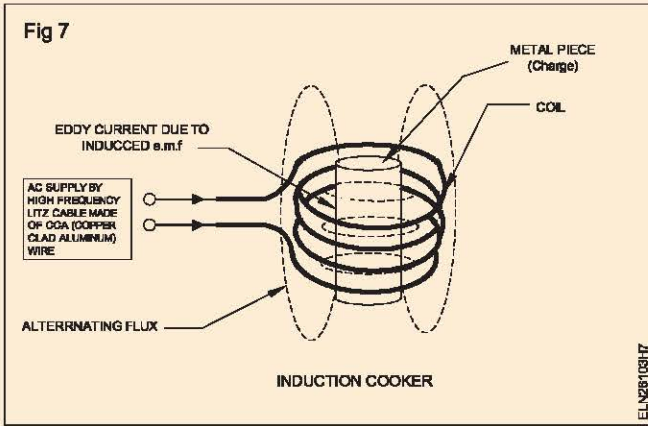
2 Turn off the power to the oven at the breaker box and unplug the oven

3 Remove the screws that secure the element to the oven

4 Pull the element 10 to 12.5 cms away from the back wall of the oven (Fig 7)

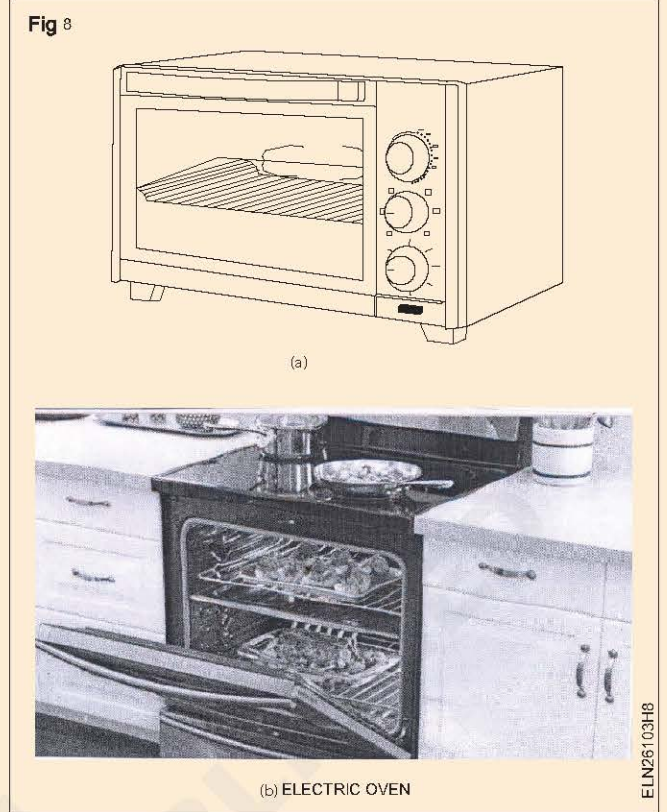
5 Remove the screws that hold the wires of element

6 Install the new oven element attaching the wires as they were before



- 7 Secure the new element to the back wall of the oven (Fig 8a) shows element.
- 8 Plug the oven back in and return the breaker back to the "ON" position
- 9 Test the oven with supply for its working.

**There may be little smoke when the new element heats up it's likely just the factory coating burning off.**



**Service and repair of mixer and grinder**

**Objectives:** At the end of this exercise you shall be able to

- read and interpret the data of the given mixer
- identify the area of problem in the mixer by visual inspection and tests
- dismantle the mixer
- trace, identify and locate faults in the mixer
- replace faulty parts with good ones
- clean and lubricate the bearings
- assemble mixer and test for its working
- read and interpret data of wet grinder
- test the line cord for continuity
- measure insulation resistance between the terminals
- trace, identify and locate faults in a wet grinder
- replace faulty parts with good ones.

**Requirements**

**Tools and Instruments**

- Electrician Tool kit - 1 Set
- Test lamp 100 W, 240 V - 1 No.
- D.E. spanner set of six 6 mm to 22 mm - 1 Set
- Plastic spanner for opening the jar screw - 1 No.
- Box spanner set of 6mm to 22 mm - 1 No.
- Multimeter - 1 No.
- Megger 500 V - 1 No.
- Philips screwdriver 4 mm blade dia - 1 No.
- Pulley puller 3leg 200 mm - 1 No.

**Equipment / Machines**

- Mixer 250 V 50 Hz. 400 watts - 1 No.
- Grinder 250 V 50 Hz 0.25 HP - 1 No.
- AC Ceiling Fan 60 W, 250V - 1 No.

**Materials**

- Grease/lubricating oil - as reqd.
- Kerosene - as reqd.
- Cleaning brush - 1 No.
- Sandpaper smooth - as reqd.
- Soldering lead, 40:60, soldering flux - as reqd.
- Service manual (if available) - 1 No.

**PROCEDURE**

**TASK 1 : Service a mixer**

- 1 Note down the name-plate details in the maintenance cards. (Table 1)
- 2 Enter the details of the complaint from the customer in the maintenance card.
- 3 Switch on the mixer and check for its functioning.
- 4 Isolate the mixer from the supply.
- 5 Open the bottom cover and conduct visual inspection for :
  - damages in the supply cord and loose terminal connections

- good condition of switches
- proper mounting of the motor.

Check whether the nylon/rubber coupling of the jar and motor are properly seated, if not replace.

**Sometimes the retaining spring and washer might have got spoiled and need to be replaced.**

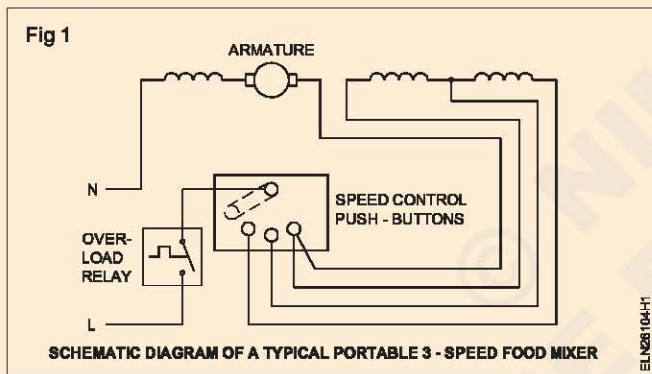
Table 1

**Maintenance Card**

Name of the customer _____		Address _____	
Name of the appliance _____		Serial No _____	
Wattage _____	Current _____	Voltage _____	
Supply _____	Make _____		
Date of servicing	Consumer's complaint	Defects noticed by visual inspection	Details of repair and replacement

Enter the mixer details in the maintenance card (Table 1)

- Conduct an insulation test of the motor and record in the maintenance card (Table 2). The schematic diagram of a mixer circuit is given in Fig 1.



**The insulation resistance value should not be less than one megohm.**

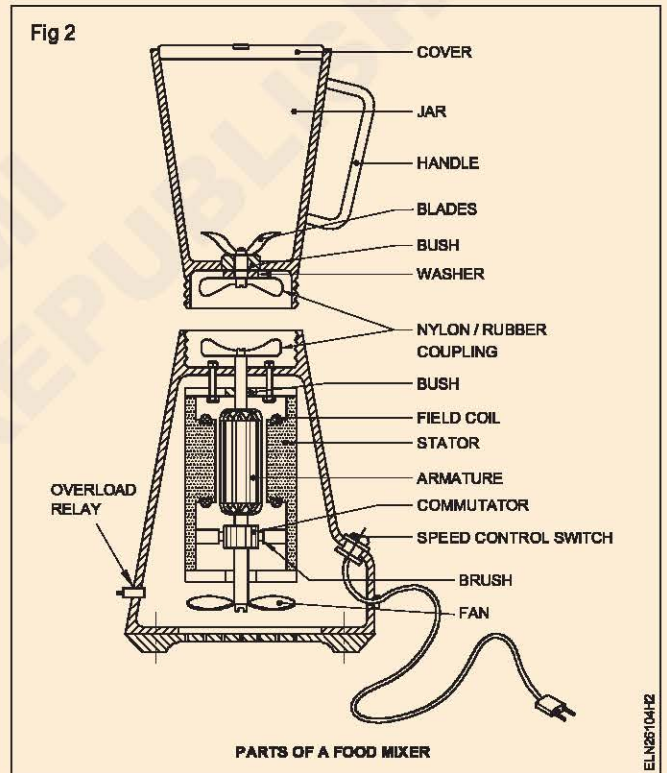
- Improve the insulation value by heating or varnishing, if the insulation value is less than one megohm and enter the test results in the maintenance card. (Table 2)
- If the motor is opened for varnishing, clean thoroughly the stator and armature and bush bearings. (Fig 2)
- Conduct the insulation test after varnishing and enter the results in the maintenance card (Table 2).

**Remember that the nuts at the blades and the centre shaft holding nut are to be loosened by clockwise movement and tightened by anti-clockwise movement in most of the mixers.**

- Lubricate the bearing as recommended by the manufacturer before assembly.

**Most of the bearings need no lubrication. If required, a drop of light oil like 3-in-1 oil could be used.**

- Clean the commutator surface. A black carbon deposit



could be removed by CTC. Seat the bushes properly over the commutator. Check for adequate length of brushes to exert spring pressure.

**If the brush length is shorter by 1/3 of its original length it is better to replace with the brushes of the same grade and size. The new brush has to be bedded on the commutator properly.**

- Assemble the motor and tighten the terminal screws.
- Assemble the blade with the jar and nylon coupling at the bottom.
- Connect the motor to the supply and start the mixer.
- Observe the working of the mixer for smooth running.

Table 2

Date of servicing	Insulation resistance before varnishing/heating		Insulation resistance after varnishing/heating		Details for repair and replacment
	Between terminal and body	Between Armature and field	Between terminal and body	Between Armature and field	

**TASK 2 : Repairing of mixer**

1 Listen to the complaints of the customer/user and enter in the maintenance card (Table 1).

Common complaints are listed in the troubleshooting chart along with reasons for the possible cause and the corrective action to be taken.

2 Inspect visually the following parts for trouble.

- Power cord and plug
- Terminal connections at the switch (back cover to)
- Couplings
- Freeness of the shaft
- Burnt smell or discolouring of windings.

**TASK 3 : Service a grinder**

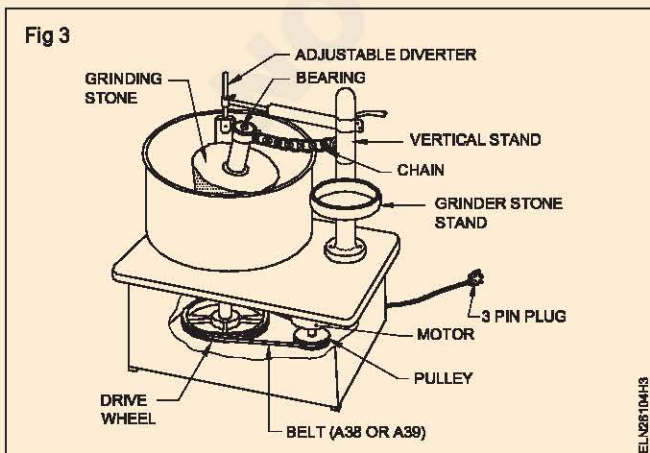
- 1 Switch on the grinder and check for its functioning.
- 2 Isolate the grinder from the supply.
- 3 Open the inspection cover. Note down the name-plate details in Table 3.

Table 3

Name of appliance _____	r.p.m _____
Serial No. _____	Volt _____
Capacity H.P. _____	Current _____
Phase _____	Frequency _____

4 Conduct visual inspection:

- for supply cord
- for good condition of switches
- for proper mounting of motor and drive alignment (Fig 3)



- 5 Conduct an insulation test of the motor and record in Table 4. If the insulation value is above 1 megohm, switch on the grinder and observe its function.
- 6 If the insulation resistance is less than 0.5 megohm, improve the insulation value by heating or varnishing, provided the motor is opened for varnishing.

Table 4

Insulation resistance	Between terminals and body	Between winding
Date of servicing		
Recommended repair		
Replacement if any		

- 7 Clean thoroughly the motor and the bearing of the grinder.
- 8 Lubricate the bearing as recommended by the manufacturer before assembly.
- 9 Assemble the motor and tighten the terminal screws, pulley screws, flywheel nuts, motor fixing bolts etc. (After adjusting belt tension)
- 10 Connect the motor to the supply and start the grinder. Observe the working of the motor and the grinder for smooth running.

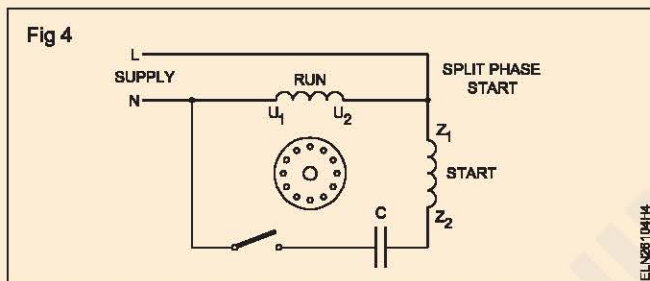
## TASK 4 : Repairing of grinder

- 1 Listen to the complaints of the customer/user complaints may be:
  - i) Grinder not working
  - ii) fails to start, but runs in either direction, when started manually
  - iii) starts but heats rapidly
  - iv) reduction in speed - motor gets too hot
  - v) grinder is noisy
  - vi) grinder gives shock.

### Grinder not working

Check whether there is open connection in line. Rectify the fault if observed.

Check for any open circuit in motor winding (starting and running winding). Send it for repairs, if open circuited. (Fig 4)

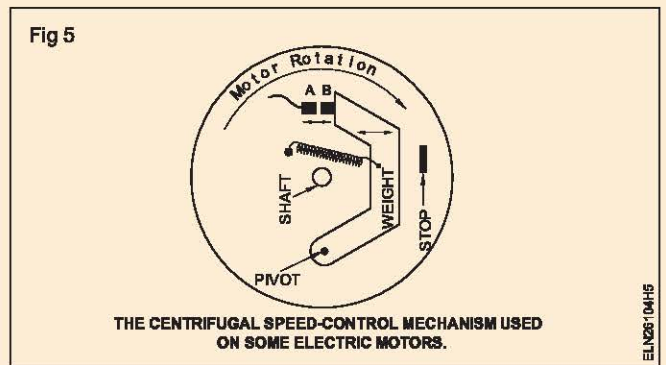


Check tightness of the belt. Adjust the belt for proper tension as recommended by the manufacturer. (Fig 3)

Check whether it is due to tight bearings. Test by turning the shaft by hand. If lubrication does not help, the bearing must be replaced.

### Fails to start, but runs in either direction when started manually.

Check the contact of the centrifugal switch. If the contact of the centrifugal switch is not closed, repair it or replace it. (Fig 5)



Check the capacitor. Replace it if defective.

### Starts but heats rapidly.

Check the centrifugal switch. If it is not opening, rectify or replace.

### Reduction in speed - motor gets too hot.

Check the winding for its short circuiting and grounding (earthing).

Check the bearing to know whether it is sticky. Repair or replace, if found defective

### Grinder is noisy

Check for worn out bearings - replace the bearings and inspect the shaft for scoring.

Check the end play, add additional end for preventing washers, if the play is too much.

Check the loose parts (that is loose hold-down bolts, loose fan, pulleys etc). Tighten them.

Check whether there is misalignment. Align the pulleys correctly. (Fig 3)

Check the belt. Replace if it is worn out. (Fig 3)

Check the shaft of the motor. Replace or send the motor for repair, if found bent.

### Grinder gives shock

Open the inspection cover and check for any line contact with the metallic body. Also ensure earthing is proper.

Rectify the accidental contact, if any, and insulate them properly.

Service and repair of washing machine

**Objectives** At the end of this exercise you shall be able to

- record the name plate details of the washing machine
- listen to the complaint of the customer and identify the type of fault
- rectify the fault in the washing machine
- service the washing machine through general checks and visual inspection
- conduct insulation resistance test on a washing machine
- record the details of maintenance in the service card.



Scan the QR Code to view the video for this exercise

Requirements

**Tools and Instruments**

- Megger 500 V - 1 No.
- Test lamp 60W,240V - 1 No.
- Combination plier 150 mm - 1 No.
- D.E spanner set 6 of 22mm set of 8 - 1 Set
- Philips screwdriver 150 mm - 1 Set
- Grease gun 1.2litre cap - 1 No.
- Oil cane 1/2 litre cap - 1 No.
- Geal pulley puller 3leg 150 mm - 1 No.
- Multimeter - 1 No.

**Equipment/Machines**

- Washing machine ordinary or semi automatic type 240V, 50Hz - 1 No.

**Materials**

- Washing machine spares - as reqd.
- Oil/grease - as reqd.
- Oil/grease - as reqd.
- Water proofing kit - 1 No.
- Teflon tape/m seal - as reqd.

PROCEDURE

TASK 1 : Repair washing machine

- 1 Record the details of the washing machine (Fig 1) in Table- 1.

Table 1

Name-plate details



Manufacturer _____	
Sl.No. _____	Phase _____
Capacity _____	R.P.M _____
H.P./K.W _____	Voltage _____Hz
Max.weight _____	Current _____
of clothes/	
drum capacity _____	

- 2 Listen to the complaints of the customer/user. The complaints may be anyone listed in the left side column of the table 2 The causes and remedies are given in the right side column of the table 2

Table - 2

### Troubleshooting chart for washing machine

Sl.No.	Complaints	Causes and remedies
1	Machine not Switching "ON"	<ul style="list-style-type: none"> <li>I Check for open connection and rectify the same</li> <li>II Check the incoming supply</li> <li>III Check the fuse on the machine</li> <li>IV Check the motor windings and repair of minor repairs can be carried out, if needed send it for repairs/rewinding for internal open circuit.</li> <li>V Check the speed governing starting switch, repair or replace with a new switch.</li> </ul>
2	Water not filling up in the washing drum	<ul style="list-style-type: none"> <li>I The inlet pipe is chocked. Open the inlet valve, clean it and reconnect it using water proofing teflon tape</li> <li>II Check incoming water supply and replace the same.</li> </ul>
3	Water does not drain out of the wash drum	<ul style="list-style-type: none"> <li>I Check the outgoing valve, clean and reconnect it with proper water proofing</li> <li>II Check the outgoing pipe for any kinks - repair or replace the same.</li> </ul>
4	Machine becomes 'ON only for a very short duration and then switches off	<ul style="list-style-type: none"> <li>I The timer setting may be incorrect;set the timer properly.</li> <li>II The speed governor switch may be faulty; dismantle the motor and repair the same, If possible, or replace the starting speed governor swivel mechanism.</li> <li>III The running winding impedance could have increased due to open circuit and insulation failure. Check the running winding impedance and rewind the motor, if necessary.</li> </ul>
5	The machine is noisy	<ul style="list-style-type: none"> <li>I Check the balancing of the drum and correct the same if found off balance.</li> <li>II The motor shaft pulley/drum driver pulley may be loose,tighten the same.</li> <li>III The belt of the machine drive might have loosened thus giving play.</li> <li>IV Check the bearings of the motor, replace the worn out or grease the same using the recommended grease.</li> <li>V Check all rubber bushings that are used in the machine for absorbing mechanical vibration, and replace, if found spoilt or missing.</li> </ul>
6	When power is switched 'ON' motor is not working	<ul style="list-style-type: none"> <li>I Check if the motor shaft is rotating; the pulley to the hum is heard but the wash agitator does motor shaft may be loose, tighten the same.</li> <li>II Check the belt tension. If the belt has become loose tighten the same by the tension adjustor or replace the belt with a new one.</li> <li>III Check if the agitator of the machine is sufficiently loose,i.e. the bearing if free and not tight; carry out lubrication of the bearing if necessary.</li> </ul>
7	When the machine control switch is switched 'ON' the fuse blows	<ul style="list-style-type: none"> <li>I Isolate the machine from the supply, isolate the motor terminals and check if there is an insulation failure/short circuit in the motor or in the wiring of the machine.</li> <li>II If short circuit/insulation failure in the motor, rewind the motor.</li> <li>III If short circuit/insulation failure is present in the rest of the machine, trace the same and remove the short circuit.</li> </ul>

## TASK 2 : Servicing of washing machine

- 1 Read the instruction manual of the washing machine.
- 2 Connect the machine to the supply and switch on the machine in steps as indicated by the operating/ instruction manual.
- 3 Check the water flow at the inlet to the machine. If found incorrect clean the inlet and reconnect the water supply using proper waterproofing method. If leakage is present at the connecting point between the machine and the water pipe, use teflon tape between the couplings to prevent leakage.
- 4 Check the water flow at the outlet and check whether all the water is drained out of the wash drum. If it does not, disconnect the machine from the supply then level the machine on the floor and let the water is drained out.
- 5 Isolate the machine from the supply. Open the inspection cover of the machine and carry out visual inspection of :
  - the supply cord and its terminations i.e. between plug and machine terminals
  - condition of the motor pulley-belt and drive alignment
  - all internal connections between the control panel and the machine motors, timer and switches, shown in Fig 2.
- 6 Lubricate the bearings of the motor with a suitable grease as recommended by the manufacturer with the help of the grease pump.
- 7 and especially where maximum vibration of the machines is felt, use a dot of grease or oil in the threads.
- 8 Conduct an insulation test of the motor and record it in Table 3, using a 500V Megger. Insulation resistance should be around 1 megohm; if found less then check the wiring and internal accessories and all Powerly live parts for moisture and weak insulation. Remove the moisture and prevent any water leakage near the Power parts suitably. Reconduct the insulation test.
- 9 Close the inspection hatch/cover and connect the machine to the supply and load the machine with the number of clothes recommended by the manufacturer for the smooth running of the washig machine.

Table 3

Insulation resistance between terminal & body windings	
Date of servicing	
Recommended repair	
Replacement of parts	

