

Cotton Candy Machine

ACB-10-120

Instruction Manual





Original instructions. Read this document before use and keep it for future reference. PDF version is available on www.robolabs.pro

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This document (hereinafter — the manual) contains essential information on installation, intended use, and technical maintenance of cotton candy machine ACB-10-120 (hereinafter — the machine).

The manual is intended for operators who work with the machine, and for technical personnel who conduct installation, commissioning, and technical service.

The manual must be kept during all life time of the machine in place readily available for operators, and technical personnel.

1 Safety requirements



This is the safety alert symbol. It is used to alert you to potential physical injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

4	 Not grounded machine can cause electric shock. Power outlet MUST HAVE proper grounding to avoid electric shock. DO NOT use excessive water or water jet for machine cleaning. DO NOT spill water on electric panels or parts. Using excessive water during cleaning can cause short circuit and electric shock. DO NOT USE any kind of adapters, inverters, or extension cords, as it might affect the overall performance of the machine, and impose additional risks. DO NOT allow supply cord to be twisted, bent, pulled, contacted with sharp edges, or to be mechanically impacted in any other way. DO NOT immerse machine and/or supply cord into water. ALWAYS unplug machine before cleaning or servicing. No user serviceable parts inside electric panel. DO NOT open electric panel unless you are qualified for this.



Spinning head is very hot while in operation. DO NOT touch until it cools down.

DO NOT leave working machine unattended. DO NOT use machine in other way than intended. DO NOT cover ventilation holes on housing. It is a MUST to provide free access, at any time, to wall receptacle, and switchboard to which • the receptacle is connected. Fast spinning head can crush your fingers. DO NOT TOUCH the spinning head until it completely stops. Foreign objects in the spinning head may cause eye injury to operator and/or other people. DO NOT put inside anything except sugar. Refilling the spinning head while it is spinning might cause eye injury. DO NOT refill the spinning head until it completely stops. Excessive sugar in the spinning head may cause eye injury to operator and/or other people. DO NOT OVERFILL spinning head with sugar. ALWAYS wait spinning head to stop spinning before sugar refilling.



- MARNING
 Improper installation, adjustment, alteration, service or maintenance can cause property
- damage, injury, or death. Read and understand this manual before use.
- Only instructed personnel is allowed to operate the machine.

2 General information

2.1 Designation

Cotton candy machine ACB-10-120 (hereinafter — the machine) is intended for making cotton candy. Professional use only.

2.2 Technical specifications

Capacity	1,5-2,0 kg/h
Rated voltage	120 V
Rated frequency	60 Hz
Rated current	8 A
Dimensions (LxWxH), not more	52x52x39 cm
Weight, not more	12,5 kg
Design life	7 years

2.3 Delivery set

Machine	1 pc.
Plastic floss pan	1 pc.
'No-Snow' cap	1 pc.
Measuring spoon	1 pc.
Supply cord	1 pc.
Documentation set	1 pc.

2.4 Packaging

The machine is supplied in packaging that protects the machine from mechanical impact and soil during transporting and storage.

2.5 Transportation and storage

The machine may be transported by any kind of covered vehicle, in accordance with transportation rules for this kind of vehicle. Ambient temperature during the transportation and storage must be between minus 25 °C and plus 55 °C.

2.6 Design and principle of operation

The machine includes the following main components, see Fig. 1

Spinning Head (7) with heating coil inside is mounted on Electric Motor Shaft (6). Electric motor is mounted on Chassis (4). Chassis is mounted on the Housing (2) with four Spring-mounted Supports (13). These supports dampen vibrations and allow the motor to self-balance during operation. Handles (3) used for transportation of the machine. Rubber legs (1) allow the machine to properly stand and prevent its slipping.

Two Brush Units (5) deliver electric current to the heating coil inside the spinning head.

Transport Fastening Nuts (12) are used to fix chassis during transportation.

Floss Pan Supports (11) hold the Floss Pan (20).



An Impeller (9) is fixed to the spinning head. Impeller spins inside the Stator consisting of two parts (8), (10). Rotating impeller creates air flow. Stator rectifies the air flow and also protects from direct contact with spinning impeller.

Control panel consists of the following:

- MOTOR Switch (14) that turns the motor.
- Voltmeter (15) that reads the voltage supplied to the heating coil in the spinning head.
- MOTOR SPEED Adjustment Knob (16) that changes rotation speed.
- HEAT RATE Adjustment Knob (17) that changes the voltage supplied to the heating coil in the spinning head.

- STANDBY Switch (18) that turns on standby mode.
- HEAT Switch (19) that turns on heating.

Two Adjustment Pins (21) are used for setting up heating circuit and motor speed circuit.

The spinning head rotates with the sugar mix inside where the heating coil warms the sugar up. When the sugar rises above 160°C/320°F, it starts to melt. Due to centrifugal force, the melted sugar escapes through laser cut slits in the sidewall, where it instantly cools and crystallizes turning into candy floss. An attached impeller rotates along with the spinning head, producing a powerful upward airflow. Air enters from below, through the axial grills of the stator, which can be restricted by the silicon collar. The airflow can lift the cotton candy several feet in the air. Sugar particles that are too heavy will collect in the floss pan.

3 Commissioning

- Not grounded machine can cause electric shock. Power outlet MUST HAVE proper grounding to avoid electric shock.
- Wall receptacle MUST be installed by a qualified electrician.
- DO NOT USE any kind of adapters, inverters, or extension cords, as it might affect the overall performance of the machine, and impose additional risks.

3.1 Ambient requirements

This machine is designed to be operated indoors at the ambient temperature from +5 °C to +40 °C (+41 °F to +104 °F) and relative humidity not more than 45% at 40 °C (104 °F) while using at altitudes not exceeding 1000 m over the sea level. The temperature decreasing is related to RH increasing, for example, 90% of RH at 20 °C (68 °F). This machine MUST NOT be exposed to precipitations of any kind (rain, snow and so on).

3.2 Unpacking and installation

- 1. Unpack the machine carefully and keep packaging for future use.
- 2. Check the delivery set.
- 3. Remove protective film where applicable.
- 4. Install machine in a level position on a stable table or cart.
- 5. Wash floss pan with mild soap, rinse with water to remove soap residues; wipe dry.
- 6. Release all four Transport Fastening Nuts (Fig. 1, Pos. 12) upwards until they reach the rubber Floss Pan Supports (Fig. 1, Pos. 11).
- 7. Place the floss pan on the machine making sure the indentations on the pan rest on the four rubber legs, above the transport fastening nuts.
- 8. Check the power supply cord to see if it is not damaged. Plug the cord into the machine.

3.3 Electric requirements

The machine is supplied with power cord fitted with NEMA L5-20P plug. Use NEMA L5-20R receptacle for connection.

Connecting to the mains must be arranged in conformity with all requirements applicable in the country of use at the moment of commissioning. Service panel must be equipped with a circuit breaker. The outlet used for machine connection, must be connected to this breaker and must be properly grounded.

Check the voltage in the receptacle. Make sure all switches on the machine are in OFF position (O). Plug the machine in. Make sure that the supply cord is not twisted, pulled, and is not mechanically impacted in any other way; and also is not in contact with hot surfaces.

3.4 First start (operation check)

ATTENTION! Machine that was kept for a long time at temperatures below 0 °C must be kept in normal room temperature (20-22 °C) not less than 12 hours before the first start.

- 1. Make sure all switches on the machine are in OFF position (O). Plug the machine in. Make sure that the supply cord is not twisted, pulled, and is not mechanically impacted in any other way; and also is not in contact with hot surfaces.
- 2. Set the Motor Switch to ON position (I). Make sure that spinning head spins without side noises. During start up and stop down there might be vibrations on the chassis, which is normal.
- 3. Set HEAT RATE and MOTOR SPEED adjustment knobs all way counter-clockwise.
- 4. Set the heat switch to ON position (I).
- 5. Turn HEAT RATE adjustment knob all the way clockwise. Make sure the voltmeter pointer moves smoothly and evenly as you turn the knob.
- 6. Turn MOTOR SPEED adjustment knob all the way clockwise. Make sure the rotation speed increases as you turn the knob.
- 7. Set main switch and heat switch to OFF position (0).
- 8. Wait until spinning head is stopped.
- 9. Make sure the spinning head got some heat.
- 10. Unplug the machine.

4 Intended use

- DO NOT use machine if supply cord, cable plug, or wall receptacle are damaged.
- DO NOT allow supply cord to be twisted, bent, pulled, contacted with sharp edges, hot surfaces, or to be mechanically impacted in any other way.



- DO NOT USE any kind of adapters, inverters, or extension cords, as it might affect the overall performance of the machine, and impose additional risks.
- If the supply cord is damaged, it must be replaced by a special cord or assembly available from the manufacturer or its service agent.



Spinning head is very hot while in operation. DO NOT touch until it cools down.

WARNING

- DO NOT leave working machine unattended.
- DO NOT use machine in other way than intended.
- DO NOT cover ventilation holes on housing.
- It is a MUST to provide free access, at any time, to wall receptacle, and switchboard to which the receptacle is connected.
- Fast spinning head can crush your fingers. DO NOT TOUCH the spinning head until it completely stops.



- Foreign objects in the spinning head may cause eye injury to operator and/or other people. DO NOT put inside anything except sugar.
- Refilling the spinning head while it is spinning might cause eye injury. DO NOT refill the spinning head until it completely stops.
- Excessive sugar in the spinning head may cause eye injury to operator and/or other people.
 DO NOT OVERFILL spinning head with sugar. ALWAYS wait spinning head to stop spinning before sugar refilling.



DO NOT ALLOW ANYONE to touch or reach in the machine while operating in public place.

- DO NOT TURN ON until transport fastening nuts are FULLY RAISED. Otherwise it may cause excessive vibration during whole machine operation, and lead to machine failure.
 - IT IS NORMAL to have vibration of the spring mounted chassis during spinning head acceleration and deceleration.

4.1 Recommendations on sugar and colorants

Use ONLY 100% pure granulated sugar (beet or cane).

DO NOT USE sugar powder, sugar with added starch, dextrose, corn syrup and so on. Doing so will lead to poor quality floss and/or quick clogging of the spinning head.

To make colored and flavored cotton candy use flavoring mix (Floss Art, for example), or ready to use flossugar.

DO NOT USE excessive flavoring mix! Doing so will:

- Increase the product cost;
- Make the product tastes bitter;
- Lead to spinning head's sidewall clogging faster;
- Lead to excessive carbon build-up on the heating coil.

If you want deeper color, sprinkle the flossugar mixture with water (1 tablespoon of water per 2 kg/5 lbs of sugar) and mix well before put in the machine.

Sugar and candy floss are very absorbent. In conditions with high relative humidity candy floss melts fast.

4.2 Operating order

- Before turning on the machine, first add 1¹/₂ cup flossugar to the spinning head, or approximately ³/₄ full. The minimum recommendation is 1/3 full at all times. Manually rotate the head in order to distribute the sugar evenly.
- You will need sticks, rods or cones to spin above the machine to collect the cotton floss as it is produced. These can be made of wood, paper or plastic. The longer the sticks, the larger the servings of cotton you can create. The ideal length is 1 ½ ft – 2 ft. Wood sticks and plastic straws should be soaked in water first in order to create better adhesion for the floss.
- 3. Turn the main switch to ON position (I), and the spinning head will begin to rotate.
- 4. Turn the heat switch to ON position (I).
- 5. Using adjustment knob, set voltmeter¹ to between 90-100 V.
- 6. Depending on conditions, it will take about 1 minute to warm up the head to operating temperature. You will usually smell the candy aroma between 10 to 15 seconds before production begins.

¹ When setting up at a new location, the power level must be adjusted according to the environmental conditions. If cotton candy comes out too slow, increase the voltage slightly. Alternatively, decreasing voltage will slow production. When you change locations or if the temperature or humidity changes later in the day (if working outdoors) then you may need to make additional adjustments.

7. Cotton floss will fly out upwards in a vertical column or 'sleeve'. This sleeve can be wrapped around a stick by rapidly turning or spinning the stick with your fingers in a counter-clockwise direction (see Fig. 3):



Figure 2

- 8. You will usually want to collect floss between 8" to 14" above the spinning head, though you can adjust for conditions and the size of the serving.
- 9. To stop operation, turn the heat swich switch to OFF position (0).
- 10. Let the motor spins for few minutes to cool down the spinning head.
- 11. Turn the main switch to OFF position (0) and capture the remaining cotton candy as the head cools down.
- 12. When the coil cools to the point that 'snow' is produced, then cover the head with the 'No-Snow' cap² and allow the head spin for 5-7 minutes to fully cool down before turning off the main switch.
- 13. Once cool to the touch, wipe out the inside of the 'No-Snow' cap, and put it back over the spinning head for protection. You can also cover this with a paper or plastic bag to protect the flossugar from dust, debris and insects. Do not leave unused flossugar in the spinning head for more than a day or two as it can harden/caramelize and effect the balance of the head during future sessions, which could ultimately result in failure of the machine.
- 14. During transportation always secure the chassis using the transportation lock-down nuts. This will prevent possible damage of the machine and prolong its life.

² See section 4.4

4.3 Voltage control

When the machine has been off for more than 15 minutes, it will take at least 60 seconds before the heating coil has warmed enough for the production of floss to begin. If the machine has been off for a brief time, such as to add more flossugar, this time will be reduced substantially.

To make heat up time shorter, turn the heat adjustment knob all the way up for short period of time.

ATTENTION! DO NOT keep the heat adjustment knob all way up for more than 10-15 seconds as you risk overheating the flossugar. If this occurs, the cotton candy would then be produced in a narrow rope that is difficult to capture. In an extreme scenario, the floss would be burnt and ejected as irregular flakes and sugar dust that would create a mess covering everything in the immediate area.

The Fig. 4 shows an example of mildly overheated heating element. Notice the cotton candy is rising more like a 'rope' than a wide 'sleeve'.



Figure 3

Keep in mind that once the heating element and sidewall have reached such a high temperature, reducing the voltage will not immediately produce the desired effect. Due to thermal lag, any changes in voltage will only slowly take effect over the next 15 to 30 seconds (or longer, depending on ambient temperatures) so it is very important to avoid overheating the element in the first place.

4.4 'No-snow' cap

In the production of cotton candy, 'snow' includes flakes, flecks, small filaments and sugar dust that are all too small to be collected in the normal winding process of producing a cotton candy serving.

There are four situations when 'snow' will be emitted from the head:

- At the very beginning of operation.
- During the end of production.
- When there there is not enough flossugar remaining.
- If the coil and sidewall are overheated.

In both the beginning and ending of operation, snow is produced as the heating element crosses the temperature threshold at which it can evenly and uniformly melt the flossugar in the head into quality candy floss.

The same is true when there is not enough flossugar left in the head, because the remaining sugar will not be evenly distributed and this will cause some of the material to overheat. Keeping the floss head at least 1/3 full at all times will prevent this from occurring.

Finally, if the coil and sidewall become extremely overheated then burnt sugar flecks and dust will be produced instead. Paying attention to Voltage regulation and not excessively preheating the coil during cold startup will ensure this does not happen.

Regardless of the cause, you can prevent the distribution of snow (which can create a mess) by placing the 'No-Snow' cap over the spinning head, where it will capture the snow as it is ejected.



However, you should not leave the 'No-Snow' cap in place for long periods of time as it will eventually become filled with floss which will then collect on the spinning head itself.

To help prevent this, the inside of the 'No-Snow' cap should be wiped off in between each use to prevent excess accumulation of spent flossugar.

If you do notice melted or burnt sugar accumulating on top or lip of the spinning head cover, or excessive buildup on the sidewall, then this should be scraped off before proceeding.

This can be done using a wooden bamboo skewer or stick (never metal) while the head is spinning. Gently put the tip of a stick into the inner right-side edge of the cover and allow the rotation of the head against the stick to scrape off any sugar accumulation. This can be repeated on the outside of the sidewall as well, again only on the right-side of the spinning head.

Scraping should not be done when customers are nearby as small pieces of sugar could fly some distance posing a risk to the face and eyes.

4.5 Motor speed

If candy floss comes out too fast, reduce the rotation speed with the MOTOR SPEED adjustment knob (Fig. 1, Pos. 16). The motor circuit includes a time relay set for 12 seconds, so each time the motor switch is turned on, the motor always spins at its maximum rate for 12 seconds, and after then the speed is reduced accordingly to the position of the adjustment knob. This provides stable and smooth motor operation and minimizes inrush current impact on the motor.

4.6 Standby mode

If there are no customers at the moment, it is convenient to keep the spinning head warmed up to be able to resume operation quickly. To turn the standby mode on, set the standby switch to STANDBY position, the switch will be illuminated.

Now, a little power is supplied to the heating element, no matter which position the HEAT RATE adjustment knob is set to.

To resume operation, set the standby switch to WORK position (the switch illumination is off).

4.7 Abnormal operation

In case of any signs of abnormal operation of the machine, such as distinctive plastic smell, smoke formation from the electric panel, loud side noises, and so on, turn the machine off, deenergize the wall receptacle from the switchboard, and call for a technician.

5 Cleaning

ALWAYS unplug before cleaning.



- DO NOT use excessive water or water jet for machine cleaning. DO NOT spill water on electric panels or parts. Using excessive water during cleaning can cause short circuit and electric shock.
- DO NOT immerse machine and/or supply cord into water.
- DO NOT immerse heating coil leads into water.
- DO NOT keep supply cord on the floor.



• Spinning head is very hot. ALWAYS wait until it cooled down before cleaning.



ACAUTION

DO NOT use sharp items, high-alcaline solutions, or abrasives while cleaning.

The purpose of maintenance and cleaning is to keep machine in good condition during all the lifetime and to meet safety requirements.

Recommended schedule:

Daily cleaning — every day.

Spinning head cleaning — every two weeks³.

5.1 Daily cleaning

- 1. Unplug the machine. Inspect supply cord, cable plug, and wall receptacle for any damages. In case of found damages DO NOT use the machine until damaged parts replaced.
- 2. Remove 'No-Snow' tool and floss pan. Wash them thoroughly and wipe dry.
- 3. Wipe outer surfaces of the machine with a clean soft cloth dampened with water to remove sugar as needed.

³ Depending on range of factors (utilization rate, raw materials quality) period may vary.

5.2 Spinning head cleaning

For spinning head cleaning you will need a flat screwdriver.

- 1. Unplug the machine.
- 2. Remove sugar residues from the spinning head.
- Remove four screws fixing Upper (1) and Lower (1) parts of Stator, and then remove upper part of the stator.
- 4. Remove three screws, fixing Impeller (2) to the Spinning Head (6); remove the impeller.
- Remove four wing nuts fixing lower part of the Stator (3) to the Chassis (7), and finally remove Lower part of the Stator.
- 6. Remove three screws fixing Cover (5) to the Spinning head (6), and then remove the cover. If the cover is 'glued' to the head, gently tap with the screwdriver handle in order to loosen the parts. ATTENTION! The cover made of Aluminum; it can be deformated if excessive force applied.



- 7. Rinse removed parts with water and wipe dry immediately. Clean thouroughly internal side of the Spinning Head Cover to remove possible carbon build up. Make sure that slits on the low edge of the cover are not clogged with sugar. If clogged, then soak the cover for a while, and then remove the sugar with stiff brush.
- 8. Assemble in the reverse order.

6 Technical service

- ALWAYS unplug while servicing.
 - Technical maintenance and repair MUST be conducted by a qualified technician only.

A WARNING

Spinning head might be hot. ALWAYS wait until it cooled down before cleaning.

WARNING



• ALWAYS use safety goggles while servicing.

6.1 Technical maintenance

To provide good and safe operation of the machine, it is a must to conduct technical maintenance on regular basis, and operating repair, as needed.

Technical maintenance — scope of work, which goal is to maintain the machine in operable condition during intended use.

Operating repair — scope of work, which goal is to recover the machine or its parts in case of malfunction, and renewal of its resource.

- Technical maintenance must be conducted every 360 hours of machine's operation.
- Operating repair must be performed as needed.

It is a must to conduct technical maintenance while performing operating repair.

Technical maintenance order is the following.

- 1. Question the operators who work with the machine for any issues related to the machine and its operation.
- 2. Ensure that the machine is installed in accordance with the installation instructions (see section 3).
- 3. Visually inspect the machine to detect any faults or broken parts. Make photo as necessary.

- 4. Unplug the machine. Inspect supply cord, cable plug and receptacle. Pay attention to mechanical damages, damaged insulation, and color changes. Replace damaged components.
- 5. Inspect internal wiring and components; pay attention to mechanical damages, insulation color changing. Replace damaged wiring; restore markings on the wiring.
- 6. Tighten contact joints and terminals of main current conducting parts, terminal block and connectors. Face up pitted contacts as necessary.
- 7. Remove four screws, fixing Upper (1) µ Lower (3) parts of Stator (see. Fig. 6), and then remove the upper part of the stator. Remove three screws fixing Impeller (2) to the Spinning head (4); remove the Impeller. Remove four wing nuts fixing lower part of the Stator (3) to the Chassis (5), and finally remove the Lower part of the Stator.
- 8. Open both Brush Units (6), then remove Carbon Electrodes (7), and see if they worn out or damaged. If worn out significantly, or damaged, replace the Brush Unit. *ATTENTION! After installing new brushes, allow the motor to run for 15 minutes before turning on the heating element. This will allow the brushes to conform to the slip rings, avoiding the potential for arcing under load.*
- 9. Inspect the Slip Rings (8) for bumps and color changes. Clean up the rings and insulators between. Replace worn out parts.
- 10. Check the heating element. There should be no open or close circuit, nor ground fault. Resistance of each element should be around 70 Ohms at room temperature.
- 11. Make a record about conducted maintenance in the corresponding section of the Factory Certificate.



Figure 6

6.2 Time relay

Time relay KT is used to provide maximal speed during start up of the motor. The relay is shown on Fig. 7.

Once the motor switch is set to ON, power comes to terminals 1, 3, 4, 10. From the same moment timer starts. The timer's set point is set with adjustment screw (1). Until timer expires, terminals 10 and 11 are closed; once the timer ¹ expires, terminals 10 and 11 are opened.

Factory set point for the timer is 12 s.



Figure 7

6.3 Standby mode voltage set up

Depending on the actual voltage in the power supply, it might be required to calibrate amount of power supplied to the heater when standby mode is activated.

- 1. Fill the spinning head with sugar.
- 2. Run the machine in standby mode.
- 3. Adjust the knob (H) (see Fig. 8) so that the spinning head remains warm, but no cotton candy comes out even during 20-30 minutes long operation in standby mode.
- 4. Turn the machine off.

6.4 Motor speed control calibration

Depending on the actual voltage in the power supply, it might be required to calibrate the motor speed control circuit.

- 1. Set the MOTOR SPEED adjustment knob in the end left position.
- 2. Turn the motor on.
- 3. Adjust the knob (M) (see Fig. 8) so the spinning head rotates with 2300 rpm.
- 4. Turn the machine off.



Figure 8

6.5 Electric panels layout

Electric panels component layout is shown on Fig. 9. The component designations corresponds to the same on the wiring diagram.



6.6 Troubleshooting (circuit v1.0)

6.6.1 Spinning head does not spin

- 1. Machine is not plugged in. Plug the machine in.
- 2. No power in the wall receptacle. Check the voltage in the receptacle.
- 3. Supply cord fault. Check supply cord for continuity, replace fault cord.
- 4. Rocker switch SA1 fault. Check switch operation. Switch contacts should open and close as switch is operated. Replace fault switch.
- 5. Capacitor C fault. Check the capacitor. Its capacity should be 20 $\mu\text{F}.$ Replace fault capacitor.
- 6. Motor M fault. Check the motor. Its rotor should spin freely. Make sure that there is no open or short circuit, nor ground fault in its windings. Resistance of each winding must be about the same. Replace fault motor.
- 7. Time relay KT fault. Check relay operation. Replace fault relay.
- 8. Open circuit. Check continuity between: XP, SA1, VS1, KT, M, C. Restore connection, face up pitted contacts, tighten loosen contacts.

6.6.2 Motor stops eventually

- 1. Power regulator VS1 fault. Check power regulator operation. Replace fault power regulator.
- 2. Variable resistor RP3, RP4 fault. Check variable resistor operation. Replace fault variable resistor.
- 3. Motor speed circuit needs to be calibrated. Perform calibration, see corresponding section of the Manual.
- 4. Open circuit. Check continuity between: RP3, VS1. Restore connection, face up pitted contacts, tighten loosen contacts.

6.6.3 Excessive vibrations

- 1. Transport fastening nuts are not loosen. Release all four transport fastening nut.
- 2. Loosen bolted joints that fix motor to the chassis. Tighten the bolted joints.
- 3. Spring-mounted supports fault. Check spring-mounted supports. Replace fault supports.
- 4. Chassis fault. Check chassis to see if it has any deformations, cracks and so on. Replace fault chassis.

6.6.4 Motor speed can not be adjusted

- 1. Adjustment knob is not fixed on shaft of the variable resistor RP3. Check the adjustment knob fixing. Tighten fixing screw.
- 2. Motor speed circuit needs to be calibrated. Perform calibration, see corresponding section of the Manual.
- 3. Time relay KT fault. Check relay operation. Replace fault relay.
- 4. Open circuit. Check continuity between: RP3, VS1. Restore connection, face up pitted contacts, tighten loosen contacts.

6.6.5 No heating

- 1. Rocker switch SA3 fault. Check switch operation. Switch contacts should open and close as switch is operated. Replace fault switch.
- 2. Heating element EK fault. Check heating elements with a tester. There should be no open or close circuit, nor ground fault. Resistance should be around 70 Ohm at room temperature. Replace fault element.
- 3. Power regulator VS2 fault. Check power regulator operation. Replace fault power regulator.
- 4. Variable resistor RP1 fault. Check variable resistor operation. Replace fault variable resistor.
- 5. Brush unit XA1, XA2 fault. Check brush units to see if carbone electrodes are not worn out. Replace fault or worn out brush units.
- 6. Slip rings wear. Check the slip rings to see if they are worn out. In case if slip rings are worn out, replace the spinning head.
- 7. Open circuit. Check continuity between: SA1, SA3, PV, VS2, RP1, XA1, XA2, EK. Restore connection, face up pitted contacts, tighten loosen contacts. If open circuit found in the spinning head, replace the spinning head.

6.6.6 Voltmeter reads the same value all the time

- 1. Adjustment knob is not fixed on shaft of the variable resistor RP1. Check the adjustment knob fixing. Tighten fixing screw.
- 2. Voltmeter PV fault. Check the voltmeter operation. Replace fault voltmeter.
- 3. Power regulator VS2 fault. Check power regulator operation. Replace fault power regulator.
- 4. Open circuit. Check continuity between: SA2, VS2, RP1, RP2, PV. Restore connection, face up pitted contacts, tighten loosen contacts.

6.6.7 STANDBY switch does not work

- 1. Too high set point for standby voltage. Adjust standby voltage set point, see corresponding section of the Manual.
- 2. Power regulator VS2 fault. Check power regulator operation. Replace fault power regulator.
- 3. Variable resistor RP1 fault. Check variable resistor operation. Replace fault variable resistor.
- 4. Relay K fault. Check relay operation. When control voltage is applied to terminals (A1+) and (A2-), contacts (11) and (14) must be closed, contacts (11) and (12) must be open, and vice versa if no control voltage applied. Replace fault relay.
- 5. Open circuit. Check continuity between: SA2, VS2, RP1, RP2, K. Restore connection, face up pitted contacts, tighten loosen contacts.

6.6.8 Long heating up time after turning STANDBY off

1. Too low set point for standby voltage. Adjust standby voltage set point, see corresponding section of the Manual.

6.6.9 Service panel's circuit breaker trips during machine operation

1. Short circuit in the machine. Locate and eliminate short circuit in the machine. Replace fault component(s) if needed.