INTROMA MAACHINE MANUAL

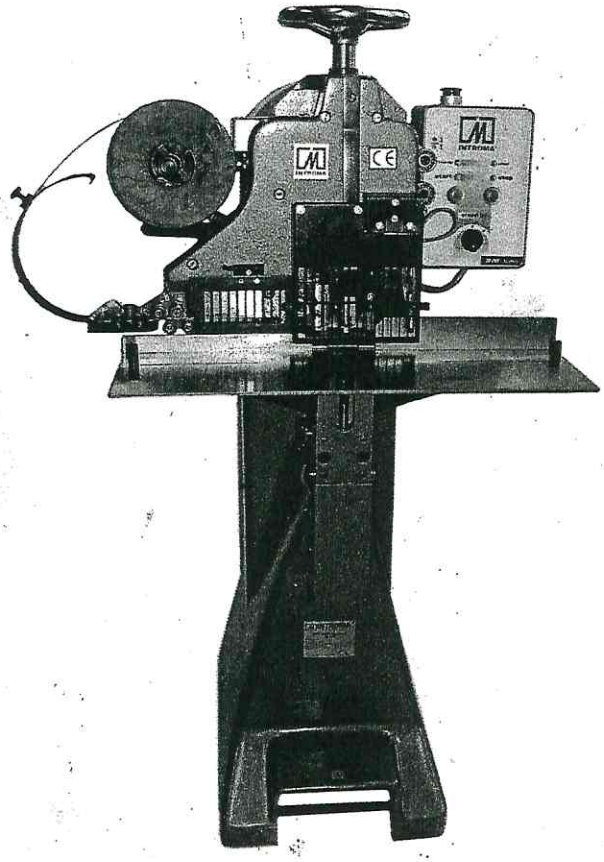
FABRYKA
MASZYN
INTROLIGATORSKICH

INTROMA®
ESTABLISHED 1953

introma@introma.com.pl
www.introma.com.pl

90-019 Łódź, Poland, ul. Dowborczyków 12
Adres do korespondencji i wjazd:
(Correspondence and delivery address:)
90-042 Łódź, ul. Targowa 11

Biuro handlowe – tel. 048-42-636-60-58
fax. 048-42-633-80-01
Serwis tel. 048-42-674-66-21



USERS MANUAL

STITCHING MACHINE ZD-2SR Standard

SERIAL NUMBER: .....

YEAR OF PRODUCTION: .....

TABLE OF CONTENTS

1. TRANSPORT AND STORAGE

1.1 Delivery

Delivery encompasses the stitching machine partly dismantled for transport. All the dismantled parts, standard equipment and accessories, and replacement and spare parts are as given in points 1.1.1, 1.1.2, 1.1.3 and 1.1.4.

1.1.1 List of dismantled parts

a) Table with margins,

b) Straightener console with attached elements,

1.1.2 List of standard equipment and accessories

a) Angular special spanner,

b) Screwdriver RWWa-10,

c) Two flat wrenches 13x17,

1.1.3 Temporary corrosion protection

The stitching machine is protected against corrosion for transport and storage. The life of this temporary protection is 3 months in specified storage conditions.

1.1.4 Storage conditions

The packed stitching machine should be stored in a dry compartment, duly protected against atmospheric influences. The machine should be stored as indicated on the packaging and kept free of any additional burdens.

1.1.5 Packaging

The packaging of the stitching machine consists of a wooden case assembled on the transport pallet. The case may be safely lifted and moved by means of a fork-lift. The gross weight of the stitching machine's packaging together with the added standard equipment and accessories amounts to 300 kg. The external dimensions, markings and correct transport and storage positions are given in fig. no. 1.

Please note: All actions connected with transport should be performed by authorised personnel.

2. TECHNICAL CHARACTERISTICS

2.1 Application

The ZD-2SR stitching machine is designed for stapling paper, its derivatives, as well as other materials having similar properties. The stapler is utilised primarily in typographic and paper processing plants, offices, libraries and various other agencies for producing brochures,

exercise books, calendars, prospectuses, writing-pads, etc.

2.2 Basic specifications

Continuous running stapling output	180 staples/min.
Diametr of wire used	0,5 to 1 mm
Wire consumption per staple	25 to 73 mm
Rated supply voltage	3 x 380 V or 230 V
Mains frequency	50 Hz or 60 Hz
Control voltage	24 V
Noise at work	76 dB
Category safety elektr.	1 according to EN954-1
Weight of stitching machine	approximately 230 kg

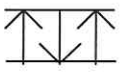
External dimensions of stapler are given in fig. 2

2.3 Construction and operation

Description according to fig. no. 3

2.3.1 Mechanical part

The extended housing (1) is the bearing element in which are located the parts, units and mechanisms of the stitching machine. The electric motor (2) powers, by means of a two-stage belt transmission (3), a mechanism that is placed in the housing head and is made up of a flywheel (4), clutch (5), clutch (6) with the driving cam for the staple closing mechanism, universal coupling (7) and eccentric disk (8). The disk activates the wire feeding mechanism (9), cut-off mechanism (10), staple-forming mechanism (11) and the staple-drive mechanism (12). A table is fixed to the housing extension arm (13), in which is placed the staple closing mechanism (14). The clutch (6) is switched on mechanically by means of a pedal (15). A mechanical switch (16) is used to select the type of duty. This is set manually in one of three positions:

- continuous movement 
- single movement 
- pedal blocked 

Continuous movement lasts for as long as the pedal is depressed. If, however, the pedal is pressed while the switch is set to single movement, then only one duty cycle will be performed; its repetition is possible after the pedal is released and pressed once again. The depression of the pedal (15) activates the clutch (6) and causes the disk (8) to rotate. This

activates the wire feeding mechanism (9), which unwinds wire from the spool (17), passes it between the rolls of the straightening mechanism (18) and leads it to the cut-off mechanism (10). After the required length of wire is cut off, mechanism (11) forms the staple, while mechanism (12) drives it into the paper that is being stitched. The operation is finished off by mechanism (14), which closes the staple.

2.3.2 Electrical equipment

2.3.2.1 Power supply

The stitching machine is supplied with a voltage of 3x380 V or 230 V by means of a plug connector. The cable with a plug is connected to the terminal strip (19) located in the motor chamber of the body (1). Adjacent to the terminal strip (19) is located the main safety terminal (20).

2.3.2.2 Control

The control circuits of the stitching machine are supplied with a safe voltage of 24 V. This voltage is supplied to:
- The RESET pushbutton;
- The contactor coil;
- The terminals of the cover position detection system;
- The emergency STOP;
- The inductive sensor.

The control apparatus is located in the electrical box (10, Fig. 4) of which the front is a control console. The layout of the control and information elements is shown in Fig. 4.
The controller board is supplied with a voltage of 230V. The entire voltage-supply system is provided with a mains filter and a fuse F1. The electronic circuits are delay-supplied through a separating transformer TR1. The transformer has two galvanic ally separated outputs, each of 24V. The first output supplies control voltage for the power circuits, the second supplies voltage to the internal electronics of the control module.
All input and output signals are galvanic ally separated from the electronic elements of the control module. The output signals are of the relay type. To increase the operating safety of the machine, start of the motor is made dependent on two control signals of which:

- The first is a signal of readiness for start of the motor and it is dependent on a signal from the extreme position of the protective covers;
- The second signal is dependent on the START pushbutton being pressed. To the control board is connected a control keyboard.

To start the machine the following operations are required (described with reference to Fig. 4):

1. Connect the machine to the supply network;
2. Change the two-way switch (9) to „ON". After about 3 seconds the machine will start test of the electronic circuits, which is visualized by lighting-up of the respective control lamps (2),(6),(3),(7),(5);
3. When the test is completed the lamps (5)-STAND-BY and (8)-STOP light up on the control keyboard. The machine is ready for operation;
4. Pressing of the green pushbutton (4)-START lights up the green lamp (3), yellow lamp (5)-STAND-BY and lamp illuminating the stitching zone. The motor is running. To start the stitching process, press the foot-operated key (15, Fig.3);
5. If during operation (flat or back stitching) one of the covers protecting the stitching zone

is raised, the machine is stopped, and the following lamps on the control keyboard are lit up:

- Yellow lamp (2) - COVER UP
- Red lamp (7) - STOP
- Yellow blinking lamp (6)-RESET
- Yellow lamp (5)–STAND-BY
- The lamp illuminating the stitching zone goes off.

To return to normal operation of the machine proceed as follows: (Procedure described with reference to Fig.4)

1. Close the stitching zone protective covers, the closed condition being signaled by the lamp (2) going OFF;
2. Blinking of the lamp (6) signifies that the machine requires to be reset for correct operation. To do that simultaneously press the pushbuttons (11)-RESET and (4)–START. As a result the motor is started and the stitching zone illuminating lamp is ON. The machine is ready for operation if the lamps (5)-STAND-BY and (3)-START on the control keyboard are ON.

Emergency stop of machine (Described with reference to Fig.4):

In emergency, pressing of the safety pushbutton (1) immediately stops the machine. Once this pushbutton is pressed all lamps on the console start blinking and the stitching zone illuminating lamp goes OFF.

To return to normal operation of the machine:

1. Unlock the safety pushbutton (1). The lamps (8)-STOP and (5)-STAND-BY on the control console will be lit;
2. Press the green pushbutton (4)-START; If due to emergency stop the slide of the machine is arrested in its upper position, then after pressing of the START pushbutton the motor will start running. To start stitching press the foot-operated key; If due to emergency stop the slide of the machine has stopped in a position other than upper, then upon pressing the pushbutton (4)-START the lamps (7)–STOP, (5)-STAND BY and the blinking lamp (6)-RESET will be ON. To start stitching reset the machine by pressing simultaneously with both hands the pushbuttons (4)-START and (11)-RESET. The machine will complete the operating cycle and retain the slide in its upper position. To start the next operating cycles press the foot key.

2.3.3 Technological equipment

The technological equipment of the stitching machine is made up of two tool kits that are designated as number 1 and number 2.

Tool kit no. 1 consists of:

- Staple bender 1 2 pieces
- Staple closer 1 2 pieces
- Staple driver 1 piece

Tool kit no. 2 consists of:

- Staple bender 2 2 pieces
- Staple closer 2 2 pieces
- Staple driver 2 1 piece
- Ring staple driver 22 1 piece

- Loop staple support

Tool kit no. 1 is pre-installed in the stitching machine. The application of both kits is given in table no. 1.

2.4 Stitching methods

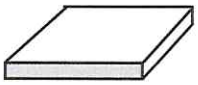
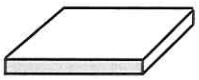
Stitching methods	Staple type	Diameter of wire (mm)					
		0,5	0,6	0,7	0,8	0,9	1
		min-max stitching thickness					
Spine staple 	Closed staple 	0,2-2	0,2-4	0,5-6	1-8		
Spine staple 	Ring staple 	0,2-2	2-4				
Flat one-sided 	Closed staple 	0,2-3	0,2-5	0,5-10	1-15	3-18	5-22
Flat two-sided 	Open staple 					24-35	36-40
Tool kit number		2	2	1	1	1	1

Table no. 1 Stitching methods

The stitching machine may stitch materials in various ways. It may also form staples of various types. The stitching methods and tool kit numbers have been displayed in table no. 1.

2.5 Wire grades

Steel bare bookbinding wire, galvanised or copperised, with a diameter of 0.5 - 1mm and conforming to the standards listed hereunder, should be used for stapling:

- PN-82/M-80089
- GOST 7480-73
- CSN 426427-62
- DIN 177

Flat wire with a thickness of 0.5 mm and diagonal of less than 1 mm may also be applied, but then tool kit no. 1 should be installed in the machine.

2.6 Dimensions of coils and spools

The wire used in the stitching machine for stapling should be in the form of spools or coils

with dimensions as given in fig. no. 5.

2.7 Stapling output

The actual stapling output is generally lower than that given in point 2.2 and is to a large extent dependent on the experience and skill of the operator, on the thickness of the blocks that are being stitched, and on the paper hardness.

2.8 Stapling quality

During the stapling of hard materials, such as chalk paper, high-quality printing paper, cardboard, etc., the quality of stitching may decline and not attain the maximum stitching thickness given in table no. 1.

3.ANALYSIS OF HAZARDS AND PRECAUTION SAPPLIED

3.1 Hazards

Potential hazards resulting from the construction and operation of the stitching machine are of a mechanical and electric nature.

3.1.1 Mechanical hazards

Mechanical hazards may result from:

a) sharp edges, corners, element tips, and also from their uneven or rough surfaces,
b) moving parts of the main drive and other mechanisms of the stitching machine,
c) movement of tools within the stitching area or its immediate vicinity, including that of the circular cutter, staple bender, staple driver, and staple closer.

3.1.2 Electric hazards

If any one of the live elements, that is those charged with dangerous electricity, were touched, this would entail the risk of direct or indirect electric shock.

3.2 Precautions against mechanical hazards

a) hazards referred to in point 3.1.1a have been eliminated by rounding off or bending those edges or corners, with which it is possible to come into contact, and also by the smoothening of surfaces;
b) hazards referred to in point 3.1.1b have been eliminated due to the application of appropriate guards. In order to remove the motor compartment cover it is necessary to use a special tool;
c) hazards referred to in point 3.1.1c have been eliminated by: movable wire feeding mechanism guard and movable stitching area guard equipped with a blocking device.

Lifting of the stitching area guard turns the main drive off, as does its incorrect closure. This condition is notified by the lighting up of the red-coloured lamp on the control desk. The guard of the wire feeding mechanism cannot be opened without first opening the stitching area guard.

3.3 Precautions against electric hazards

a) utilisation of a safe control voltage;

b) application of a supply disconnection system in the form of a supply voltage plug connector;

c) application of a supply disconnection system in the form of a 220 V and 380V supply voltage plug connector and a two stage main disconnector switch for voltages of 230 V and 3 x 380 V;

d) fitting the stitching machine with a system and protective terminal that ensure the continuity of the protective conductor;

e) application of overvoltage protection that guards against the automatic activation of the motor when the supply voltage fades and reappears, and switches the motor off when nominal supply voltage falls excessively (up to 70%).

Please note:

The red-coloured switch which turns the motor off also functions as the emrge-ncye disconnector, since the duty cycle activated mechanically by depressing the pedal may be stopped at any moment.

3.4 Conformity with safety standards

The constructional solutions of elements, mechanisms and control systems, tech-nikal precautions against mechanical and electric hazards, and safety functions incorporated (including the duty cycle control function and the unexpected motor activation prevention function) applied in the stitching machine conform to the relevant requirements of standards:

- EN ISO 12100-1 Safety of machinery, Basic concepts, general principles for design– Part 1: Basic terminology, methodology
- EN ISO 12100-2 Safety of machinery, Basic concepts, general principles for design– Part 2: Technical principles
- EN 954-1 Safety of machinery-Safety related parts of control systems–Part 1: General principles for design
- EN 60204-1 Safety of machinery-Electrical equipment of machines-Part 1: General requirements

3.5 Work safety instructions

During all operational activities, which cover the utilisation of the stitching machine and its

setting or regulation, replacement of tools, maintenance and repairs, the following basic safety rules should be adhered to:

a) the operator of the stitching machine and all persons entrusted with maintenance and repairs should be acquainted with its construction, functioning and technological capabilities;
b) overhauls, maintenance and repairs should be performed only by duly authorised and qualified personnel;
c) setting the stitching machine, replacement of tools, maintenance and repair work are to be performed when the power supply is disconnected;
d) before starting work the operator should check in order to establish that all guards are properly installed, the adjustable part of the stitching area guard is set in accordance with the stitching thickness, and that the interlocking at its opening operates correctly;
e) if any irregularities are observed during stitching, the operator should stop work and correct the default or - if he is not authorised to do so - inform of the machine's unserviceability;
f) after finishing work the power supply should be cut off and the pedal blocked.

4. PREPARING FOR OPERATION

4.1 Unpacking

If the stitching machine is delivered in a case, it should be unpacked in accordance with the sequence presented in fig. no. 6a, b, c.

Sequence of unpacking operations:

a) Remove the upper and side panels (1) from the pallet;
b) Lift the pallet and stitching machine to a vertical position (2) on a stand (3) with a thickness of 100-120 mm (cf. fig. no. 6c);
c) Unscrew and remove the nuts (4) and washers (5) (cf. fig. no. 6c);
d) Remove the pallet (6), unscrew and remove the stud bolts (7) from the housing of the stitching machine, then remove the plastic covering from the machine (cf. fig. no. 6c)
e) Lift the machine by means of the lifting sling with an M16-eye screw, screwed into the opening (8) (cf. fig. no. 6b), then move the machine to its workplace;
f) Use the levelling screws (9) (cf. fig. no. 6b) to level the stitching machine (exact to 3 mm/1000 mm) in both directions, using a level placed on the machine's table.

4.2 Protective coating removal

Since the stitching machine is protected temporarily against corrosion for transport and storage, it is delivered with a protective coating. This anticorrosive layer should be removed with a brush and rags soaked in petrol. Protectivie coating must be removed from the table, the margines and the wire guiding mechanism.

4.3 Stitching machine assembly

The elements of the stitching machine that have been dismantled for transport have to be reinstalled. They should be assembled in accordance with the sequence given in fig. no. 7, i.e.:

a) Fasten the straightener console to the guide with screws (3) (cf. fig. no. 7b);
b) Attach the table (1) (cf. fig. no. 7a);
c) Fasten the table with the knob screws (2) (cf. fig. no. 7a);
d) Fasten the uncoiling mechanism console with screws (4) (cf. fig. no. 7c);
e) Attach the spring (5) (cf. fig. no. 7c).

4.4 Connection of stitching machine to power supply

The stitching machine driven by a single-phase motor is fitted with an electric cable and plug. The stitching machine driven by a three-phase motor is not equipped with a plug and may be connected to the power supply solely by a duly authorised electrician. In order to this it is necessary to follow the sequence of operations given in fig. no. 7d:

a) Remove the rear cover (6);
b) Connect electric cable to the plug clamps according to the wiring diagram;
c) Check whether the motor rotates in the proper direction (marked on the pulley);
d) Mount the rear cover

Wiring diagrams of supply 3x380V or 230V according to the point 10.

4.5 Loading spools and coiled wire

In order to load a coil of wire such as that shown in fig. no. 5a or a spool such as the one shown in fig. no. 5c, it is necessary to follow the sequence of operations given in fig. no. 8a:

a) Remove the handwheel (1);
b) Remove the cover (2) and the front shield (3);
c) Load the coiled wire or spool (4);
d) Replace all previously removed elements.

In order to load a spool such as that shown in fig. no. 5b, it is necessary to follow the sequence of operations given in fig. no. 8b:

a) Remove the nut (5);
b) Remove the sleeve (6), spring (7), second sleeve (8) and spool (9);
c) Load the spool (10);
d) Replace all previously removed elements.

4.6 Manual inspection of the stitching mechanism

In order to check the stitching mechanism manually, it is necessary to follow the sequence of operations shown in fig. no. 9:

a) Set the switch (1) shown in fig. no. 4 to the "off" position;
b) Set the operation procedure knob (1) to the "single cycle stapling" position;
c) Press the pedal (2);
d) Place the special spanner in the appropriate socket (3) and rotate it through a full 360^0 angle.

There must not be any such increase in resistance that would hinder the full rotation of the shaft. It is also forbidden to rotate the shaft without depressing the pedal. Non-fulfilment of these conditions would be indicative of mechanism unserviceability and therefore entail an overhaul in order to correct the default.

4.7 Insertion of wire

In order to insert wire into the mechanisms of the stitching machine, it is necessary to follow the sequence of operations shown in fig. no. 10:

a) Open the guard of the stapling area (1);
b) Open the guard of the wire feeding area (2);
c) Thread the wire through the upper wire guide (3) while lifting the lubricating insert;
d) Thread the wire through the lower wire guide (4);
e) Thread the wire through the guiding sleeve (5);
f) Thread the wire between the rollers of the horizontal straightener (6);
g) Thread the wire between the rollers of the vertical straightener (7);
h) Thread the wire between the latch and the block of the feeding mechanism (8);
i) Thread the wire between the latch and the block of the cutting mechanism (9);
j) Thread the wire through the hole of the hollow blade (10);
k) Thread the wire through the gaps in the wire guide and the anvil (11);
l) Close guards (2) and (1).

4.8 Test-running the stitching machine

In order to check whether the machine has been correctly assembled and is ready for operation, it is necessary to idle-run it in according to the point 2.3.2.2

5. PREPARATION FOR STAPLING

5.1 Re-setting to spine stapling

5.1.1 Re-setting the machine to spine stapling with wire with a diameter of 0.5 to 0.6 mm

The stitching machine delivered to the end user is pre-set for stapling with wire with a

diameter of 0.7 to 1 mm and has tool kit no. 1 pre-installed. In order to re-set it to stapling with wire with a diameter of 0.5 to 0.6 mm, it is necessary to go through the sequence of operations shown in fig. no. 11:

a) Disconnect the power supply by means of switch (1);
b) Fully rotate the handwheel (2) in the direction indicated by the arrow;
c) Open the stapling area guard (3);
d) Pull back the bottom part of the spring and remove the anvil (4);
e) Unscrew driver fastening screw (5) and pull out the driver (6);
f) Set the operation procedure knob (7) to the to the "single cycle stapling" position;
g) Press the pedal (8);
h) Place the special spanner in the socket (9) and proceed to rotate the double joint shaft until the benders are at the very bottom;
i) Remove the table (13);
j) Remove the fastening screws of the benders (10);
k) Use the special spanner to rotate the double joint shaft home;
l) Pull out the benders (11) and replace them with benders marked "2", keeping the marked face outwards;
m) Press the pedal (8);
n) Use the special spanner to rotate the double joint shaft until the benders are at the very bottom;
o) Press the benders upwards and sideways, then fasten them with screws (10);
p) Use the special spanner to rotate the double joint shaft home;
q) Insert the driver marked "2", keeping the marked face outwards;
r) Press the driver upwards and fasten it with the screw (5);
s) Pull back the bottom part of the spring and replace the anvil;
t) Close the stitching area guard (3);
u) Unscrew and remove the knob screws (12);
v) Unscrew the two screws (14) and remove the front plate (15);
w) Remove the closers from the shaft (16) and replace them with closers marked "2";
x) Replace the front plate (15) and fasten it with screws (14);
y) Replace the table (13) and fasten it with knob screws (12).

5.1.2 Re-setting to spine stapling with ring staples using wire with a thickness of 0.5 to 0.6 mm

In order to re-set the stitching machine to spine stapling with ring staples using wire with a thickness of 0.5 - 0.6 mm, it is necessary to follow the sequence of operations shown in fig. no. 12

a) Disconnect the power supply by means of switch (1);
b) Fully rotate the handwheel (2) in the direction indicated by the arrow;
c) Open the stapling area guard (3);
d) Pull back the bottom part of the spring and remove the anvil (4);
e) Unscrew driver fastening screw (5) and pull out the driver (6);
f) Set the operation procedure knob (7) to the to the "single cycle stapling" position;
g) Press the pedal (8);
h) Place the special spanner in the socket (9) and proceed to rotate the double joint shaft until the benders are at the very bottom;
i) Turn the special spanner (10);
j) Loosen the staple stand shaft fastening screw and remove the shaft (11);
k) Remove the staple stand (12);
l) Insert the ring staple stand (13);
m) Insert the stand shaft (11);
n) Tighten the staple stand shaft fastening screw and remove the special spanner (10);
o) Use the special spanner to rotate the double joint shaft home;
p) Insert the ring stitching driver (14);
q) Tighten the screw (5) fastening the driver;
r) Loosen the screw (15);
s) Use the lever (16) to lower the wedge, at the same time pulling back the sleeve (17);
t) Tighten the screw (15);
u) Pull back the bottom part of the spring and replace the anvil;
v) Close the stitching area guard (3);

5.1.3 Re-setting the stitching machine from open staple to closed staple operation

In order to re-set the stitching machine from open staple operation to closed staple operation, it is necessary to follow the sequence of operations shown in fig. no. 12:

a) Loosen the screw (15);
b) Fully rotate the handwheel (2) contrariwise to the direction indicated by the arrow;
c) Tighten the screw (15);
d) Adjust the stitching machine to the desired stapling thickness in accordance with point 6.1.

5.1.4 Setting the table and stapling area guard for spine stitching

In order to set the table and stapling area guard for spine stitching, it is necessary to follow the sequence of operations shown in fig. no. 13:

a) Unscrew the knob screws (1) and remove the margin (2);

b) Loosen the knob screws that fasten the table and rotate the table (3) through an angle of 45^0, initially lifting it upwards;
c) Tighten the knob screws that fasten the table;
d) Loosen the screws (4);
e) Move the movable part of the stapling area guard (5) to the very bottom and then tighten the screw (4).

5.2 Re-setting to flat stapling

5.2.1 Re-setting to open staple flat stapling with a stitching thickness of 24 to 36 mm

In order to re-set the machine to open staple flat stapling with a thickness of 24 to 36 mm, it is necessary to go through the sequence of operations given in fig. no. 14:

a) Disconnect the power supply by means of the switch;
b) Loosen the screw (1);
c) Fully rotate the handwheel (2);
d) Tighten the screw (1);
e) Adjust the stitching machine to the desired stapling thickness in accordance with point 6.1.

5.2.2 Re-setting to open staple flat stapling with a stitching thickness of 36 to 40 mm

In order to re-set the machine to open staple flat stapling with a thickness of 36 to 40 mm, it is necessary to go through the sequence of operations given in fig. no. 14:

a) Disconnect the power supply by means of the switch;
b) Loosen the screw (1);
c) Fully rotate the handwheel (2) and at the same time pull back the sleeve (3);
d) Tighten the screw (1);
e) Adjust the stitching machine to the desired stapling thickness in accordance with point 6.1.

5.2.3 Setting the table and stapling area guard for flat stitching

In order to set the table and stapling area guard for flat stitching, it is necessary to go through the sequence of operations shown in fig. no. 13:

a) Loosen the screws (4);
b) Move the movable part of the stapling area guard (5) to its central position;
c) Tighten the screws (4);
d) Loosen the knob screws that fasten the table and move the table (3) to its horizontal

position, initially lifting it upwards;

e) Tighten the knob screws that fasten the table;

f) Replace the margin and fasten it with screws (1).

During the flat stapling of materials with a thickness in excess of 15 mm the movable part of the stapling are guard may move further upwards.

5.2.4 Setting the long margin

In order to set the long margin, it is necessary to follow the sequence of operations shown in fig. no. 13:

a) Loosen the knob screws (1);

b) Using the ruler, set the margin (2) in the desired position;

c) Tighten the knob screws (1).

5.2.5 Setting the short margin

In order to set the short margin, it is necessary to follow the sequence of operations shown in fig. no. 13:

a) Loosen the margin (6) by turning it anti-clockwise;

b) Move the margin the required distance;

c) Tighten the margin by turning it clockwise.

6. ADJUSTMENTS

6.1 Adjusting the stitching machine to the desired stitching thickness

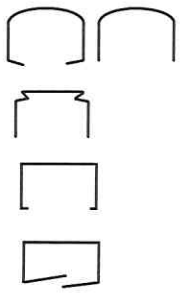
The stitching thickness needs to be adjusted when the thickness has been changed or when the product is insufficiently compressed, which state may result in a number of staple defects:

- convex and springing staple back;

- extended and flattened staple back;

- staple legs excessively short;

- staple legs excessively long.



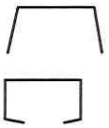
In order to adjust the stitching machine to the desired thickness, it is necessary to go through the sequence of operations shown in fig. no. 15:

a) Place the material to be bound between both bearings (1);
b) Turn the handwheel (2) until the material is pressed;
c) Remove the material from between the bearings;
d) Activate the stitching machine and remove the first staple.

6.2 Adjustment of wire straightening

The stitching machine is pre-set for straightening wire with a thickness of 0.8 mm. It may require adjustment if after changing wire thickness the precision of straightening deteriorates; this state may result in a number of staple defects:

- convergent or divergent staple legs;



- staple arms bent and misaligned - deflected on both sides.
- the wire misses the hole of the hollow blade or the anvil slit

In order to perform an adjustment of wire straightening, it is necessary to follow the sequence of operations shown in fig. no. 15:

a) Loosen the nut (3);
b) Turn the handle until the error is eliminated;
c) Tighten the nut (3) while keeping the handle in the selected position;
d) Loosen the nut (4);
e) Turn the handle until the error is eliminated;
f) Tighten the nut (4) while keeping the handle in the selected position.

6.3 Adjustment of wire tension

Wire tension is to be adjusted when excessive tension may result in staple legs and arms of unequal length. In order to adjust the wire tension correctly, it is necessary to turn the nut (12) in accordance with fig. no. 10.

6.4 Adjustment of the wire feed

The wire feed needs to be adjusted if the wire is either fed unevenly or is not fed at all or the wire unrolls from the spool. Wire feed problems may result from:

- incorrect latch position adjustment;
- worn or damaged latches.

6.4.1 Latch position adjustment

In order to adjust the latch position, it is necessary to follow the sequence of operations shown in fig. no. 16:

a) Tilt the latch (1)
b) Insert a lenght of wire (2) into the groove in the block;
c) Loosen the nut (3)
d) Turn the eccentric sleeve (4) so that the tilted latch is shifled into its bottom position;
e) Release the latch (1);
f) Turn the eccentric sleeve (4) until the latch face is perpendicular to wire axis;
g) Tighten the nut (3) while keeping the sleeve in the selected position.

6.4.2 Latch blade replacement/latch replacement

In order to replace the latch, it is necessary to go throught the sequence of opera-tions given in fig.16:

a) Loosen the nut (3);
b) Remove the sleeve (4) and latch (1), then unhook the spiral spring (5);
c) Place the sleeve (4) in the second hole of the latch or in a new latch;
d) Slide the sleeve with the latch onto the pin and attach the spiral spring (5);
e) Tighten the nut (3);
f) Adjust the position of the latch in accordance with point 6.4.1.

6.5 Cutter and blade position adjustment

It is necessary to adjust the cutter and blade position if it is established that the wire is either not being cut off at all or that it is cut off incorrectly, with burrs at the staple edges. In general, cut-off failure may be caused by:

- incorrect adjustment of the circular cutter;
- blunt or damaged circular cutter;
- blunt or damaged hollow blade;
- excessive cut-off clearance.

6.5.1 Adjustment of circular cutter

In order to adjust the circular cutter, it is necessary to follow the sequence of operations shown in fig. no. 12 and no. 17:

a) Open the stitching area guard (3) (cf. fig. no. 12);
b) Set the operation procedure knob to the "single cycle stapling" position (7) (cf. fig. no. 12);
c) Press the pedal (8) (cf. fig. no. 12);
d) Rotate the double joint shaft (9) with the special spanner until the circular cutter reaches the bottom position;
e) Loosen the nut (1) (cf. fig. no. 17);
f) Turn the sleeve (2) (cf. fig. no. 17) until the bottom edge of the circular cutter coincides

with the lower edge of the hollow blade hole;

g) Tighten then nut (1) (cf. fig. no. 17) while keeping the sleeve (2) (fig. no. 17) in the selected position.

6.5.2 Replacement of circular cutter

In order to replace the circular cutter, it is necessary to go through the sequence of operations shown in fig. no. 17:

a) Remove the screw (3);
b) Remove the housing of the wire cutting mechanism (4);
c) Loosen the screw (5) or - if the cutter is to be replaced - remove it;
d) Turn the cutter (6) or replace it with a new one;
e) Fasten the cutter with the screw (5);
f) Adjust in accordance with point 6.5.1.

6.5.3 Replacement of hollow blade

If a fragment of the cutting edge of the hollow blade is blunt or damaged, its sharper part out to be utilised. In order to replace the hollow blade or change its position, it is necessary to go through the sequence of operations shown in fig. no. 18:

a) Remove the screw (1);
b) Remove the housing of the cutting mechanism (2);
c) Loosen the nut (3) by about two turns and then force it into the housing;
d) Move the circular cutter (4) upwards;
e) Push the hollow blade (5) out;
f) Turn the old blade;
g) Press the old or new hollow blade into the housing of the wire cutting mechanism;
h) Adjust in accordance with point 6.5.4.

6.5.4 Adjustment of cut-off clearance

In order to adjust the cut-off clearance, it is necessary to go through the sequence of operations shown in fig. no. 18:

a) Remove the screw (1);
b) Remove the housing of the wire cutting mechanism (2);
c) Loosen the nut (3) by about two turns and then force it into the housing;
d) Shift the hollow blade (5) so that it touches the circular cutter (4);
e) Tighten the nut (3);
f) Replace the housing of the wire cutting mechanism (2);
g) Fasten the housing of the wire cutting mechanism.

6.6 Adjustment of staple leg length

The staple leg length needs to be adjusted when the legs of the staple are too short or are of different length.

6.6.1 Adjustment of the right staple leg length

In order to adjust the right staple leg length, it is necessary to follow the sequence of operations shown in fig. no. 19:

a) Loosen the screw (1);
b) Open the guard (2);
c) Loosen the nut (3);
d) Rotate the adjustment screw (4) until the required staple leg length is achieved (screwing in shortens the staple leg and vice versa);
e) Tighten the nut (3), keeping the screw in the selected position;
f) Close the guard (2);
g) Tighten the screw (1).

6.6.2 Adjustment of the left staple leg length

In order to adjust the left staple leg length, it is necessary to follow the sequence of operations shown in fig. no. 19:

a) Loosen the nut (5);
b) Rotate the eccentric shaft until the required staple leg length is achieved (upward rotation shortens the staple leg and vice versa);
c) Tighten the nut (5), keeping the shaft in the selected position

6.7 Adjustment of staple support pressure

The staple support pressure needs to be adjusted whenever it is incorrect. This may result in the following staple defects:

- staple back is convex and springing;

- staple back is deflected sideways;

- staple legs are convergent or divergent;

- staple back bent

In order to adjust the staple support pressure, it is necessary to follow the sequence of operations given in fig. no. 20:

a) Loosen the nut (1);

b) Turn the screw shackle (2) until a properly formed staple is achieved.

6.8 Adjustment of staple closure

Staple closure should be adjusted when the closure of the staples is incorrect. This may result in the following staple defects:

- both staple legs not fully closed; 

- both staple legs closed too deeply . 

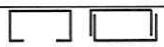
Adjustment is also essential when switching from the stitching of thick materials to thin ones, since otherwise the staple benders may be damaged.

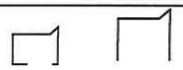
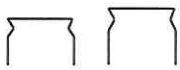
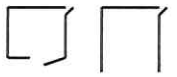
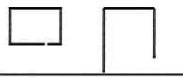
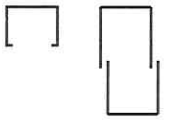
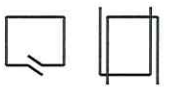
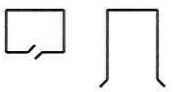
In order to adjust staple closure, it is necessary to follow the sequence of operations given in fig. no. 21:

a) Loosen the screws (1);
b) Open the guard (2) and interlock it with the screws in the top position;
c) Loosen the nut (3);
d) Turn the pin (4) so that the arrow head moves upwards (if the staples are insufficiently bent) or downwards (if the staples are bent too deeply);
e) Tighten the nut (3), keeping the pin in the selected position;
f) Unblock and close the guard (3);
g) Tighten the screws (1).

7. STAPLE DEFECTS - CAUSES AND COUNTERMEA-SURES

In table no. 2 (presented on the following page) we have described the most commonly occurring staple defects, their causes, and effective countermeasures.

No.	Staple defect	Description of staple defect and cause	Countermeas-ure
1.		Perfect staple	
2.		Convex and springing staple back - sticking out and springing to due to edges: - too hard and springing wire, - insufficient compression of the staple bound material, - insufficient staple support pressure.	according to point 2.5 5.2.1 6.7
3.		Slightly concave and flattened back: - insufficient wire diameter, - excessively soft wire, - incorrect wire cutting off, - staple material too hard.	according to point 2.4 2.5 6.5 2.1

4.		Staple corner buckles: - defective staple driver.	according to point 5.1.1
5.		Back deflected sideways: - incorrect set of replaceable parts - excessive staple support pressure, - defective staple bender.	according to point 2.4 & 5.1.1 6.7 5.1.1
6.		Extended and flattened back - bent edges: - insufficient compression of the staple material, - excessively soft wire, - staple material too hard, - insufficient wire diameter, - incorrect set of replaceable parts.	according to point 5.2.1 2.5 2.1 2.4 2.4 & 5.1.1
7.		Wire jams and breaks in benders: - excessive wire diameter, - incorrect set of replaceable parts.	according to point 2.4 2.4 & 5.1.1
8.		Wire breaks at bending points: - wire too hard, - defective staple bender.	according to point 2.5 5.1.1
9.		Convergent or divergent staple legs: - defective vertical wire straightening, - incorrect staple support pressure.	according to point 6.2 6.7
10.		Staple legs of different length: - incorrect staple leg length adjustment, - wire feed not adjusted properly, - excessive wire tension.	according to point 6.6 6.4 6.3
11.		Staple legs excessively short, but of equal length: - insufficient compression of the stapled material, - incorrect stapler setting for double-sided stapling.	according to point 5.2.1 5.2.1
12.		Staple legs excessively long, but of equal length: - excessive compression of the stapled material, - incorrect stapler setting for double-sided stapling.	according to point 5.2.1 5.2.1
13.		Burrs at the staple edges: - blunt cutters, - incorrect adjustment of cutters.	according to point 6.5 6.5
14.		Both legs not fully closed or closed too deeply: - wrongly adjusted staple closers.	according to point 6.8
15.		Staple leg not bent fully towards the material: - defective staple closer.	according to point 5.1.1
16.		Bent arms misaligned - deflected on both sides: - defective horizontal wire straightening.	according to point 6.2

8. REPAIRS

8.1 Replacement of V-belts

In order to replace the V-belts, it is necessary to go through the sequence of operations given in fig. no. 22:

a) Unscrew the screws (1) and remove the rear guard (2);
b) Loosen the screws (3);
c) Remove the V-belt (4) from the belt pulley;
d) Unscrew the screws (5) and remove the spring (6);
e) Unscrew the screws (7) and remove the cover (8);
f) Remove the V-belts;

8.2 Regeneration of parts

In order to lower the operating costs, the user may self-regenerate those parts of the stitching machine, which are shown in fig. no. 23:

a) Latch - item (1); Grinding off of marked surface by a maximum of 0.4 mm;
b) Circular cutter - item (2); Grinding off of marked surface by a maximum of 0.2 mm;
c) Hollow blade - item (3); Grinding off of marked surface by a maximum of 0.5 mm;

9. MAINTENANCE AND OVERHAULS

9.1 Maintenance

No.	Operation	Agents	Frequency
1.	Tidying and ordering the work-place		daily
2.	Lubrication of points marked (1) in fig. no. 24	3-4 drops of machine oil	weekly
3.	Lubrication of points marked (2) in fig. no. 24	refill with Antykol TS12 oil	monthly
4.	Lubrication of points marked (3) in fig. no. 24	refill with 1 cm of machine grease	monthly
5.	Cleaning and lubricating the rolling bearings	machine grease	every 12,000 h, but at least once every 2 years

9.2 Overhauls

No.	Subject of overhaul	Type of defect	Frequency
1.	Electric wiring	traces of external damage	daily
2.	Stitching mechanism	Inspection according	daily

		to the point 4.6	
3.	Circular cutter, hollow blade, latches	blunt or damaged work surface	monthly
4.	Rollers of wire straightener	worn work surface	bimonthly

10. PICTURES

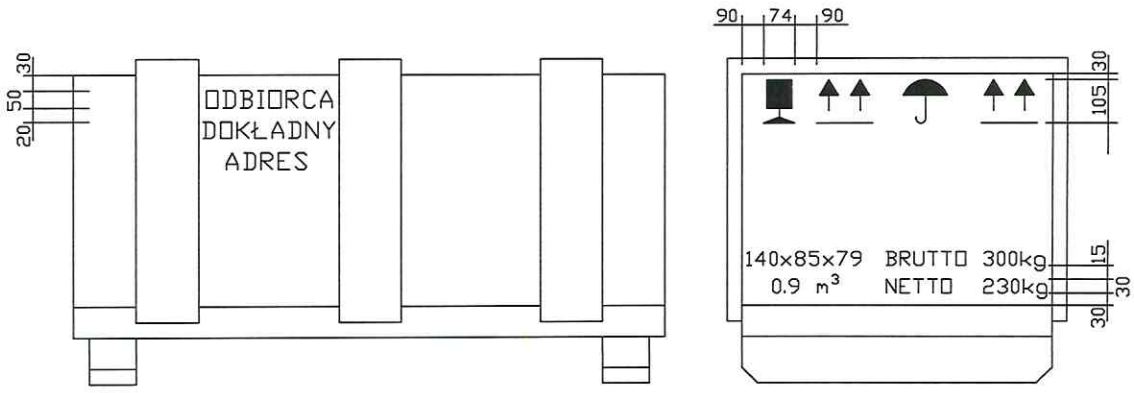


Fig. no. 1 External dimensions and markings of the stitching machine's packaging

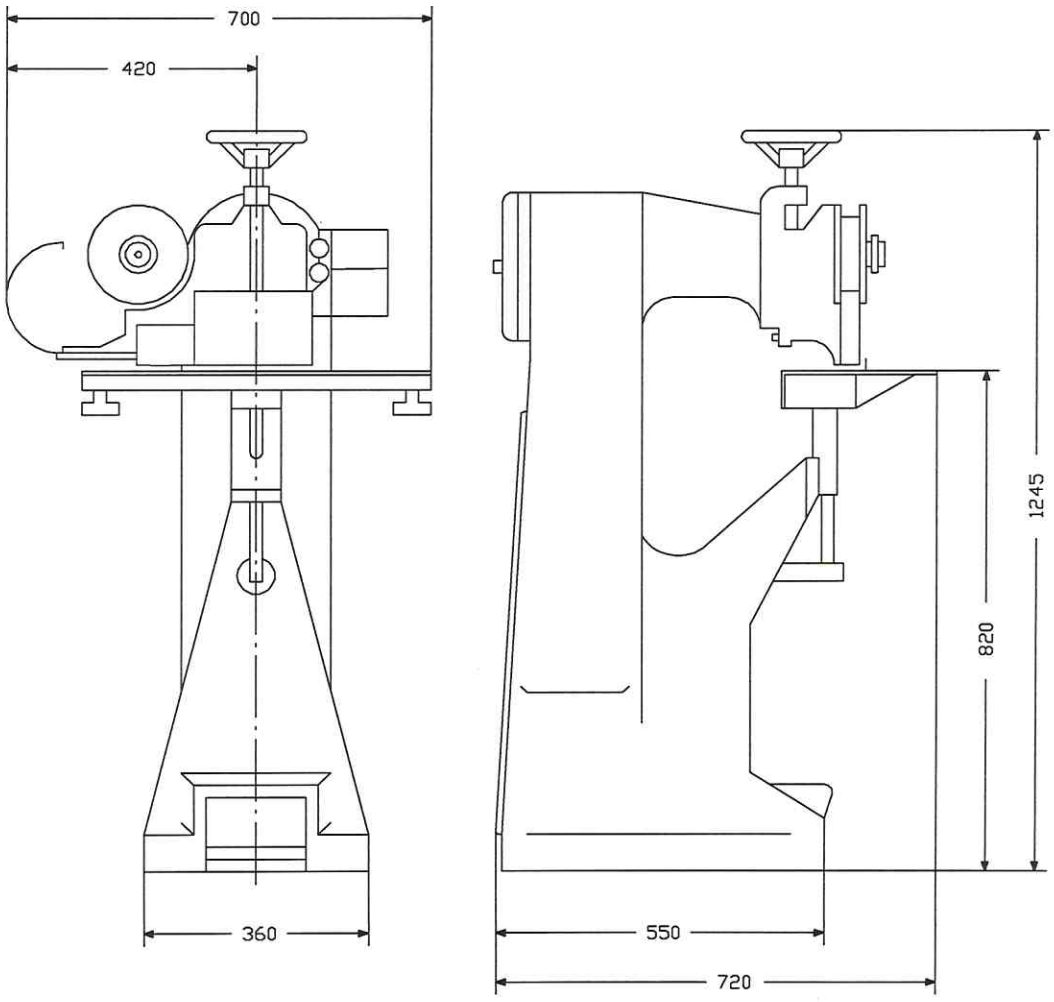


Fig. no. 2 External diameters of stitching machine

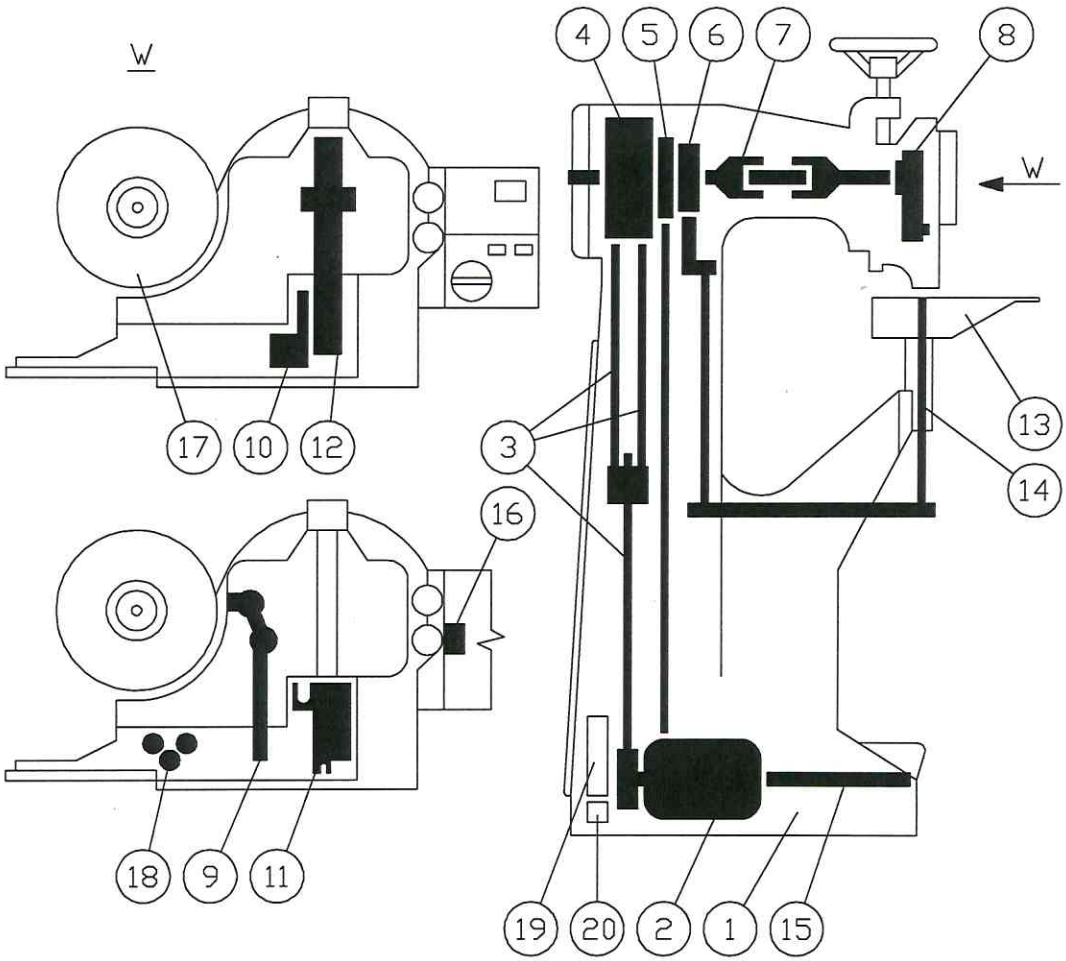

W
4
5
6
7
8
W
17
10
12
3
13
14
16
18
9
11
19
20
2
1
15

Fig. no. 3 Construction of the stitching machine

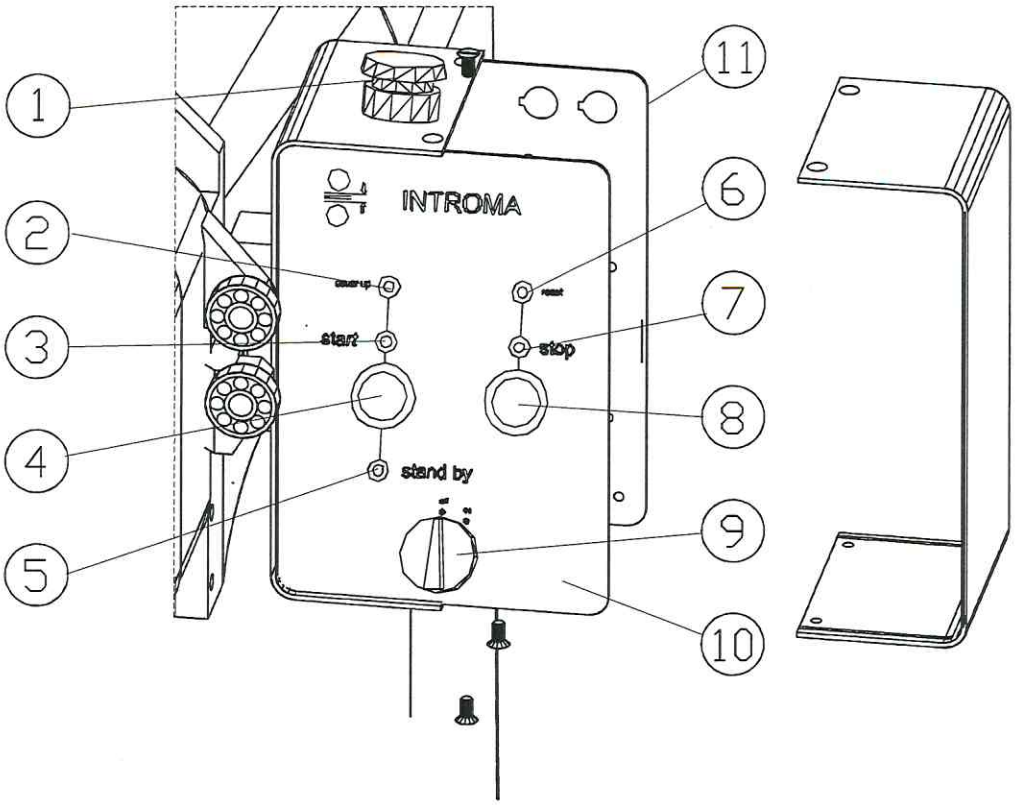


Fig. no. 4 Situation of control and informatory elements

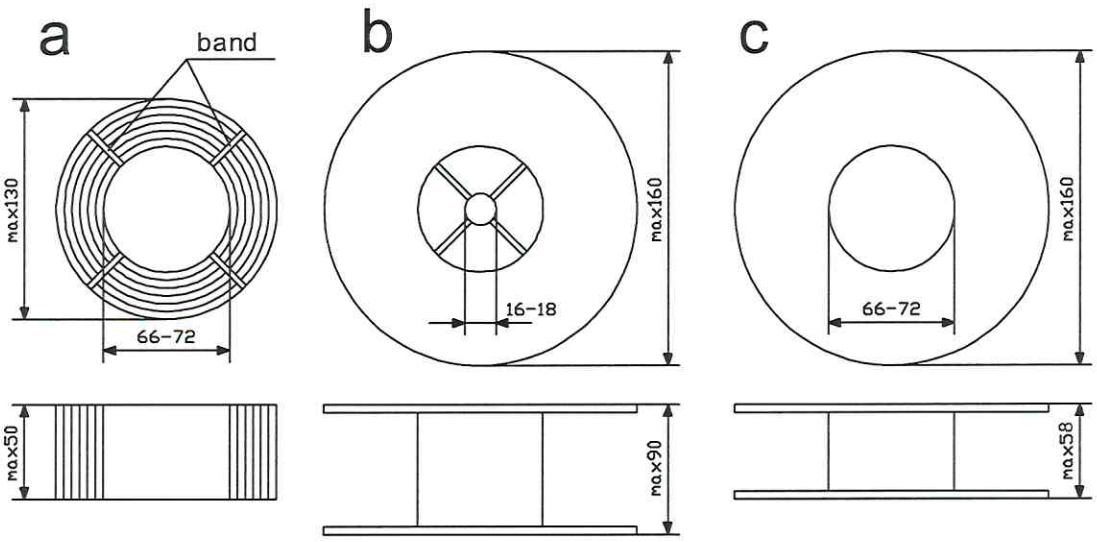


Fig. no. 5 Dimensions of coils and spools

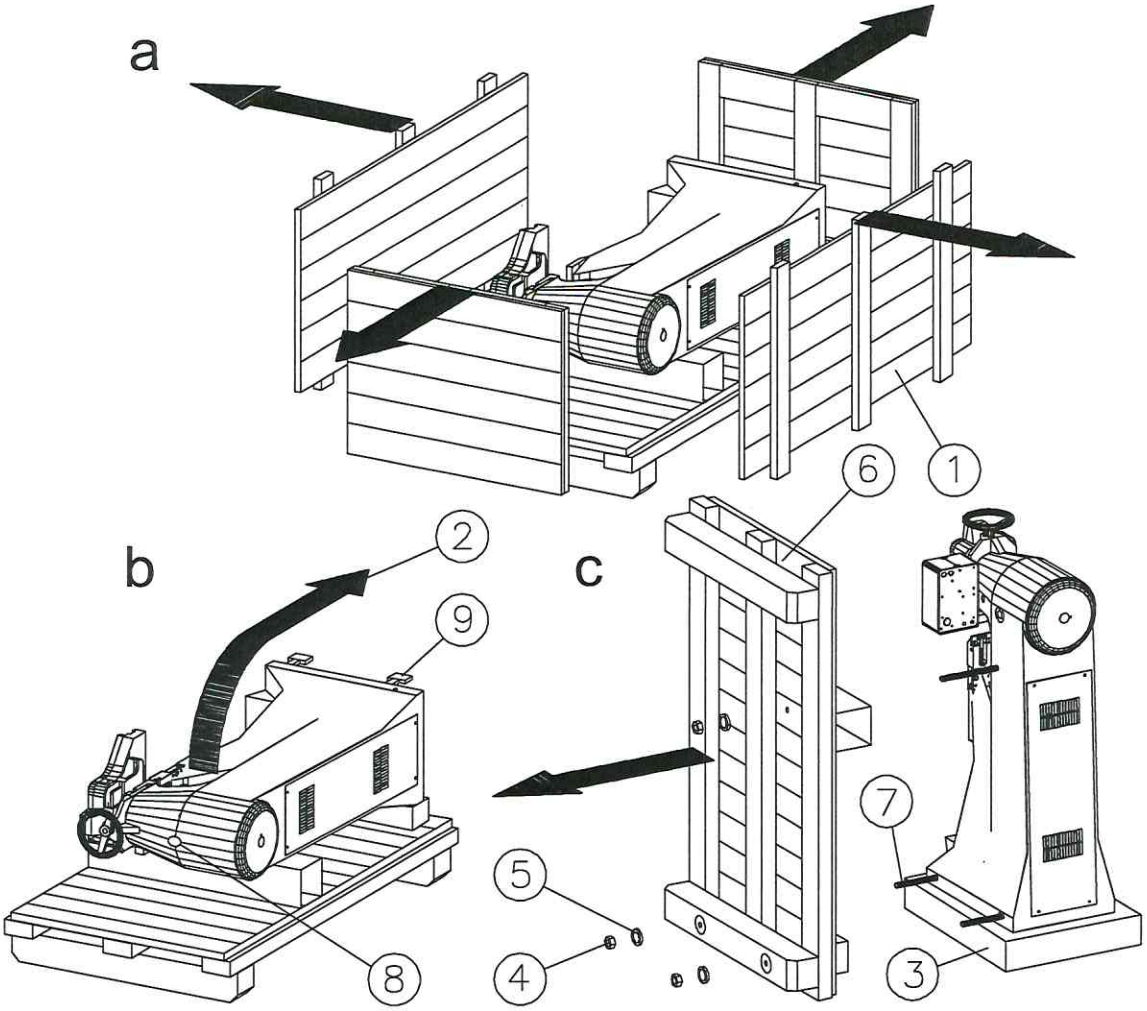


Fig. no 6 Sequence of unpacking operations

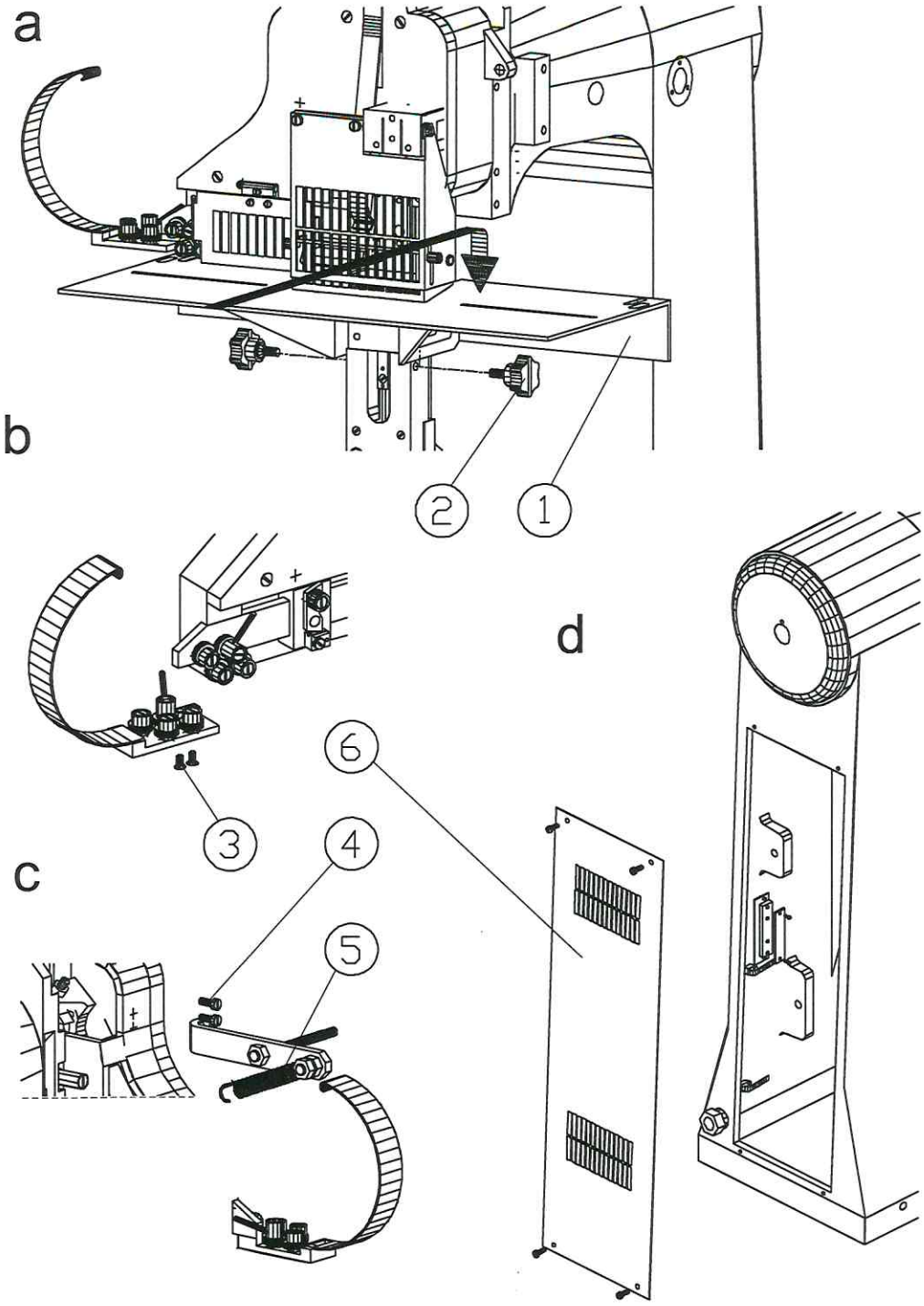


Fig. no. 7 Assembly and connection to power supply

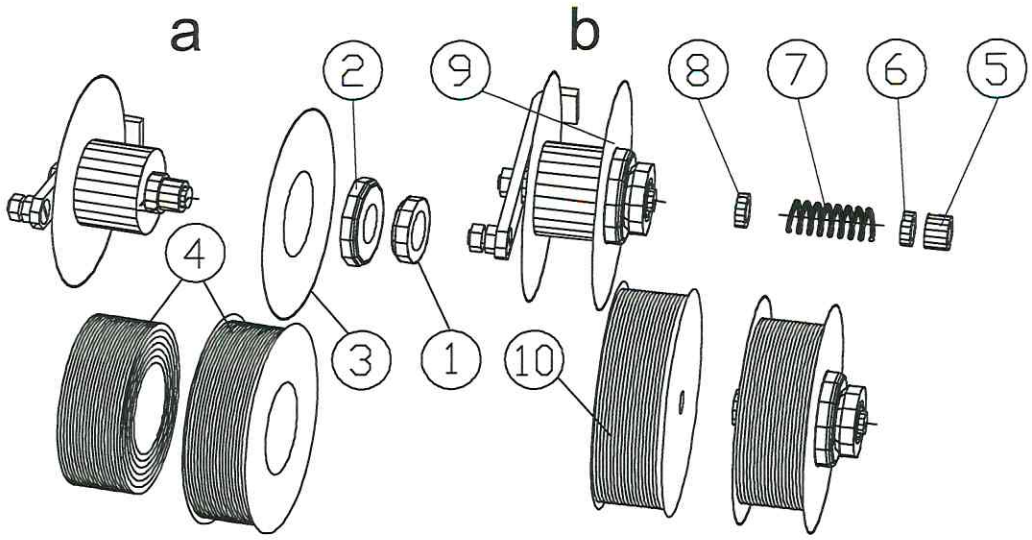


Fig. no. 8 Loading spools and coiled wire

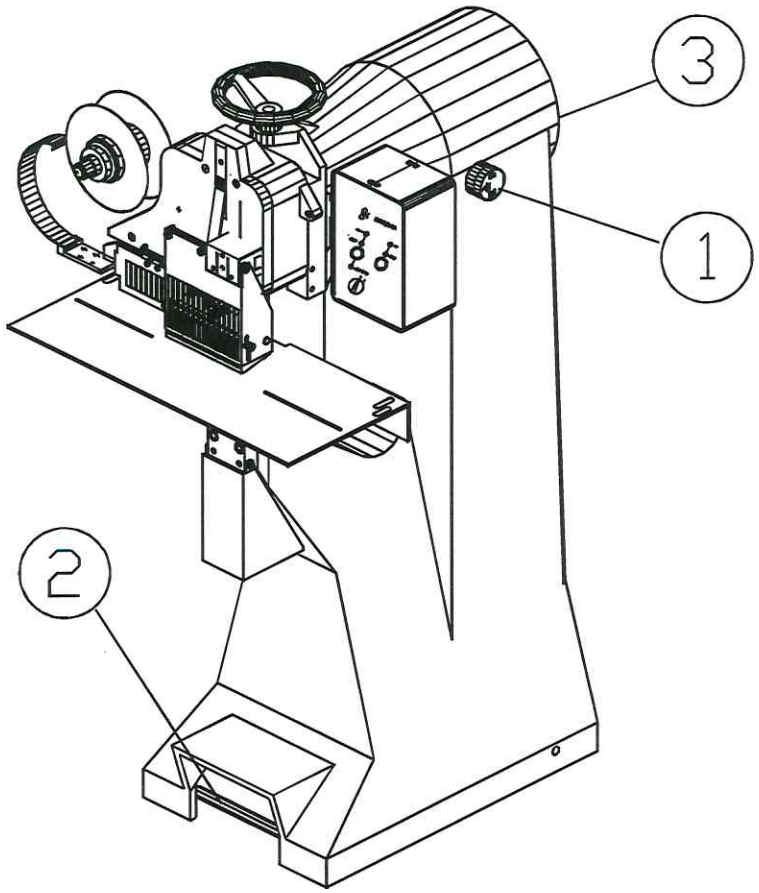


Fig. no. 9 Manual inspection of the stitching mechanism

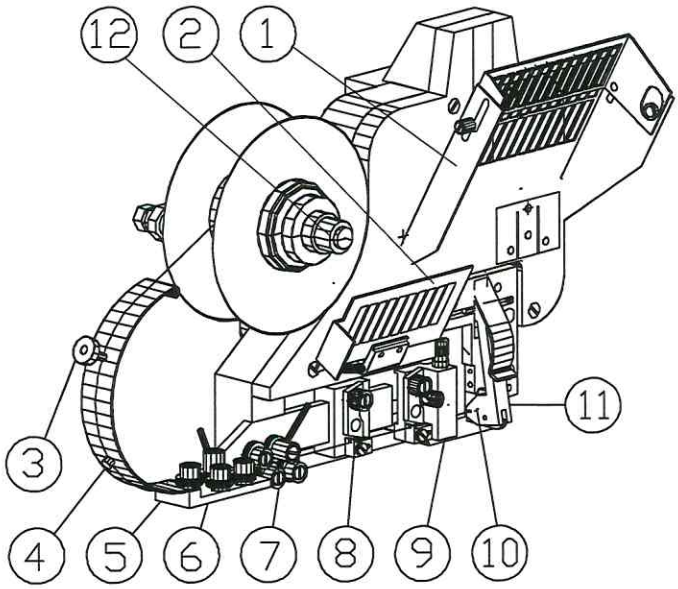


Fig. no. 10 Insertion of wire and regulation of wire tension

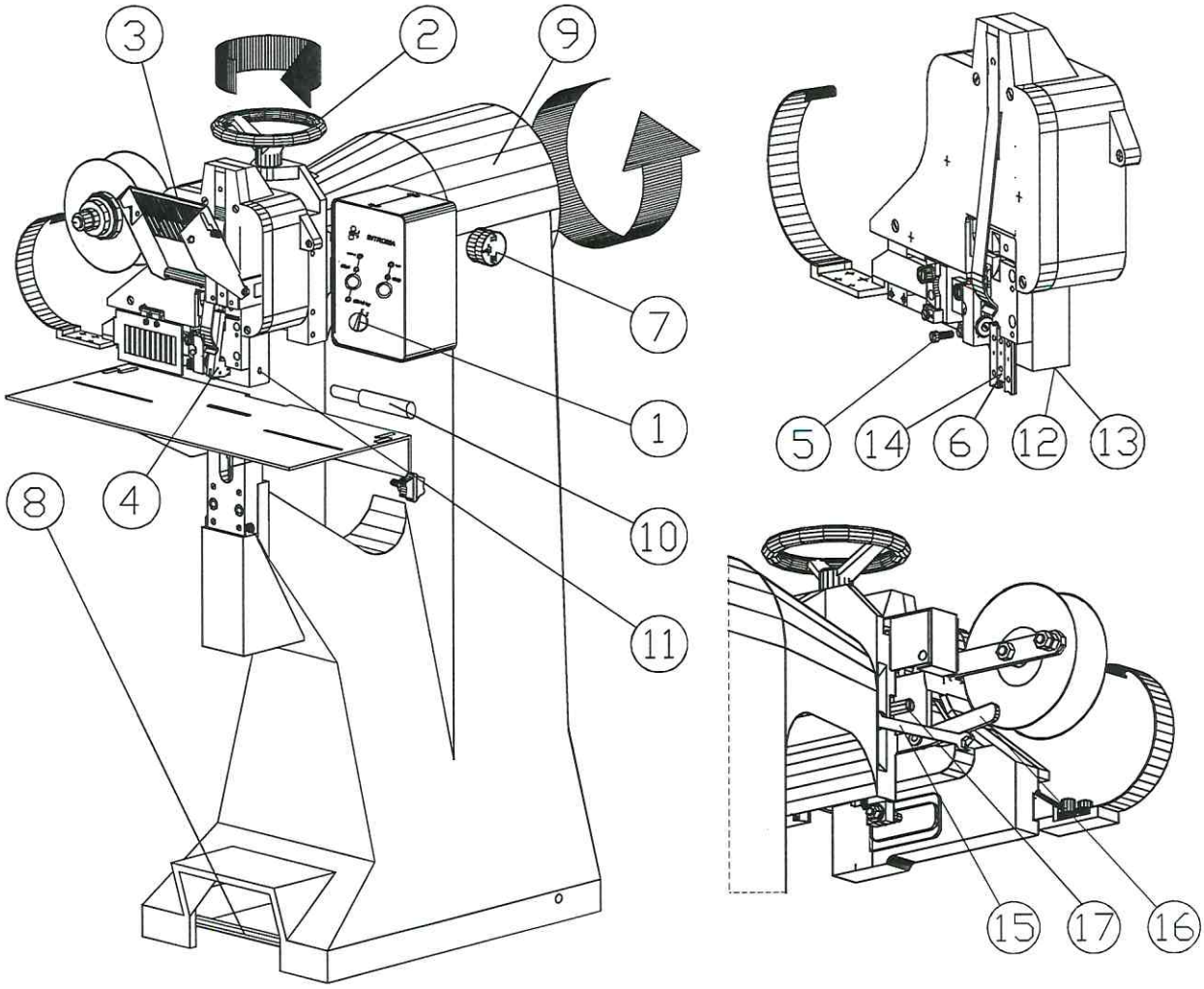


Fig. no. 12 Re-setting the stitching machine to spine stapling with ring staples using wire with a thickness of 0.5 to 0.6 mm

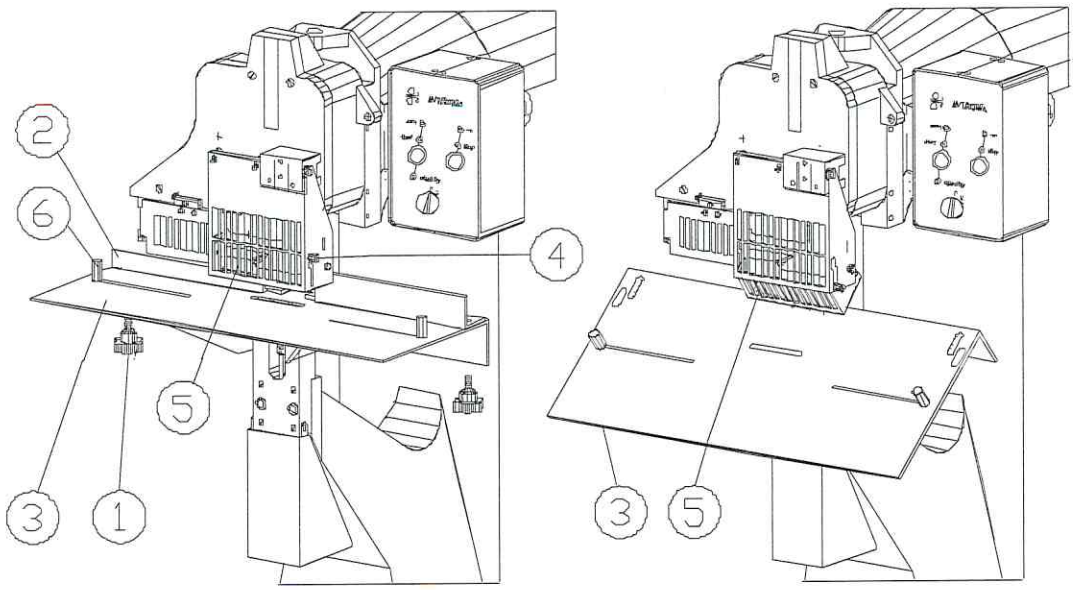


Fig. no. 13 Setting the table, stapling area guard and margins for spine stitching

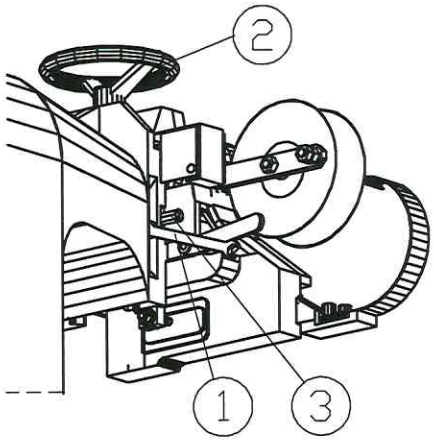


Fig. no. 14 Re-setting to open staple flat stapling with a stitching thickness of 24 to 36 mm and 36 to 40 mm

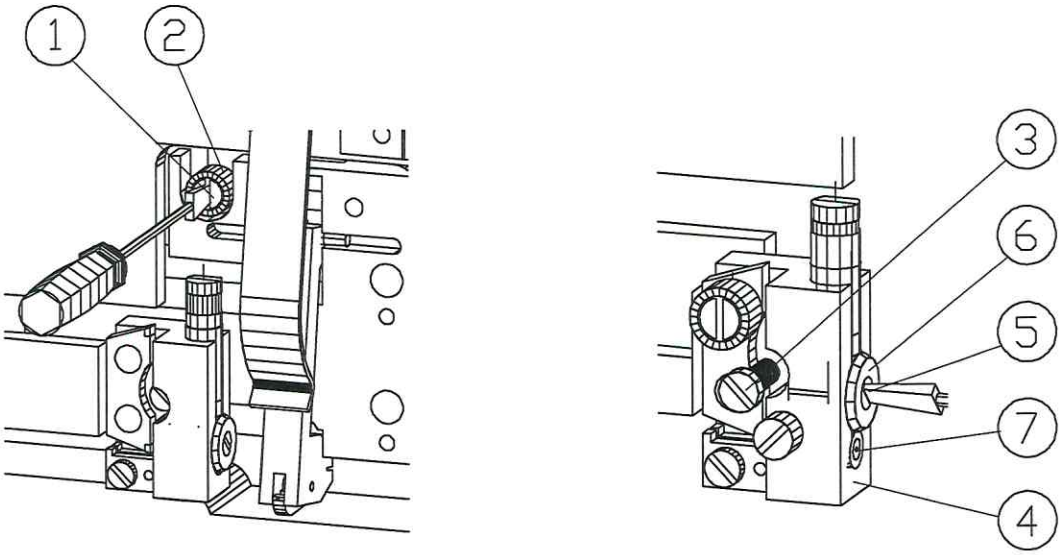


Fig. no. 17 Adjustment and replacement of circular cutter

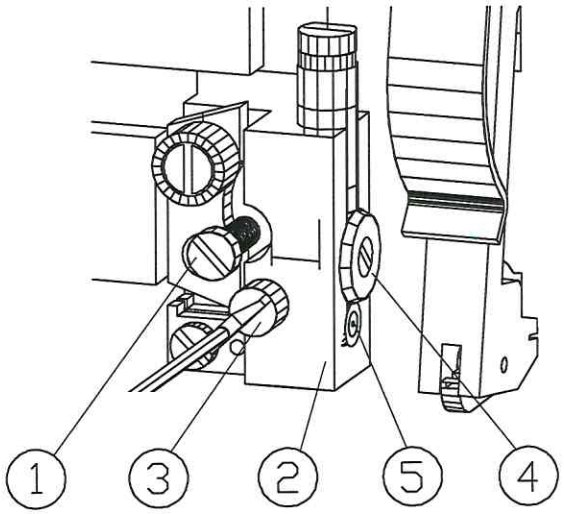


Fig. no. 18 Replacement of hollow blade and adjustment of cut-off clearance

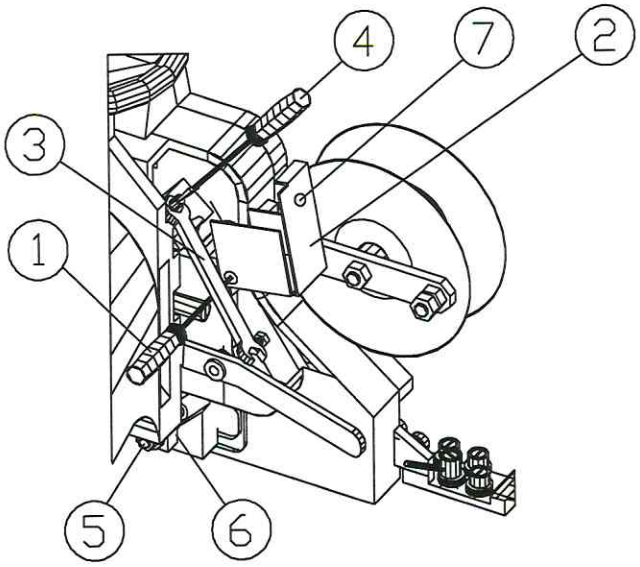


Fig. no. 19 Adjustment of length of staple legs

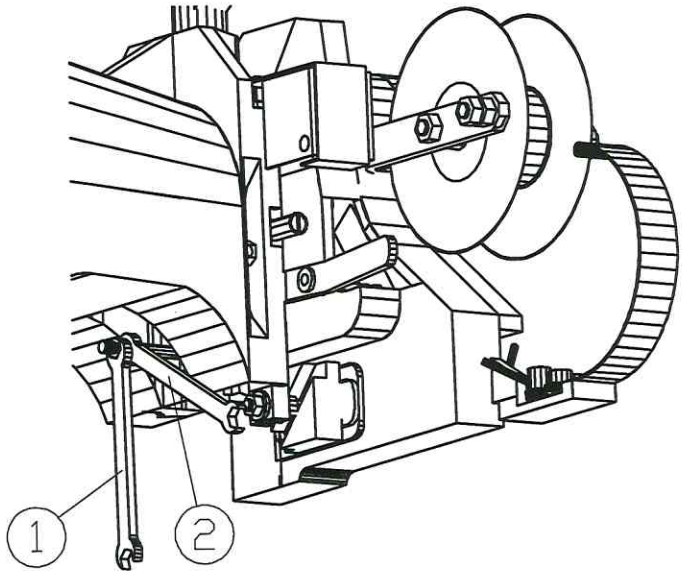


Fig. no. 20 Adjustment of staple support pressure

Three phase diagram