

LAYER WINDING MACHINE
SRN - 0.5 U

Technical description

SRN 000 TO

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D 3 APR 2008
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1. PURPOSE

1.1. The machine SRN - 0.5U is meant for the open layer winding with electric cable of spools on round frameworks. The machine has the adjustment for the winding pitch, smooth adjustment of the rotating speed of spindle with the help of floor pedals.

2. TECHNICAL DATA

- 2.1. Diameter of the winding cable, mm
 - minimum 0.05
 - maximum 0.5
- Longitudinal step of the carriage of thread carrier, mm
 - minimum 3
 - maximum 150
- 2.2. Maximum diameter of the winding cable, mm 122
- 2.3. Adjustment of the pitch of arranging the cable (step less), mm
 - minimum pitch 0.05
 - maximum pitch 0.55
- 2.4. Tension force of cable, N (kg f) 14.7 ± 1.47 (1.5 ± 0.15)
- 2.5. Height of the centers, mm 80
- 2.6. Rotating speed of the spindle, turns / min.
 - on idling 1000
 - at a maximum load 900
- 2.7. Number of simultaneously wound spools 1

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Tech. Head								
QA Head								
Approved by								

- 2.8. Drive of the machine:
 electric engine of direct current
 voltage, V 220
 frequency, Hz 50
 power, kilo Watt 0.18
 number of turns per minute 5000

Reduction gearbox with a transmission ratio of 1: 5.

- 2.9. Overall dimensions of the machine, mm 875 x 775 x 1400.
- 2.10. Layer winding is ensured, if the frames of the winding spools, having smooth surface without chips and irregularities (unevenness) is used.

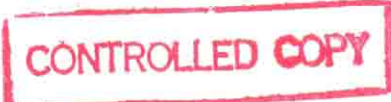
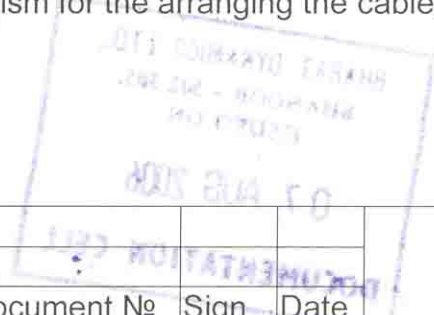
3. SAFETY TECHNIQUES

- 3.1. The personnel, who have undergone the briefing about the safety techniques and those who have studied the set up of the machine, are allowed for the operations.
- 3.2. Before starting the operations, carry out the checking for the serviceability of the machine, for the presence and accuracy of earthing, fencing of the rotating parts, lighting at the work place.
- 3.3. The preparation should be carried out only after the machine stops completely.

4. DESIGN OF THE MACHINE

- 4.1. The machine consists of the following units:

drive;
 rear post;
 mechanism for the arranging the cable;



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per the scale plate of the machine. The accurate setting of the arranging pitch is carried out during the winding process of the cable on the article.

4.5. Metering counter

The metering counter (length measurer) consists of programmer, transducer and the metering wheel with a length of circumference - 0.5 m. During the operations of the machine, the moving cable rotates the metering wheel, rotates the disc with cut on rim through gear transmission. Transmission coefficient (gain factor) of the metering wheel - disc is 2: 1. The metering counter works in reverse mode.

Before winding the article, it is necessary to set the zero reading of the counter, by pressing the push button INPUT of the programmer.

4.6. Mechanism for adjusting the rotating speeds of spindle.

The adjustment of the rotating speed of spindle is carried out with the help of the electronic circuit on the thyristors.

The control signal in the electronic circuit is supplied from the induction transducer. The actuation of the transducer is carried out from the pedals of pedal control through the tie - rod. The returning of the pedals to the initial position is done by a spring. The limitation for the maximum rotating speed of the spindle is carried out by shifting the limiting stop.

To avoid sharp increment and decrement of the rotating speed of spindle, damper is set on the pedal. The actuation time of the damper is set with a adjusting screw in the limits of 1.5 - 2 sec.

4.7. The device for adjusting the tension of cable PRN consists of the following:

- electronic unit (amplifier);
- recording milli voltmeter;
- releasing device with two electric engines Dv1 and Dv2;
- tension transducer.

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- 4.7.1. Electronic unit (amplifier) serves for the amplification of the synchro transmitter signal and automatically maintaining the tension force of winding cable in the specified limits during winding and also during unwinding.

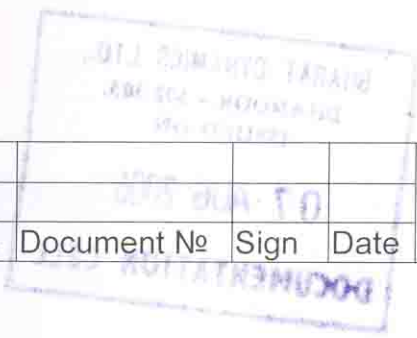
Excitation winding of the synchro is feed from the power transformer with a voltage of alternating current of value 20 - 24 V and frequency 50 Hz. Signal, removed from the synchro transmitter is supplied on the divider. The signal can be changed depending upon the position of the synchro rotor relative to the stator by value and when the signal passes through zero, the phase changes to the opposite one. The signal value is adjusted also with the divider from zero to maximum value. Further, the signal is supplied through the phase adjuster and noise - immune (anti noise) filters to the input of the lamp amplifier. Intermediate transformer servers as the load of lamp amplifier. The transformer adjusts the operations of the transistor amplifier with the transformer at the output. The output transformer is loaded on the control winding of the engine Dv 1, the excitation winding of this engine is feed with a voltage of 110 V from a power transformer. For the phase shift, non polar capacitor is included in this circuit sequentially with the excitation winding. Depending upon the position of the synchro rotor, on the shaft of the engine Dv1, adjustable tension force is created, and also the rotating direction changes.

- 4.7.2. Recording milli voltmeter is used for the continuous recording of the tension force of cable on the chart strip of width 250 mm and having a coordinate scale of 2.5 mm.

measuring range from 0 to 100 m. V
 permissible measuring error 2.5 %
 power supply mains 220 V, 50 Hz.

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4.8. Tuning of the tension transducer.

4.8.1. Tuning of the tension transducer is carried out before winding each spool.

Wind the loops of the cable piece MKU - 2SP on the guiding roller 4 (sketch 1), pass them through the roller of the lever of transducer 3, throw them through the metering wheel 5 and suspend a load of weight 1.500 kg to the end of the cable. With the help of the screw in the body of the mobile bracket, carry out the tightening of the spring of transducer PRN till it's lever takes the vertical position.

To avoid the auto oscillations of the transducer lever, damper is set on the axis of the spring while winding the article.

4.8.2. Carry out the following settings of synchro transmitter at zero, while the engine Dv1 is switched on:

- switch on the toggle switch MAINS on the front panel of the amplifier;
- warm up the device for a period of 10 minutes;
- the knobs of the potentiometers R1 and R2 should be set in the middle position;
- further adjustment should be carried out open - loop system of adjustment, when the kinematic connection of the engines with the synchro through the tightened wire is absent;
- loosen the fastening screws of the synchro body;
- shift the toggle switch D - 1 to upper position;
- by rotating the body of the synchro stator relative to the rotor, on the axis of which the lever of the tension transducer is fastened, the speed of the engine Dv1 is achieved to be equal to zero;

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- during the deviation of the transducer's lever from the neutral position, which leads to the changes in the tension of the wire, the shaft of the engine Dv1 should rotate towards the side, opposite to that one, in which the unwinding of the wire is carried out, and while passing through the neutral position, the rotating direction should get changed. In case if the rotation of the shaft of engine Dv1 occurs in the opposite direction to the required one, then turn the synchro stator by 180 ° relative to the rotor;
- close the body of the stator;
- shift the toggle switch D - 1 to the lower position.

4.8.3. Without removing the load of weight 1.500 kg, carry out the marking for the position of recording element on the chart strip.

4.8.4. Remove the load of weight 1.500 kg and suspend the load of weight 1.350 kg. Carry out the marking for the position of recording element on the chart strip.

4.8.5. Remove the load of weight 1.350 kg and suspend the load of weight 1.650 kg. Carry out the marking for the position of recording element on the chart strip.

4.8.6. Remove the load of weight 1.650 kg.

4.8.7. While tuning the device, the displacement of the calibration line of spring is allowed up to ± 2.94 N (0.030 kg f) as a result of multiple static changes of the tension force from 13.23 N (1350 kg f) to 16.17 N (1.650 kg f). The calibration range of the spring, which is recording on the chart strip at a force of (14.7 ± 1.47) N (1.500 kg f ± 0.150 kg f), should be of width not less than 30 mm.

4.9. Tuning of the engine Dv1.

4.9.1. The tuning of the engine Dv1 should be carried out before starting the shift.



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4.9.2. Switch on the toggle switch D - 1 and adjust the phase of the signal of potentiometer R2 during the open - loop system of adjustment. Potentiometer R1 should be set in the middle position, the lever of the transducer PRN should be displaced at an angle of 10 ° - 15 ° from the neutral position. The correct positioning of the potentiometer R2 corresponds to the maximum moment, generated by the engine Dv1, which can be measured with the help of the dynamometer while engine (sketch 2) is stopped (braked). The measurement range of the dynamometer is from 0 to 2.000 kg, measuring error is ± 1 %.

4.9.3. Adjustment of the amplification factor (gain factor) of system is carried out by the potentiometer R1 in the close - loop system of adjustment, with sharp increment of the speed and sharp stopping of the drive engine of machine SRN - 0.5U. In case if the amplification factor is small, the system can be insufficiently stationery and if the amplification factor is more, auto oscillations may appear, i.e., the automatic adjustment system becomes instable. The force should be not less than 2.94 N, while a load of weight 1.500 kg is set. The rest condition of the suspended load is achieved or the lifting of the load as per the sketch 3.

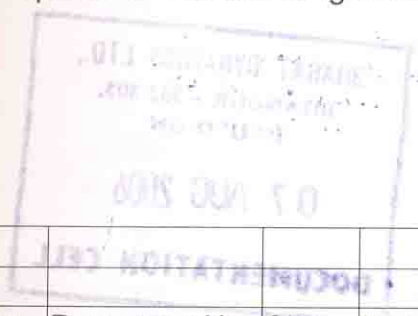
4.9.4. Switch of the toggle switch D - 1.

4.10. Tuning of the engine Dv2.

4.10.1. Tuning of the engine Dv2 is carried out before winding each spool.

4.10.2. The adjustment of the tension force in the circuit of the engine of constant tension Dv2 is carried out with the help of the automatic transformer.

4.10.3. Mount the spool with the cable MKU - 2SP (sketch 4) on the spindle of the releasing device.



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4.10.4. Pass the cable MKU - 2SP as per the sketch 3, tie the end of the cable in the form of a loop and suspend a load of weight 1.500 kg on it. Switch on the toggle switch D - 2.

By rotating the knob of the automatic transformer and simultaneously holding the knob of the spool with the cable, the equilibrium position of the load is achieved.

4.10.5. Switch on the toggle switch D - 1. The suspended load of weight 1.500 kg should preserve it's rest condition. During this, the position of the recording element should coincide with the marking, specified in clause 4.8.3, with a permissible deviation as per the clause 4.8.6.

4.10.6. Switch off the toggle switches D - 1, D - 2 and remove the load.

4.11. Checking for the serviceability of the device PRN.

4.11.1. Check the tension of the cable, which should be (14.7 ± 1.47) N $(1.500 \text{ kg f} \pm 0.150 \text{ kg f})$, in the following sequence (sketch 3):

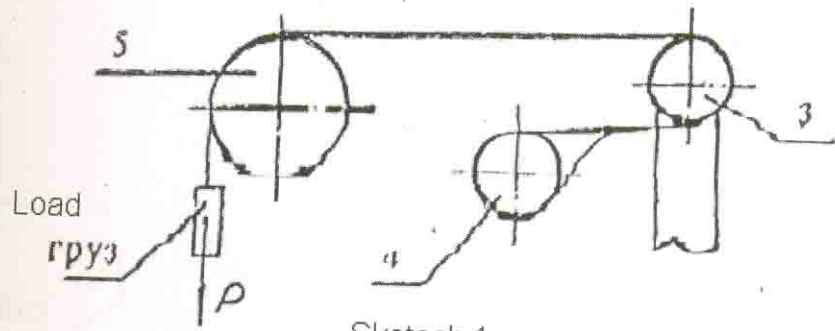
- suspend a load of weight 1.350 kg to the loop of the cable;
- switch on the toggle switches MAINS, D - 1, D - 2, cable should get wound on the spool with cable;
- switch off the toggle switches D - 2, and remove the load;
- suspend the load of weight 1.650 kg. Switch on the toggle switch D - 2, cable should get unwounded from the spool;
- switch off the toggle switches D - 1, D - 2, and remove the load;
- cut the loop of the cable, which is used for suspending the loads;

In case of satisfactory results of tension checking, start the winding.

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Sketch 1
Схема 1

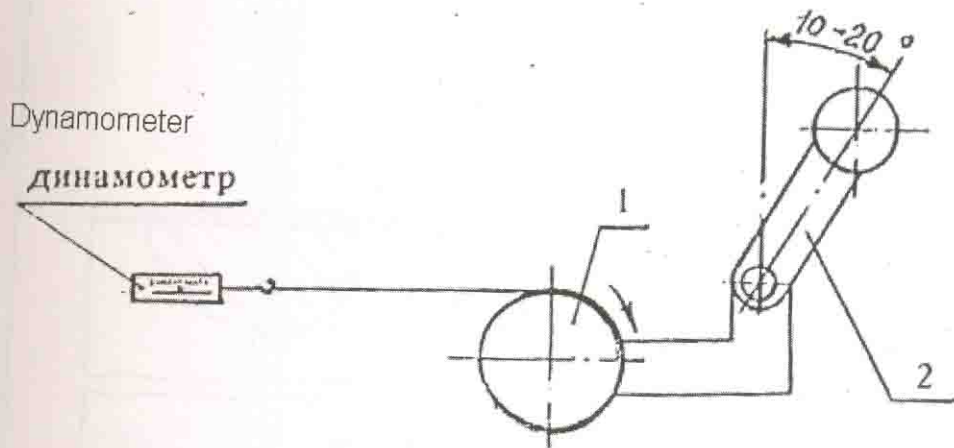
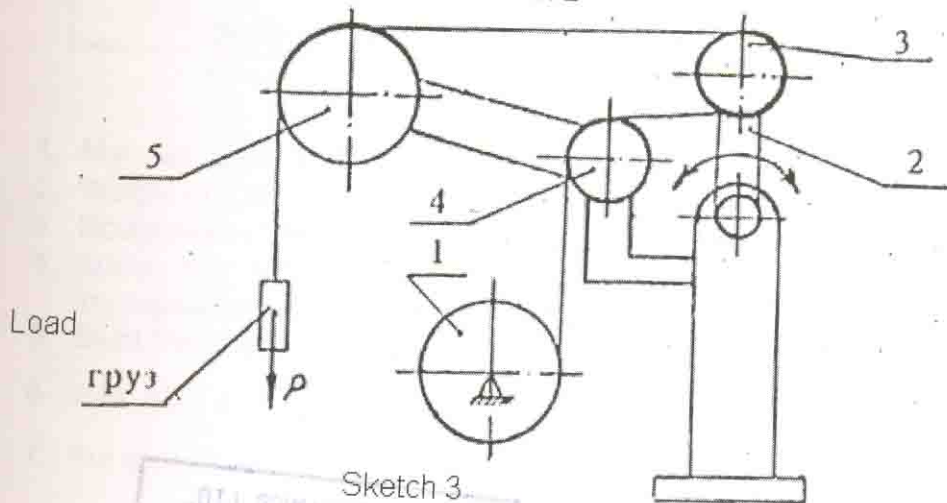


Схема 2
Sketch 2



Sketch 3
Схема 3

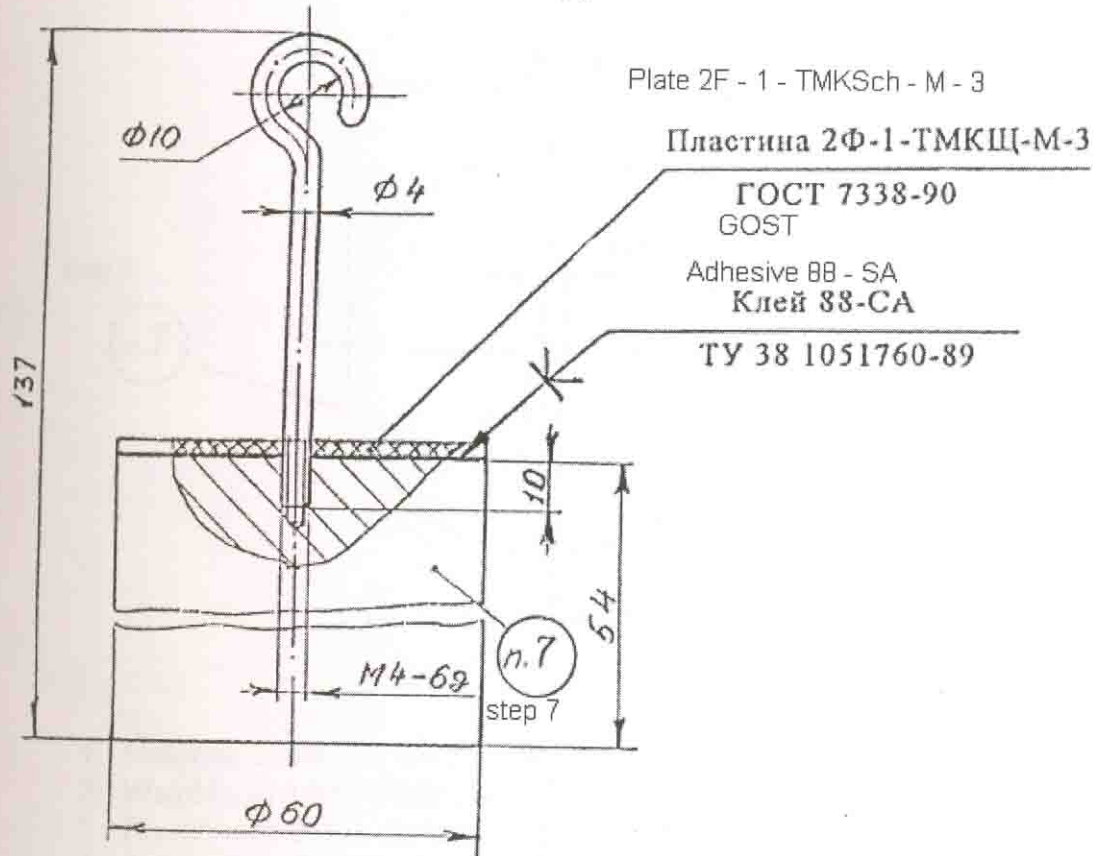
- 1 - spool with the cable MKU - 2SP
- 2 - lever of the transducer
- 3 - roller of the lever of transducer
- 4 - guiding roller
- 5 - metering wheel.

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Annexure A
(mandatory)

Load



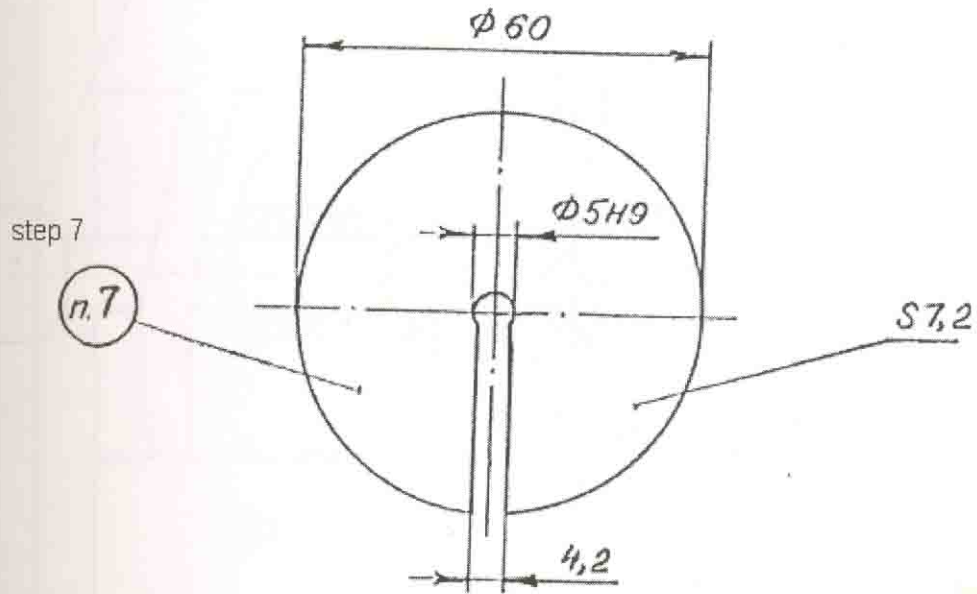
1. Material: Steel 3 of GOST 380 - 94
2. Weight - (1.200 ± 0.024) kg.
3. Roughness of the surface - 2.5 micro m.
4. Apply the following coating: Chemical oxidation followed by impregnation with oil.
5. Blunt the sharp edges R 0.5 mm.
6. H14, h14, $\pm \frac{JT14}{2}$
7. Put the stamp: 1.2 kg.

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Annexure B
(mandatory)

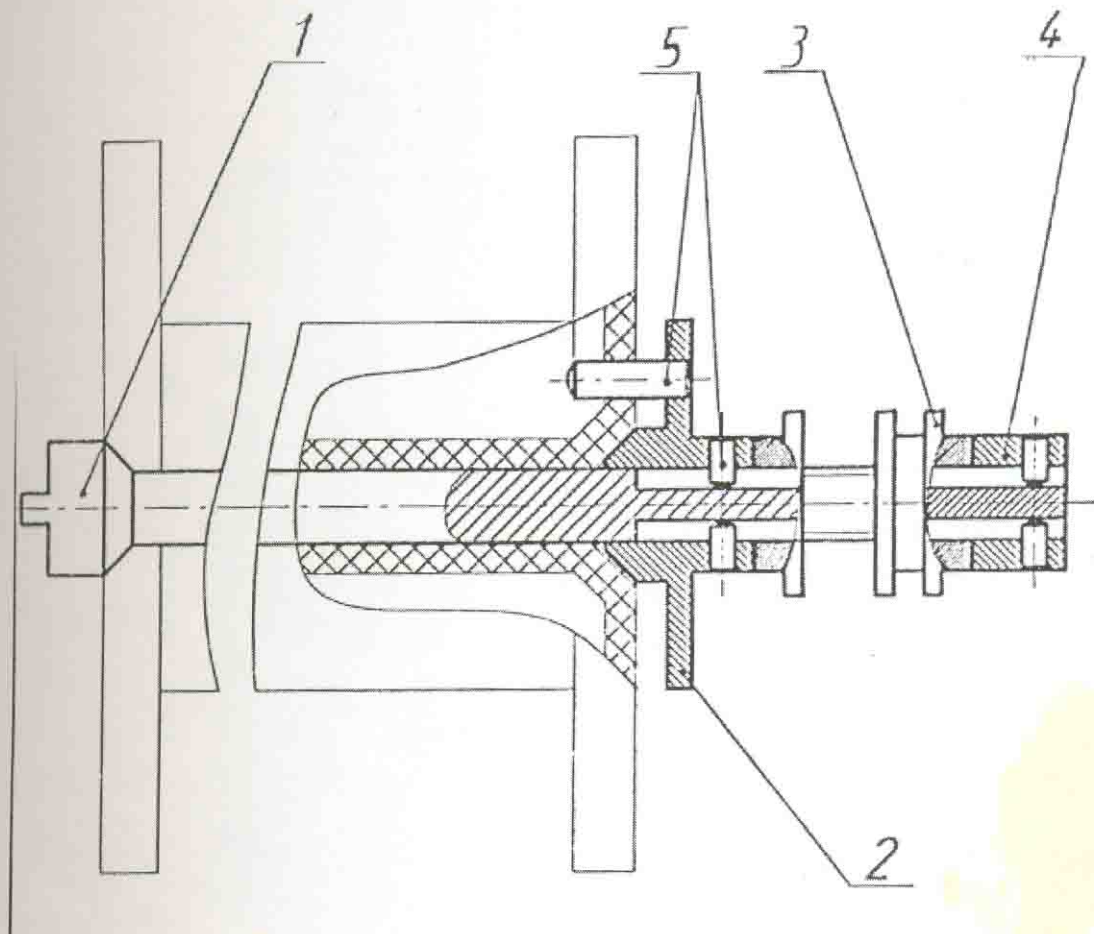
Load



1. Material: Steel 3 of GOST 380 - 94
2. Weight - (0.150 ± 0.006) kg.
3. Roughness of the surface - 2.5 micro m.
4. Apply the following coating: Chemical oxidation followed by impregnation with oil.
5. Blunt the sharp edges R 0.5 mm.
6. $H14, h14, \pm \frac{JT14}{2}$
7. Put the stamp: 0.150 kg.

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- 1 - spindle
- 2 - right taper
- 3 - nut
- 4 - bush
- 5 - dowel pins

Sketch 4

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