

BASIS OF RESEARCH DIRECTION FOR IMPROVING SAW TOOTH OPENING EQUIPMENT

Madrakhimov Dilshod Usupalievich

Tashkent Institute of Textile and Light Industry, PhD, Senior Researcher

Mansurov Ilkhomjon Islamjon ugli

Andijan state technical institute , base doctoral student

Abstract: The article presents information on the selection of the direction of scientific research based on a brief analytical analysis of the history of the development of saw tooth-cutting equipment, which is recommended for use in saw repair shops of cotton ginning enterprises in cotton-textile clusters.

Key words: Saw, tooth, equipment, saw disc, construction, matrix, punch, mechanism.

The degree of curvature of the teeth of the saw discs being prepared, their dimensions and the condition of the assembled saw cylinder have a significant impact on the production efficiency of gin and linter machines, the quality of fiber, lint and seed.

Each cotton ginning enterprise has its own saw repair shop, where saws that can be reused are sorted by size, sharpened, filed, chamfered, and placed in a sand bath.

Until the 1980s, OPV-type saw blade gearing equipment was used (Fig. 1). The main working elements of OPV-type saw blade gearing equipment are the flywheel 1, punch 3 and matrix 5 mounted on the frame 2. During the gearing process, the saw blade holding device 4 ensures a firm grip of the saw blade. The punch with the matrix can move in a horizontal plane depending on the diameter of the saw blade being geared. The punch moves vertically during the gearing process [1].

The main disadvantages of the OPV saw toothing equipment are: low productivity; lack of centering clamping devices for mounting the saw blade on the dividing spindle of the machine; lack of a spring-loaded mechanism in the brake system; difficulty in adjusting the machine to a saw tooth of a certain size and the bevel angle of the profile being formed.

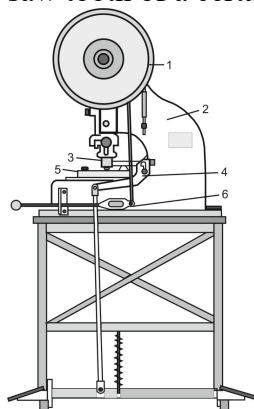


Fig. 1. The scheme of the device for opening teeth for OPV-type saw discs, 1st flywheel; 2-cell; 3-pounson; 4- Do not hold the saw; 5-matrix; 6-turn off mechanism

Since the machine does not have a mechanism for moving the spindle, it is installed by moving the die to adjust it to the diameter of the toothed disc and then aligning the punch on it. Thus, due to the lack of fixed positions of the cutting tools in the machine, the uncertainty of setting the punch and matrix comes.

Taking into account the shortcomings in the design of OPV equipment, a semi-automatic saw tooth-cutting device was developed by TsNIIHProm (Figure 2) [2].

The PNC equipment consists of a frame 1, a transmission axis 2, a centering device 3, a connecting rod 4 that transmits its movement to a support 5 mounted on an axis 6, a lubricant dropper 7 that lubricates the cutting teeth, the head of the support 5 8, a punch with a punch holder, a matrix 9 with knives, which are fixed on a horizontal table 10 (Fig. 2).

The saw blade to be cut is mounted on the head 11 of the spindle 12, which is mounted with a cylindrical sleeve 13 using a mounting bracket 14 and a mounting rod 15.

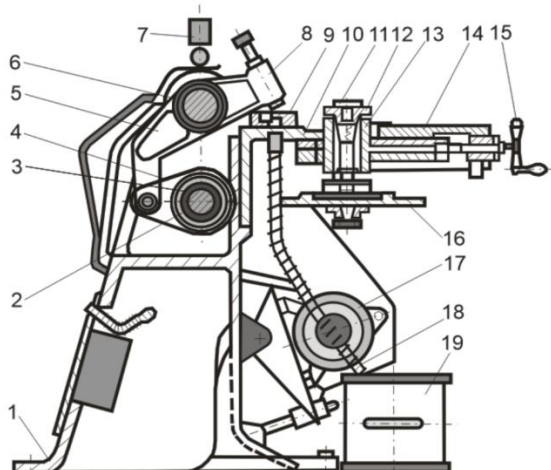


Figure 2. Scheme of the PNTs type saw tooth opening machine

To divide the installed saw blade into the required number of teeth, a ring 16 is installed in the lower part of the spindle, to which a replaceable gear wheel is attached, which performs this division. The machine is driven by an electric motor 17 through a belt drive and a drive clutch with a rotary key that transmits movement to the transmission shaft. A flexible hose 18 and a hopper 19 are used to remove the cuttings formed during cutting of the saw teeth.

handle, controlled together with the punch by an eccentric shaft of the PNC type, allowed to slightly increase productivity compared to the OPV machine. As a result of the modernization of individual components of the PNC machine, the SPH saw toothing machine was created, characterized by a simplified design of the spindle assembly [3] (Fig. 3).

of PNC and SPH equipment over OPV equipment is that these equipment have a simplified adjustment to a given saw diameter, which is achieved by moving the spindle assembly in the designated positions of the matrix and punch. Since the mass of the vibration damper in PNC and SPH equipment is significantly less than that of OPV equipment, this increases the cutting efficiency to 700 cuts per minute.

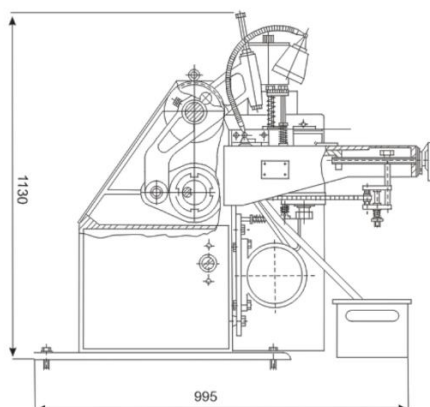


Fig. 3. Diagram of the SPH saw tooth-cutting equipment

That's it emphasize should be above described equipment worker part of changeable movement direction and saw teeth cutting on time processing given part of periodic stop necessary periodic are cars . This processing to give indicators and cutting of accuracy to be mechanism to work depending on impact does this saw of teeth circle to the height suitable coming central to the corner in the turn extendable general collected mistake with is described . The equipment to be mechanism efficiency cut tooth profile accuracy with detection can Figure 4 , a) on the SPX machine the last 280th tooth the space cutting during tooth profile separation mechanism negative collected mistake with shows . The last one cut tooth profile thickness and height according to demand since it was done noticeable to the extent difference makes (Fig. 4 , b) teeth of space his last 280th shot during to be mechanism positive collected mistake with [4] .

In OPV and SPX equipment toothed saw teeth corner on the playground the most big collected 35-40 degrees of error minutes to the values enough , this approximately two neighbor tooth ends between corner playground half a can be equal.

This drawback can be eliminated if , instead of a small gear wheel with an exact number of teeth equal to the number of teeth of the saw tooth of the gear cutting machine , a gear disk with increased kinematic accuracy and a large gear ratio is used.



a)



b)

Figure 4. The effect of the precise operation of the dividing mechanism of the SPH saw tooth cutting machine on the cutting of the saw teeth

a) with negative cumulative error; b) with positive cumulative error.

Solving this problem led to the development of a new saw tooth opening device based on the rotary principle of operation, the essence of which is to cut the tooth gaps with a punch (together

with a matrix) mounted on a rotating cartridge (Fig . 5).

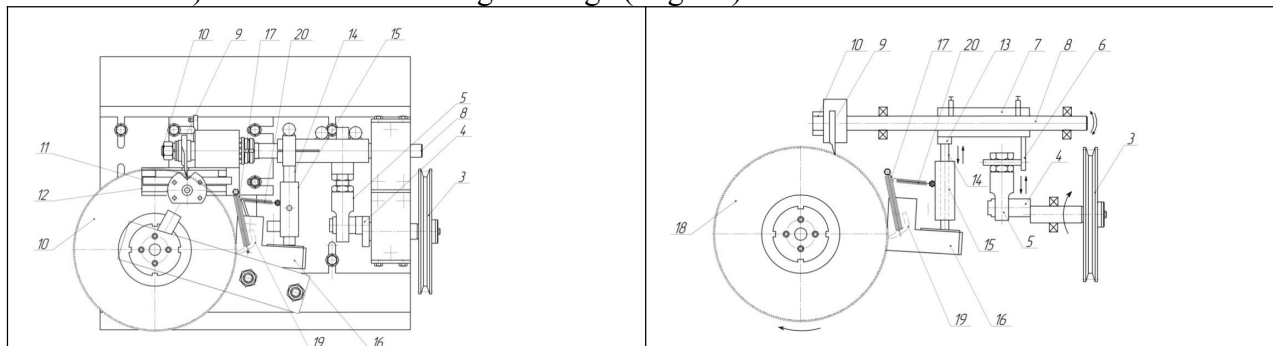


Figure 5. The scheme of the saw tooth opening equipment developed at JSC "Cotton Industry Scientific Center".

The saw tooth opening device (Fig. 5) mainly consists of an electric motor 1, a rotating pulley 3, an eccentric shaft 4, a clamp 5, a G-shaped lever 6 fixed to a pipe 7, a reciprocating shaft 8 passing through the inside of the pipe 7 (the shaft is fixed to the pipe with a screw), a punch 9 fixed to its end with a nut 10, a matrix 11 fixed in a matrix holder 12, a cam 13, a rod 14 sliding inside a bushing 15, a pusher 16 with a compression spring 17, a dividing mechanism 18, a clamp 19 with a spring 20, a pneumatic clamp 21 for saw blades and a frame 22.

The tooth opening equipment for this saw was prepared and put into production [5].

Since the most advanced of the saw tooth-cutting equipment analyzed above is currently the one shown in Figure 5, we chose this equipment for the direction of our scientific research.

According to the results of preliminary studies, it was found that it is possible to improve the quality of saw tooth cutting by simplifying the design of this equipment and improving the process of cutting the punch and matrix discs. Improving the design of the equipment consists in ensuring the transmission of the rotational motion of the electric motor directly to the reciprocating shaft 8 (Fig. 5).

The research is expected to simplify the design of saw toothing equipment and improve the quality of toothing.

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