CHARACTERISTICS OF THE DESIGN OF DRUM MACHINES FOR GRINDING LEATHER SEMICONS

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Annotation. This study is devoted to the study of the designs of drum machines used for grinding leather semi-finished products and their operational characteristics. Large-scale research work is being carried out in the world to improve the technology of primary processing of products and the development of their scientific foundations. Especially in this direction, increasing the efficiency of grinding drum machines and ensuring their reliability in operation when processing leather semi-finished products is of great importance. Also, a rational justification of the geometric, kinematic, and control parameters of the grinding drum machine contributes to increasing its economic efficiency and ensuring its preservation.

Keywords. grinding machine, grinding paper, abrasive material, dust removal, abrasive treatment, grinding drum, aspiration device, ferromagnetic abrasive powder, electromagnetic inductor, brush conveyor

Annotatsiya. Ushbu tadqiqot charm yarim mahsulotlarini maydalash uchun qo‘llaniladigan barabanli mashinalarning konstruksiyalari va ularning ekspluatatsion xususiyatlarini o‘rganishga bag‘ishlangan. Jahonda mahsulotlarga dastlabki ishlov berish texnologiyasini takomillashtirish va ularning ilmiy asoslarini ishlab chiqish bo‘yicha keng qamrovli ilmiy-tadqiqot ishlari olib borilmoqda. Ayniqsa, bu yo‘nalishda charm yarim mahsulotlariga ishlov berishda barabanli maydalash mashinalarining samaradorligini oshirish va ularning ishlashdagi ishonchliligini ta’minlash muhim ahamiyat kasb etadi. Shuningdek, maydalash barabanli dastgohining geometrik, kinematik va boshqarish parametrlarini ratsional asoslash uning iqtisodiy samaradorligini oshirish va saqlanishini ta’minlashga xizmat qiladi.

Kalit so‘zlar. jilvirlash mashinasi, jilvirlash qog‘ozi, abraziv material, changsizlantirish, abraziv ishlov berish, jilvirlash barabani, aspiratsiya qurilmasi, ferromagnit abraziv kukuni, elektromagnit induktor, cho‘tkali konveyer.

Аннотация. Данное исследование посвящено изучению конструкций барабанных машин, используемых для измельчения кожевенных полуфабрикатов, и их эксплуатационных характеристик. В мире ведутся широкомасштабные научно-исследовательские работы по совершенствованию технологии первичной обработки продукции и разработке ее научных основ. Особенно в этом направлении повышение

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эффективности барабанных шлифовальных машин и обеспечение их надежности в эксплуатации при обработке кожевенных полуфабрикатов имеет большое значение. Также рациональное обоснование геометрических, кинематических и управляющих параметров измельчающего барабанного станка способствует повышению его экономической эффективности и обеспечению сохранности.

Ключевые слова. шлифовальная машина, шлифовальная бумага, абразивный материал, удаление пыли, абразивная обработка, шлифовальный барабан, аспирационное устройство, ферромагнитный абразивный порошок, электромагнитный индуктор, щетковый конвейер

Introduction.

Grinding is one of the most complex mechanical finishing operations. It consists of removing the shell layer from the face or back using fine-grained abrasive material. Depending on the purpose of the operation, the method of its implementation is determined. The face side is polished to eliminate large surface defects in small areas of the skin or to remove the entire surface, which is required when developing modified skins. The intensity of raw material grinding has a great influence on the quality of the leather and its appearance. Rear grinding of the raw material is carried out to smooth its thickness and give the surface a silky softness. In the leather industry, there are a number of scientific and technical sources on the grinding process. These studies provide detailed information on the effectiveness of grinding technology, its methods, and the equipment used. Today, the leather semi-finished products industry plays an important role in increasing the efficiency of production processes and improving product quality. In this area, there are many technological processes, among which grinding drum machines are of primary importance. Grinding drum machines are one of the main equipment used in the production of leather semi-finished products, which play a crucial role in improving product quality and accelerating the production process [1-4].

Grinding drum machines act as a mechanical device that rotates or vibrates the product. They perform cleaning, mixing, packaging, or other processes by rotating the product under the influence of various mechanical forces. These technological processes serve as effective tools for product quality control, detection of malfunctions, and automation of the production process [5].

Research Methodology

He conducted research on the production of drum machines for grinding raw materials and the improvement of grinding machines.

In particular, the leather grinding and dust removal machine, developed by D.R. Amirkhanov and V.N. Maltsev, is a device used in the leather industry and is

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designed for high-quality processing, grinding, and dust removal of leather products. This machine is intended for the mechanical processing of leather semi-finished products and artificial hides [6].

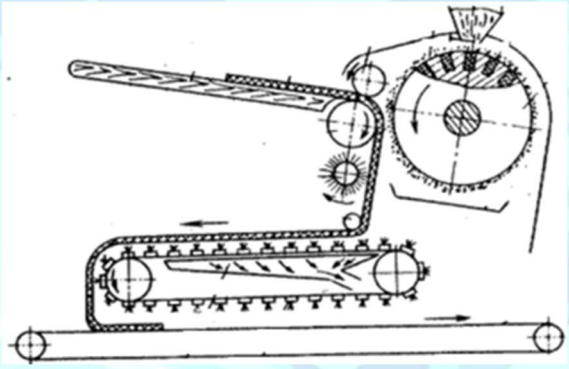


Figure 1. Schematic view of a leather grinding and dust cleaning machine

This machine is a leather grinding and dust cleaning machine, the working part of which is a drum covered with sandpaper, cardboard, or diamond particles.

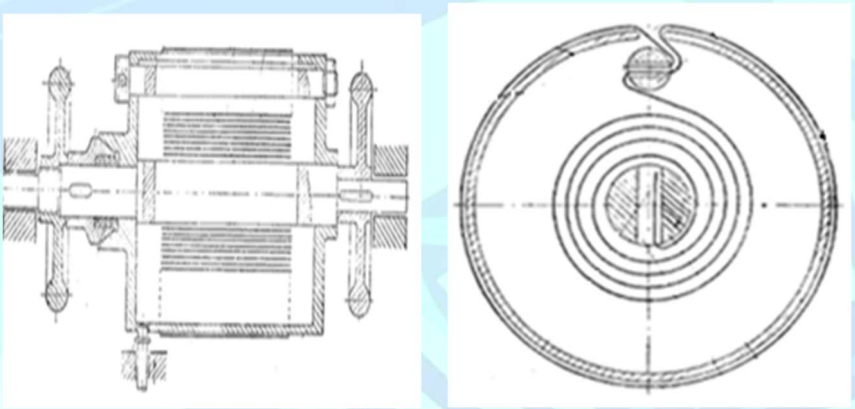
There is a sanding and leather dust removal machine, a leather conveyor, a sanding drum, and an aspiration device for removing dust from the leather surface, which has the following features: in order to increase the workload and improve the quality of processing, it is equipped with a device for holding ferromagnetic abrasive powder on the surface of the sanding drum, the dust removal device from the leather surface includes a brush conveyor, and the aspiration device is located between its branches [7].

There is also a device for grinding non-magnetic materials, which consists of two carriers, an inductor, and a ferromagnetic abrasive powder bath. The object material (sheet, tape) is passed between the inductor and the valve, and the periodic ignition of the electromagnet at a specified frequency leads to the powder rising from the bottom of the valve and touching the processed surface, carrying out the grinding process.

The disadvantage of the existing designs of machines is the impossibility of high-quality processing of the peripheral parts due to the stiffness of the grinding drum and the imbalance of the thickness of the skins over the entire area. In addition, the grinding drum heats up quickly and breaks down. Securing the cutting tool to the drum and removing dust from the skin surface presents certain difficulties.

P.P.Burakov and V.I.Krasnopolsky were scientists and engineers who made a great contribution to the technology of shoe production. Their work was mainly aimed at optimizing processing processes in the footwear industry, increasing their efficiency, and developing new methods [8].

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a) b)

Figure 2. Schematic view of the machine for grinding the lower parts of footwear: a - cross-section of the working drum; b - longitudinal surface of the working drum

This is a machine for grinding the lower parts of shoes, which has a hollow drum equipped with sandpaper. The machine provides the possibility of significantly reducing the consumption of sandpaper compared to existing similar machines.

A distinctive feature of the machine is that the drum is installed on the control shaft with the possibility of free rotation, in which there is a longitudinal clearance for placing one end of the sandpaper. The drum is also equipped with a longitudinal slot, under which, in the inner part of the drum, in the holes in its side walls, another roller is installed. On this roller, there is a longitudinal crack for fastening the second end of the sandpaper. The sandpaper is placed inside the drum, wrapped in a roll, and covers the outer circular surface of the drum. A coupling is installed on the control shaft to rotate the drum, which connects the shaft to the drum. For winding sandpaper on the shaft, the clutch is equipped with a flywheel firmly mounted on the control shaft when the clutch is in an open position. The drum has a special hole (groove) to keep the drum stationary while winding the sandpaper on the shaft [9].

This machine, developed by V.N. Maltsev and A.N. Lebedev, is mainly designed for sanding artificial skins and cleaning the dust from them. The machine's design ensures high-quality grinding of materials, but also includes cleaning the material after the grinding process [10].

The leather grinding machine, consisting of a grinding drum, a supporting device, and a brush, has the following features: in order to improve grinding quality and ensure constant hardness in the grinding zone, the supporting device consists of a housing with a base made of elastic material, the end of which, facing the grinding drum, is made in the form of an arc, and there is a screw for holding and adjusting the base [11].

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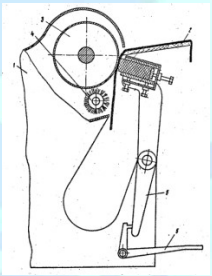


Figure 3. Schematic view of the skin grinding and dust removal machine 1-leather grinding machine, 2-table, 3-drum, 4-brush, 5-pedal

The machine's operation process is carried out as follows. The input device from the table into the leather processing zone is transmitted in a limited state. When the pedal is pressed, the support device presses the leather onto the grinding drum, smooths it, and simultaneously delivers it through the conveyor at a speed depending on the pressure force [12].

Result and discussion

When cleaning leather, grinding is performed several times, first with coarse-grained material, then with fine-grained material. The intensity of grinding depends on the elastic-plastic properties of the shell, i.e., its moisture content, the size of the abrasive grains, and the pressure of the grinding roller. The structural elements of the surface being polished (fibers and their bundles) must have a certain hardness, and the fiber network must also be elastic. If the shell being polished is too plastic, the micro-cutters will not cause separation, but will cause their displacement and mutual friction. In this case, the energy generated by friction is converted into heat, and the shell heats up. The degree of grinding directly affects the quality of the leather. Thus, if 3-4% of the leather mass is polished, its quality level after preparation will be in the range of 76-78% (first grade). If the mass of the leather semi-finished product obtained during the grinding process reaches 13-15%, the leather quality level increases by 88-89%. However, this issue cannot be considered from only one side, since very deep grinding does not contribute to the elimination of deep defects in the surface layer. As a result, the leather takes on the appearance of a spool (the middle part of the entire leather), and all the difficulties that arise in the preparation of spool leather used for topwear, i.e., excessive roughness, arise. This creates additional difficulties in processing the leather surface.

Excessively deep grinding (production of cleaned skins during the surface grinding process), resulting in the shell appearing similar to spilok skin, as the maximum permissible grinding depth is violated. Holes in the surface layer open, increasing the absorption capacity of the coating. After this, the finish on the finished skins will not be uneven and smooth;

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Insufficient deep grinding (production of cleaned hides during the surface grinding process), as a result of which the surface layer of the coating is uneven and not all defects are removed. In this case, the finished leather is usually poorly covered, and most of the natural defects are noticeable. In addition, such skins have a low viscosity of the coating;

Uneven grinding of the surface layer leads to the appearance of the defects described above on the surface of the coating. In addition, repeated unprocessed areas may appear in the form of cuts and unrefined areas. This increases unevenness and defects on the skin surface, which negatively affects the quality.

As a result of the study and analysis, existing designs of drum machines for grinding leather raw materials were studied. Based on the analysis, an improved design of a leather grinding machine is proposed (Fig. 4).

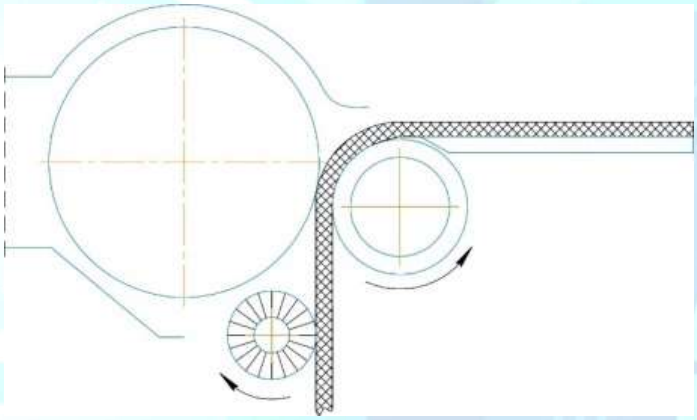


Figure 4. Skin Grinding Machine

This scheme is a leather grinding drum machine, in which the main working elements are a large drum, an auxiliary roller, a brush, and pressure mechanisms. The advantages of this machine are as follows: As a result of the uniform application of pressure with the help of a drum and roller, the quality of skin smoothing improves. Thanks to rotational movement, constant and uniform processing is ensured, which increases efficiency. During processing, it allows for proper smoothing of the skin without disrupting its structure. Such schemes can be adapted to automated systems, which reduces the human factor and increases productivity. The drum mechanism creates the possibility of continuous processing and serves to increase production volumes. By adjusting the pressure, it is possible to process leather of different density and thickness.

Conclusion. Using available analogues, instead of the helical strips of the working shaft (drum), grinding inserts (flippers) are placed symmetrically from the middle of the shaft along the right and left ends along the screw and secured using special glue and under a certain pressure.

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Thus, in the technological process of grinding the surface of leather raw materials, an increase in the useful area and quality indicators of the product is achieved.

The manufacture of the working grinding drum, developed on the basis of the proposed technical solution, is relatively easy, and replacing grinding (abrasive) paper that wears out during the technological processes performed does not require much labor and time.

The improved working sanding roller machine, developed on the basis of such a technical solution, has a number of advantages in terms of economic efficiency and serves the production of export-oriented finished leather products with high added value in the leather industry of the republic.

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