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D. BEZBORODKO ET AL
COMBINED MACHINE FOR SURFACE GRINDING AND POLISHING GLASS AND OTHER MATERIALS

Filed May 27, 1941

Serial No. 395,384

8 Sheets-Sheet 1

Fig. 1

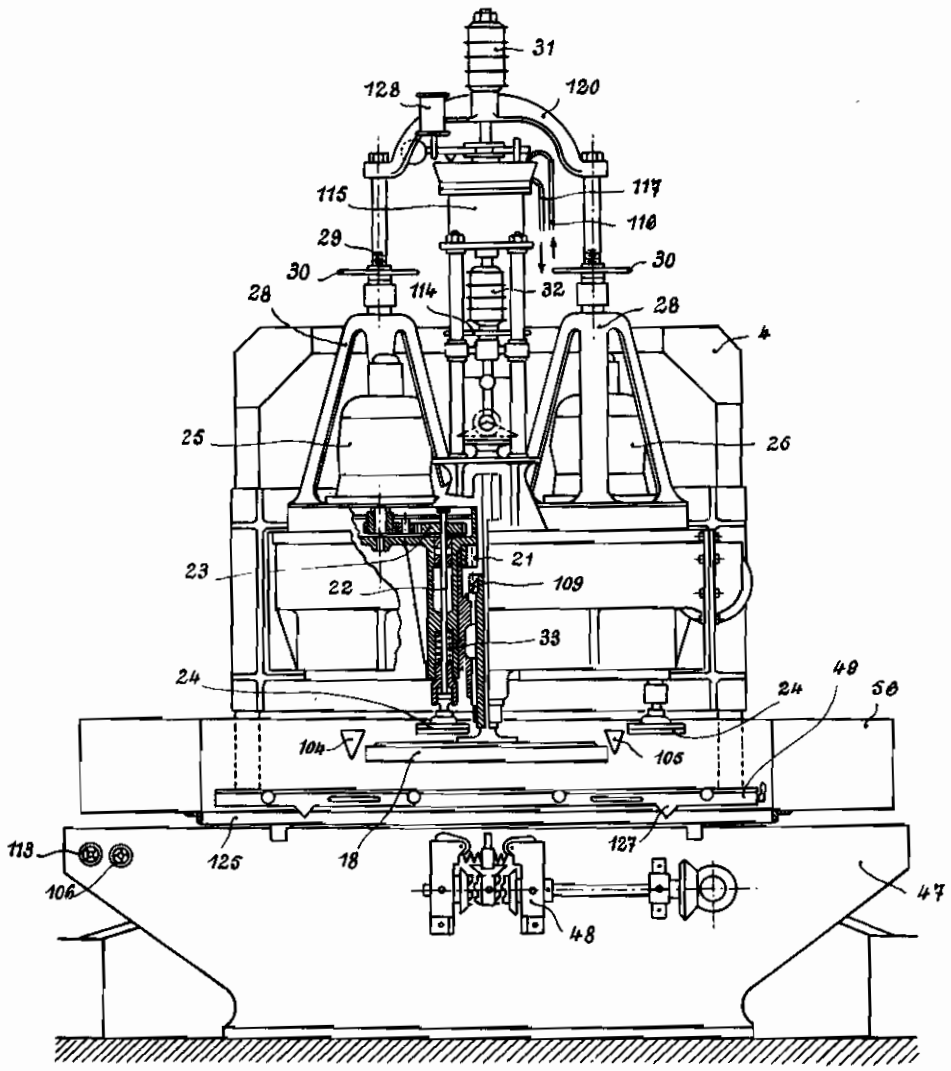

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Fig. 2

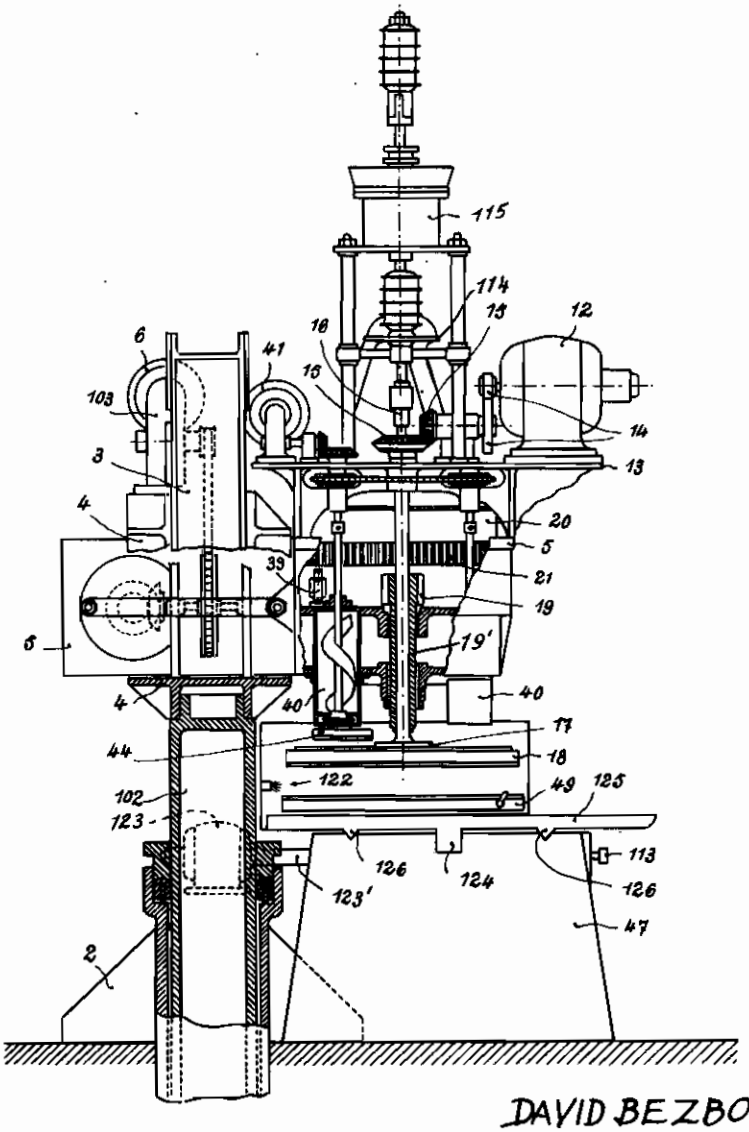

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Fig. 3

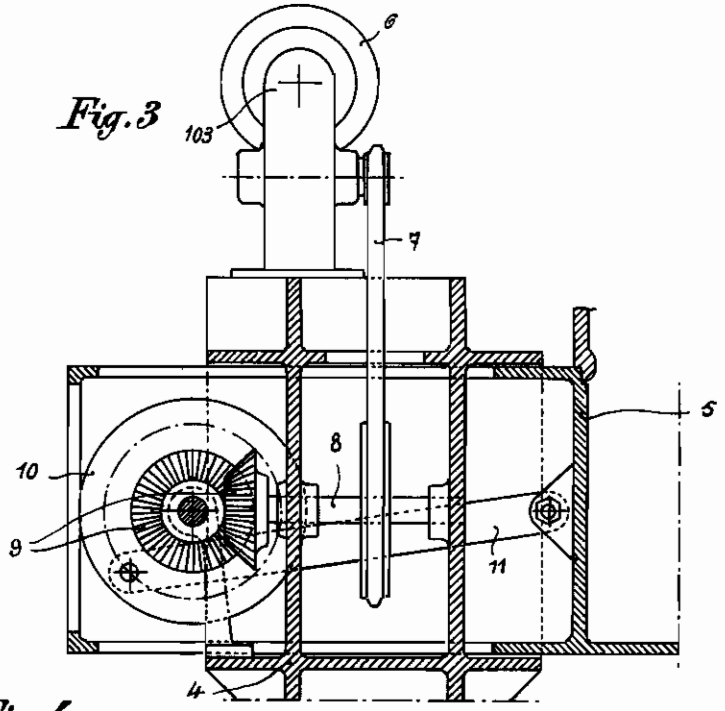

Fig. 4

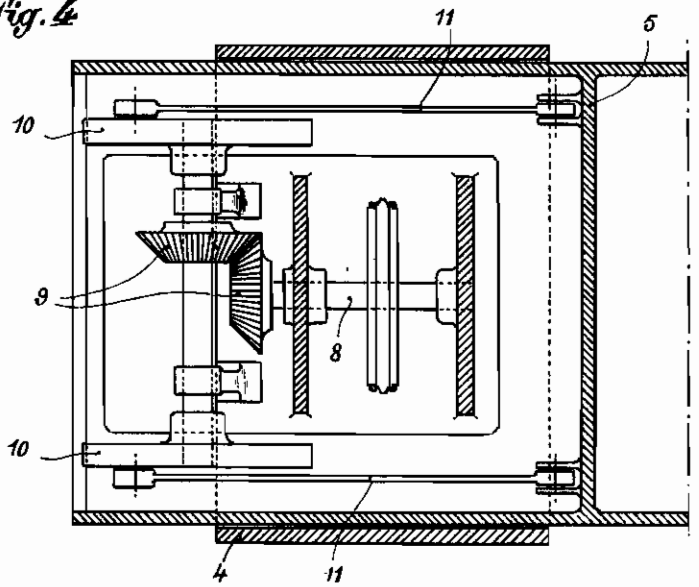

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Fig. 5

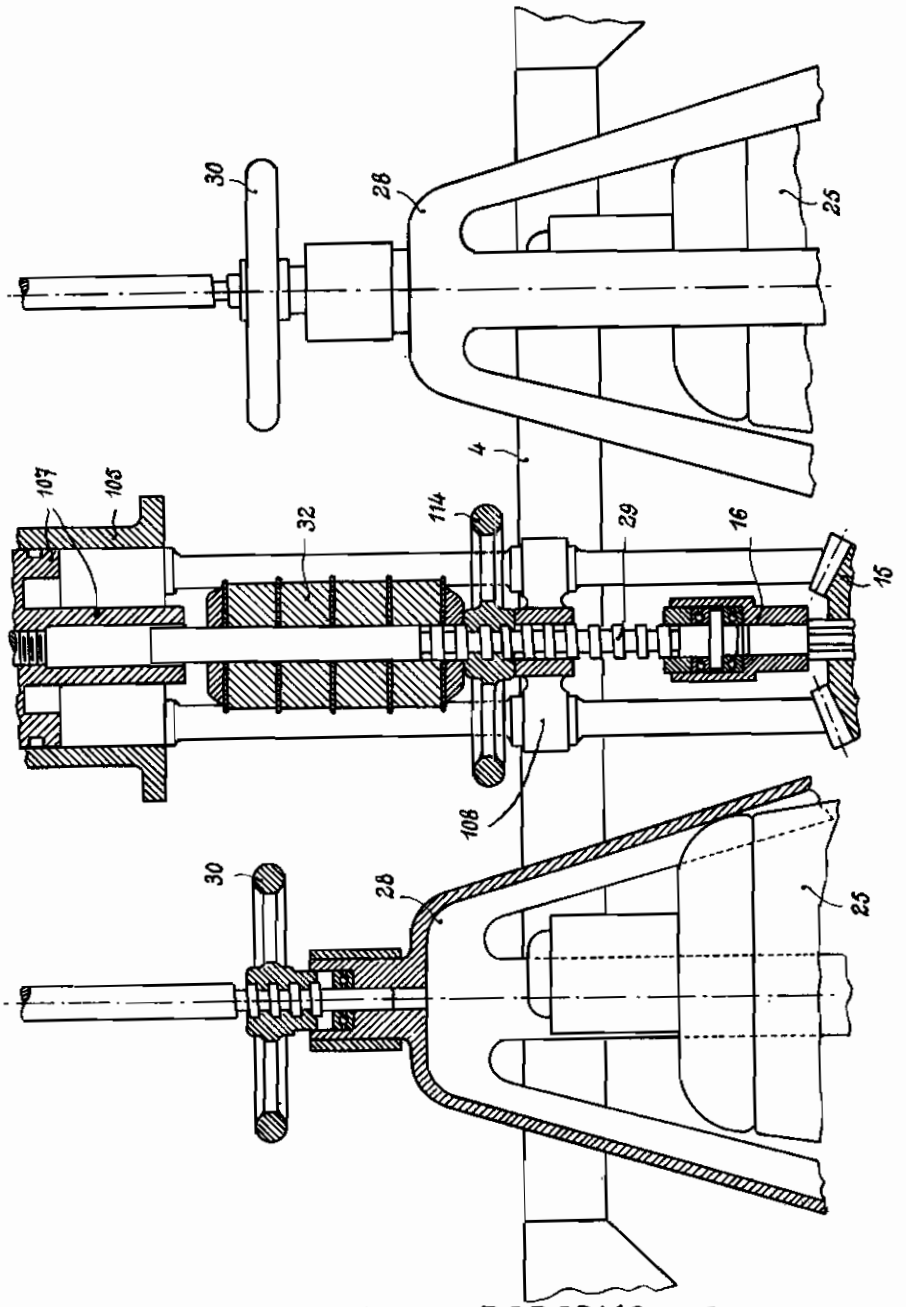

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Fig. 6

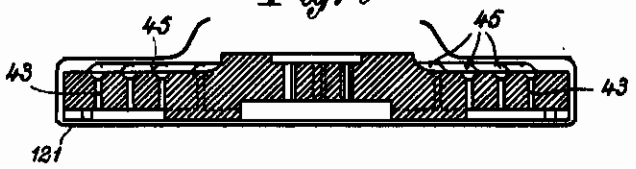


Fig. 7

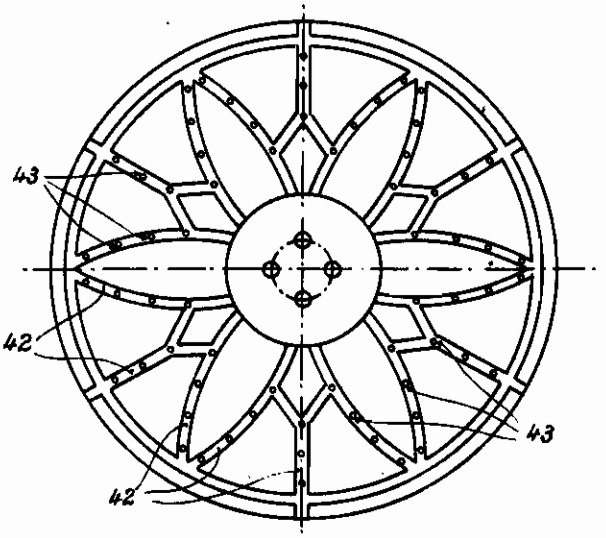
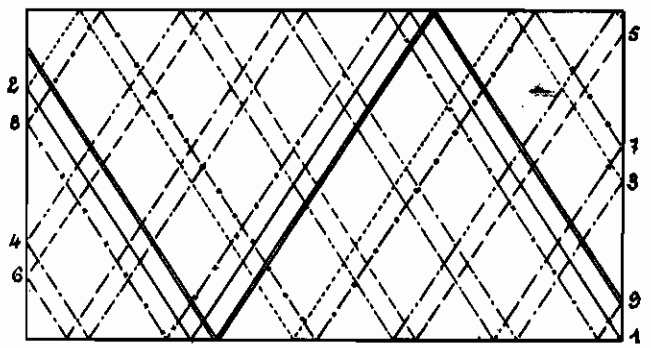


Fig. 8



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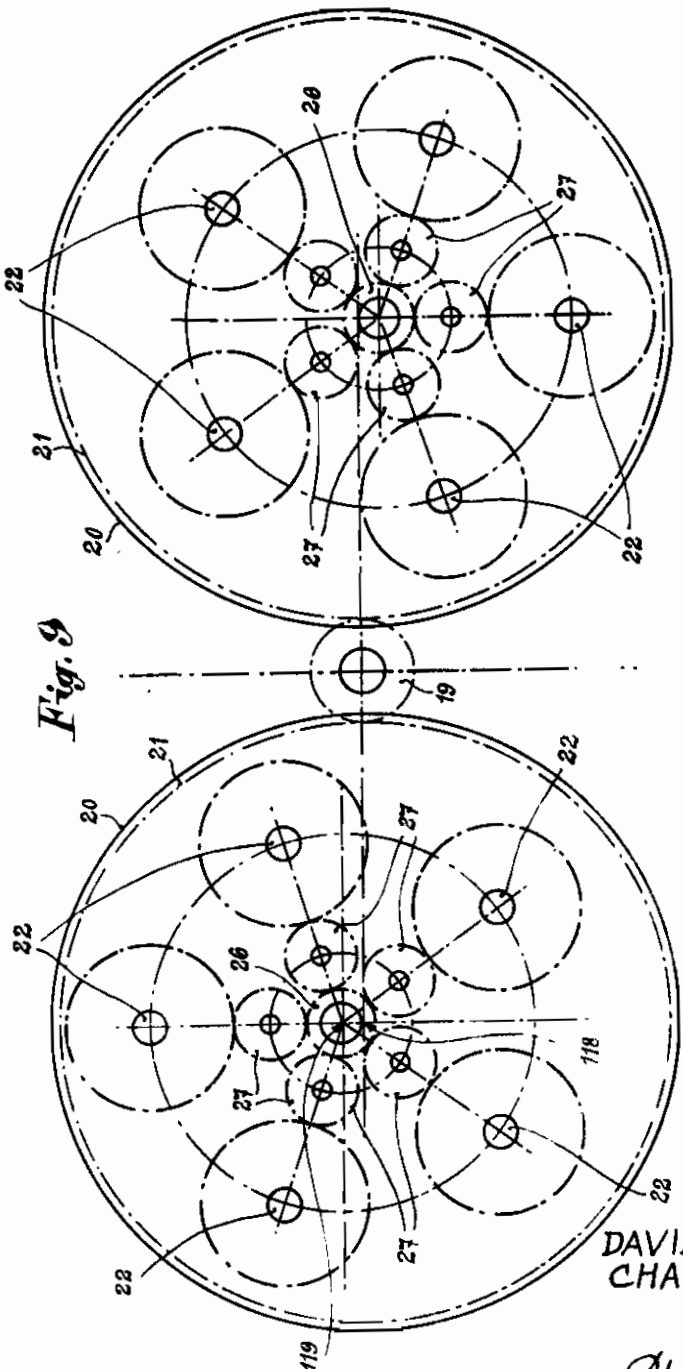

Fig. 9

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Fig. 10

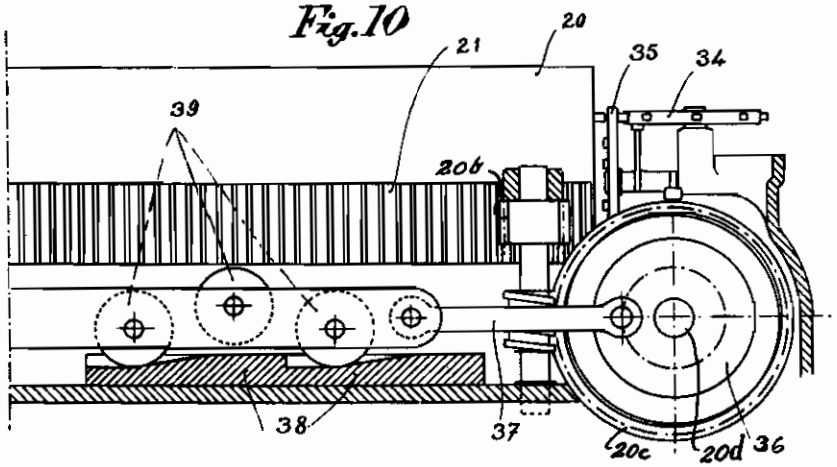

Fig. 11

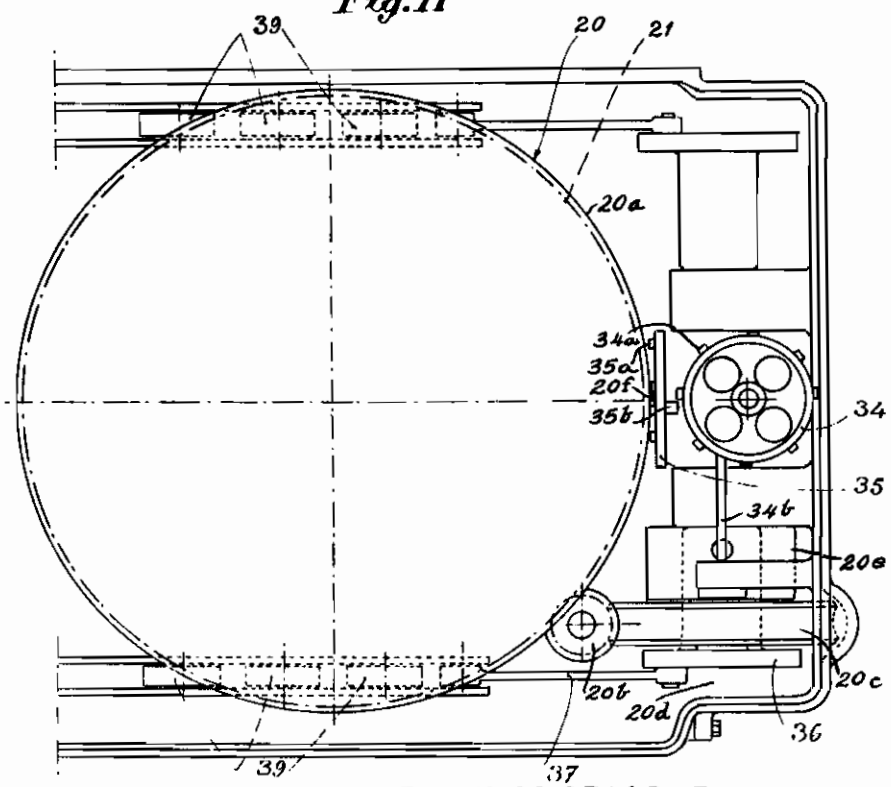

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Fig. 12

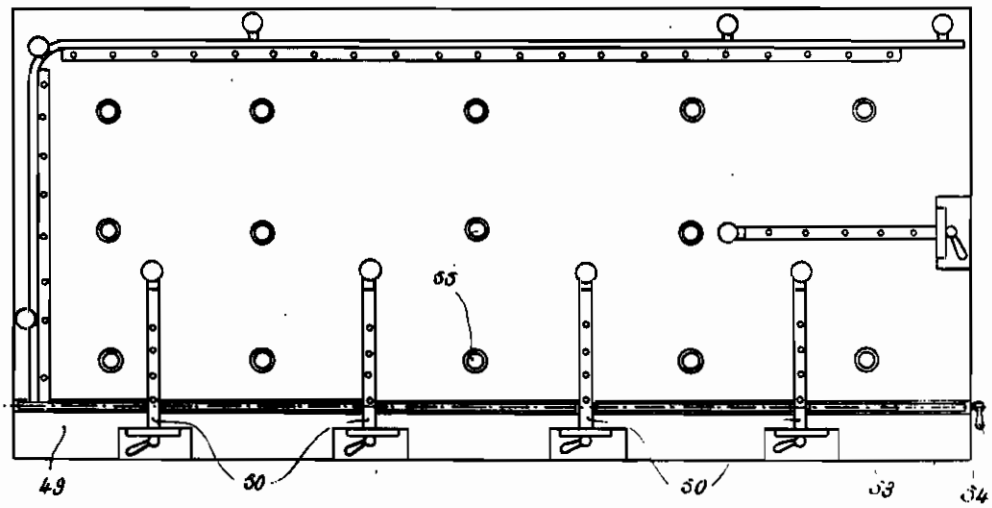


Fig. 13

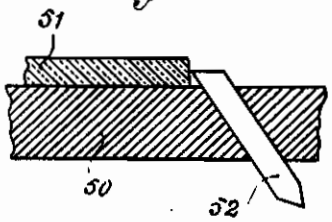
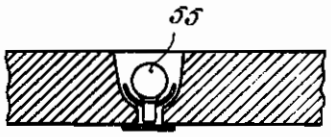


Fig. 14



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ALIEN PROPERTY CUSTODIAN

COMBINED MACHINE FOR SURFACE GRINDING AND POLISHING GLASS AND OTHER MATERIALS

David Bezborodko and Charles Zucker, Nice, France; vested in the Alien Property Custodian

Application filed May 27, 1941

The surface grinding or straightening treatment of the glass, the object of which is to remove all the waves or other inequalities on the surface of the glass, is realized by removing on both faces of the glass plate a thickness which was previously valued in a very approximative manner. By making use of this method, a too thick glass layer is removed, sometimes without any necessity, because the operator is forced to start from a very considerable depth. Abrasive materials of decreasing sizes must then be used and severe precautions must be taken during the various operations. Two surface grinding processes are currently used. According to one the square glasses are treated on round tables, however this treatment brings about a loss of 20 to 40% of materials and a great consumption of electricity, because of the particular construction of these tables. The wedging as well as the loosing of the glass on the table equally necessitate much labour.

The second process said continuous process saves some of the driving power and a great deal of labour. However, in spite of the fact that a great quantity of material is removed when the second process is applied to the laminated or drawn out glass, it is impossible to suppress, in any case, the waves which are of quite unlike depths and practically immensurable, because this process excludes any possibility of controlling the worker during the work. In this way, the defects can be seen only after the finishing, and for this reason this manufacture system gives but very little of silver-plattable glass. It is chiefly used for carriage-glass plates. Another drawback of this process is given by its very expensive installation, because it keeps still thousands of tons of cast-iron and a very important labour for its treating. Its use is justified only when the production is very great and it cannot be used in countries consummating small quantities of plane glass.

The combined machine for surface grinding or straightening the glass constituting the object of this invention performs, in an ordered manner, all the motions executed by a hand-polisher by routine. It eliminates all the drawbacks mentioned above and may eventually be used for the treatment of other materials such as marble, metals, wood and other materials. It offers the advantage of lowering the cost-price of the surface grinding or straightening treatment of glasses and may be applied even without abrasive materials by using natural or artificial grindstones. Owing to the new process the installation costs of a plate glass factory are greatly lowered.

With this machine it is possible to realize the surface grinding and polishing at once.

It is essentially characterized by the fact that it comprises the following elements taken together or separately:

(*a*) A device supporting a moveable frame vertically and means controlling this displacing such as a hydraulic piston, the said frame supporting the surface grinding and polishing organs for the glass.

(*b*) a surface grinding device supported by a frame effectuating a transversal to-and-fro horizontal motion and bearing only one planing wheel fixed in the centre of the said frame and receiving a rotation motion from a motor, this planing wheel regularly fed with abrasive matter rubbing on the glass plate fixed beneath, on a table describing a to-and-fro longitudinal motion, with a pressure depending on its own weight, the supplement of supple pressure being obtained by the compression of rubber rounds by the aid of a device comprising a hydraulic piston or any other implement.

(c) a polishing device comprising two or more groups of polishing wheels supported by the same frame describing a horizontal motion that bears the surface grinding device, these wheels rubbing on the glass plate with a graduated and supple pressure which may be regulated by the more or less great compression of rubber rounds. These wheels, in combination with the glass plate moving longitudinally with its support, describe six various motions forming a mosaic, and being raised periodically for the airing of the felt disks and the feeding in putty or abrasive mixture taking place during the ascending period, these devices secure a more rational feeding and reduce the material losses.

This invention also refers to a certain number of accessory devices to be used more particularly but not exclusively with this machine.

Thus, this combined machine for surface grinding and polishing may be used with a table supporting the glass, the to-and-fro motion of which is controlled, without a dead point, by the aid of a known device, said table comprising two parts the one of which having its longitudinal displacing controlled during the work by the aid of an individual motor or not, the other part directly supporting the glass being provided with stops for the mechanical fixation of the glass and drawing parts to displace it transversally outside the work; a cam fixed in the thickness of the table

on the whole of its length secure the instantaneous removal of the glass, even the finest one, without any risk of breaking it and electric lamps coloured if necessary and arranged in the said table enable to control the planing of the glass during the work. Small channels for the recovering of the waste abrasive matter as well as a protecting device surround the table supporting the glass.

With this machine and this table and by making use of any known or unknown device, the planing wheel may be fed with liquid abrasive matter across the disk.

It may also be fed from the exterior and even by the aid of dry abrasive matter distributed automatically by the longitudinal displacing motion of the table. Experience has shown that when working in the indicated manner, it was possible to realize a 20%–25% greater biting on the glass and consequently a corresponding economy in driving power. The formation of small protuberances hindering sometimes the wheel from being in contact with the glass on the whole surface, is thus avoided.

This invention includes, moreover, any other machine for surface grinding and polishing glasses comprising, in totality or in part, the application of similar arrangements.

It will be well understood, in any manner, by the aid of the description given hereafter and the annexed drawing given only by way of example.

Figs. 1 and 2 are elevation views respectively front and side views of the machine, with partial section.

Figs. 3 and 4 are schematical views respectively elevation and plane views of the controlling device of the frame supporting the drums.

Fig. 5, on a greater scale, gives a view of the bells and of the regulating devices for the pressure of the polishing wheels.

Figs. 6 and 7 are views of the polishing wheel respectively in section along the line 6—6 of the Fig. 7 and in plane seen underneath.

Fig. 8 is a scheme of the draught of the displacing having the shape of a mosaic described by a polishing wheel.

Fig. 9 is a schematic view giving the arrangement of the polishing spindles in the drums and their controlling device.

Figs. 10 and 11 are, on a great scale, schematic views respectively in elevation and in plane showing the airing mechanism of the polishing wheels.

Fig. 12 is a schematic view of the table supporting the glass.

Figs. 13 and 14 are, on an enlarged scale, detail views of the stops and the lamps placed in the alvearies of the table supporting the glass.

The machine is arranged on the fixed frame 2 comprising two guiding columns 3 between which a frame 4 may move vertically under the action of a hydraulic piston 102 or of any other suitable device; a frame 5 supporting all the grinding and polishing organs and any other controlling mechanism may move horizontally in the frame 4. The to-and-fro motion of the frame 5 (Figs. 3 and 4) is obtained by the aid of a mechanism supported by the frame 4. It comprises a motor 0 with the reducer 103 which controls, by the aid of the chain 7, a shaft 8 on the extremity of which a couple of angular pinions 9 acts upon two adjustable disk cranks 10 the connecting rods 11 of which impart to the frame 5 a horizontal motion the course of which may be regulated by displacing, on the said disk cranks 10, the oscillation point of the head of the connecting rods.

The frame 5 supports the complete grinding and polishing mechanism which comprises a motor 12 (Fig. 2) arranged on an upper platform 13. This motor acts, by the intermediary of belts or of a couple of cylindrical gears 14 and of a couple of annular pinions 15, a central shaft 16 on the lower extremity of which is fixed a plate 17 supporting the planing wheel 18.

The feeding of this wheel with abrasive matter is realized with the aid of dry abrasive. It is controlled by the motion of the table 49 and comprises, for instance, two funnels 104 and 105 opening alternatively, that on the right when the table travels to the right and that on the left when the table moves to the left; these openings may, moreover, be regulated according to the width of the glass to be worked.

For the surface grinding of the glass, the planing wheel 18 is lowered to its contact by opening the valve 113 which controls the piston 102. Then, with the aid of the nut 114, the upper extremity of the shaft 16 is brought into contact with the piston 107 which is movable in the cylinder 115, its displacing being controlled by the aid of the funnel 106, which open or shut the arrival and the discharge pipes for water under pressure 116 and 117. The going down of the piston 107 compresses the rubber round 32 thus bringing about the desired supple pressure of the wheel 18 on the glass.

The surface grinding of the glass is followed by the polishing which is realised by the same machine. For this purpose the planing wheel 18 is raised and dismounted for its removing. The polishing wheels 24 are then lowered close to the glass.

The central shaft 16 bears in its middle part a pinion 19 having a long bush which serves to drive the polishing mechanism. The latter is comprised in two drums 20 arranged on each side of the central shaft 16 bearing on its upper part a crown wheel 21 brought into gearing with the pinion 19 by raising the central shaft 16 after the planing of the glass.

The drums 20 then perform a rotation motion round their axle 118. In the described machine, each of them comprises five spindles 22; and each spindle bears a vertical pinion 23 on its upper part and a polishing wheel 24 on its lower part. These spindles 22 are arranged at various distances from the axle of the drum 20 (Fig. 2). For the driving of the polishing wheels is arranged on the upper part of each drum 20 a vertical motor 25 the axle 119 of which is eccentric with respect to that of 118 of the drums 20 and which serves to impart, through the suitable gears 26 and 27, a proper rotation to the spindles 22.

The whole of the drum with spindles and polishing wheels and driving motors is rigid connected with a bell 28. A connection through regulating screws 29, regulating fly-wheel 30 and connecting tie 120 is secured between the two bells 28 and a system of supple pressure constituted by an upper group 31 of rubber rounds.

This system completes the action of the springs 33 fixed on each spindle and serving to smooth the shock just as all the spindles come in contact with the glass. It is driven by the aid of a hydraulic piston 107 controlled by a valve fixed in 106 or in any other suitable manner and serves to obtain a graduated supple pressure from the polishing wheels, this pressure being determined in function of the work to be realized.

The airing of the polishing wheels takes place, for instance all the 45 revolutions described by the

drums 20, by raising it. This motion is brought about by the aid of a star system 34 analogous to that of gas-meters which acts upon a cam 35 at regular intervals, this cam bringing about, intermediately a disk crank 36 and connecting rods 37, the displacing on a double slope 38 of two pairs of carriages 39. The drum is thus raised then lowered with the polishing wheels 24.

The pressure of the tools on the glass may also be regulated by the aid of a clockwork which controls the upwards and the downwards motion of the drums and the compression, or by the aid of an electromagnet acting upon the valve 128 of the cylinder 115 of the piston 107 for shutting it after the going down of the drums in order to compress the rubber rounds and to open it to discompress them before their upwards motion.

The rational feeding of the wheels of each drum is effected with grinding putty mixed by two mixers 40 arranged in the frame. The mixers are brought into motion, in a continuous manner, by the aid of a motor 41 arranged on the upper part of the frame 5, intermediately suitable transmissions. At their lower part is arranged a stop-valve 44 alternately opening and shutting their evacuation orifices at the lower part of each mixer. It is controlled by the ascending and descending mechanism of the polishing wheels in order to cause to fall on the glass, at each ascension of the wheel, the necessary layer of very diluted virgin putty. The mixer is heated electrically in order that the matter to be polished may be brought at a temperature sufficient to hinder the breaking of the glass during the feeding.

In order to secure its feeding with liquid, the planing wheel (Figs. 6 and 7) is provided, at the lower part, with a certain number of grooves 42 uniformly distributed under it as shown on the Fig. 6 and in the bottom of which are bored holes 43 emerging above the said wheel.

Pieces 45 forming borders to hinder the projection outside of the liquid brought in any suitable manner are fixed on the upper part of the wheel.

The polishing is carried out mechanically by the combination of six various motions:

1. A longitudinal motion of the table supporting the glass.

2. A transversal motion of the frame supporting the drums.

3. A rotary motion of the drum supporting the wheels.

4. A rotary motion of each polishing wheel.

5. An eccentric rotation motion of the whole of the groups each of these comprising five wheels.

6. The airing motion by going up and going down of the drums.

All these motions cause a displacing of each of the polishing wheels so that the whole constitutes a mosaic.

Fig. 8 gives a theoretical outline, in form of a mosaic, of nine runs of the polishing wheel, the order of these runs being appointed by the aid of the figures represented on this scheme.

This outline results from the combination of the longitudinal displacing motion of the table supporting the glass, on the one hand, and of the transversal displacing of the frame supporting the polishing tools, on the other hand.

In order to hinder the abrasive matter in the grooves of the planing wheel from falling upon the table 125, when the glass is changed, a cover 46 (Fig. 6) is then placed on these wheels.

The table supporting the glass given in detail by Fig. 12 is arranged on a base 47 (Figs. 1 and 2) comprising a to-and-fro device, without a dead point, of a known model serving for its displacing controlled by the motor 123 by the intermediary of the device for direction changing 48 and the gear drive 124 arranged under the carriage 125 guided in its longitudinal displacing by the slide 126.

The plate 49 provided with a system of sliding bars 50 is placed on the carriage 125, the tightening of the glasses being realized mechanically by the aid of stops 52 foreseen in the sliding bars 50 (Figs. 12 and 13).

The plate 49 is movable in the slide 127 perpendicularly to the carriage 125.

The border of the table as well as the under part are surrounded by grooves receiving the projected water and securing the removal of the waste abrasive matter.

A cam fixed in a groove 53 (Fig. 12) running along the whole length of the table is foreseen for the instantaneous loosening of the glass without any risk of breaking it even if it be very fine. This cam is controlled by the aid of a hand-lever 54 arranged on the side.

Electric lamps 55 (Figs. 12 and 14) are fixed in the table supporting the glass and serve to control the planing of the glass during the work.

At last, a protecting device 56 (Fig. 1) surrounding the table contributes to the recovering of the abrasive matter, prevents the accidents and protects the mechanical organs of the machine, and enables the workman to work without getting dirty.

Brushes such as 122 for the cleaning of the felt disks may be foreseen in certain parts of the frame.

It is clear that the invention is nowise limited by the example given above nor by the various parts described, but comprises, on the contrary, all possible variants. The planing and the polishing in particulars, may be realized on two distinct machines in which application is made of the arrangements given above. This execution manner may present some advantages in the more important installations where considerable quantities of glass are to be polished.

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