Oct. 24, 1933. P. J. M. ESCOLE 1,932,305

SURFACING APPARATUS

Original Filed June 10, 1932 2 Sheets-Sheet 1

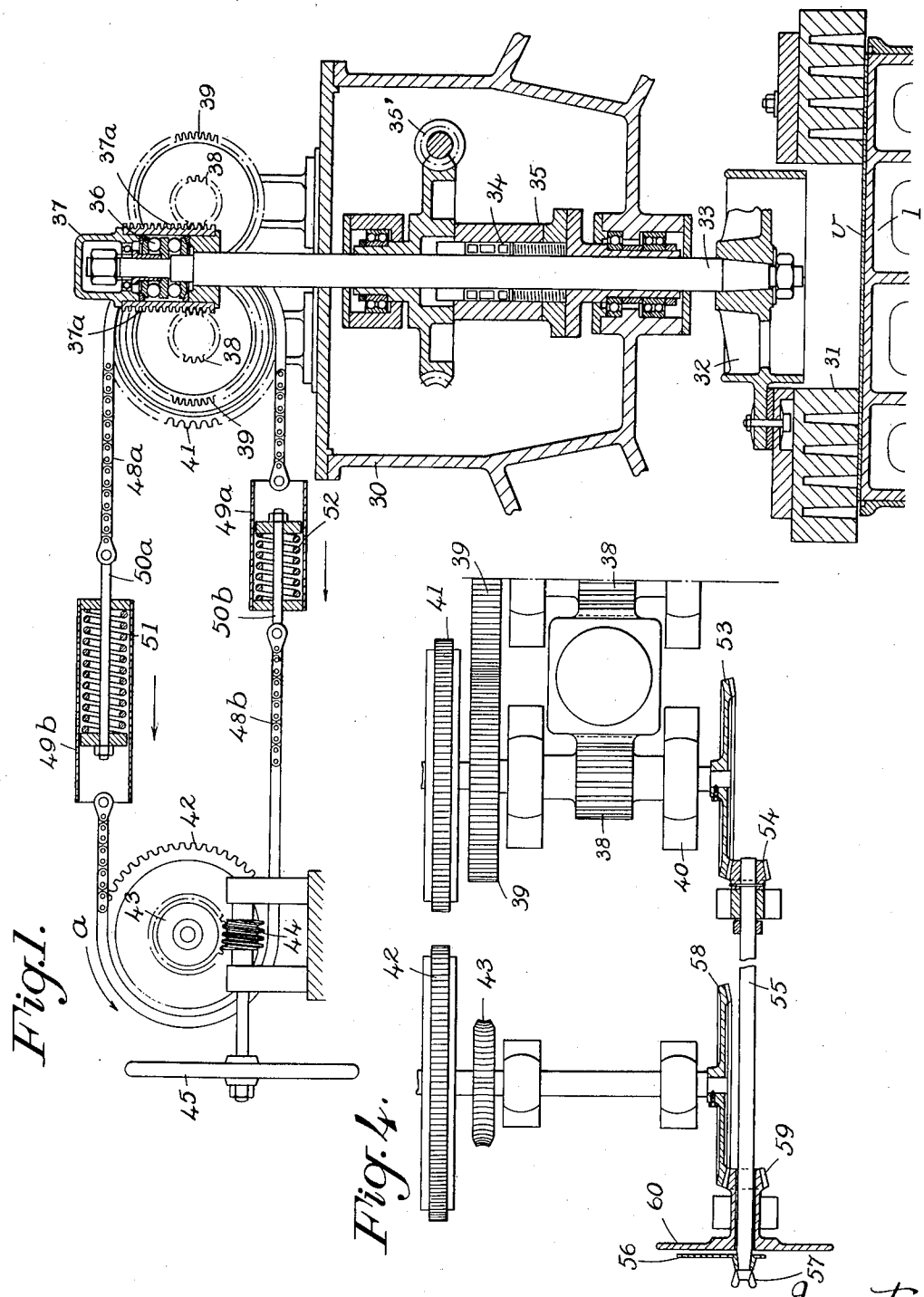


Fig. 1.

Fig. 4.

Inventor:-
Paul J. M. Escole,
By:- Smith, Michael & Gardiner,
Attorneys.

Oct. 24, 1933. P. J. M. ESCOLE 1,932,305

SURFACING APPARATUS

Original Filed June 10, 1932 2 Sheets-Sheet 2

Fig. 2.

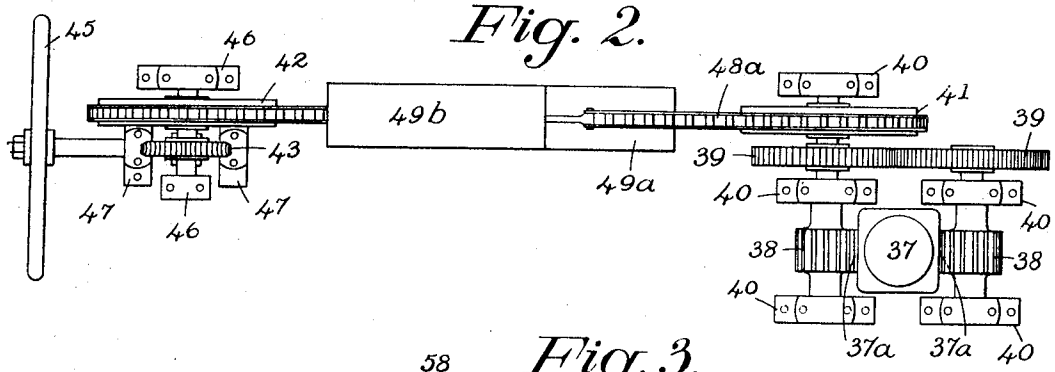
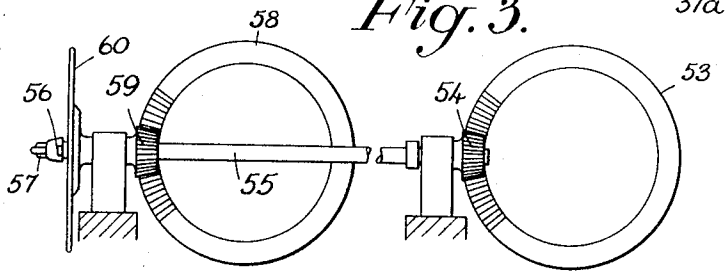


Fig. 3.



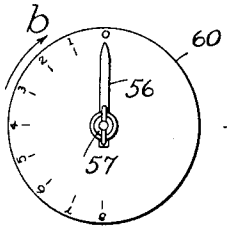


Fig. 5.

Fig. 6.

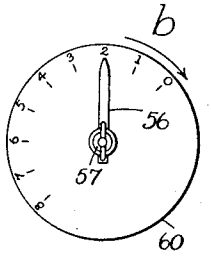
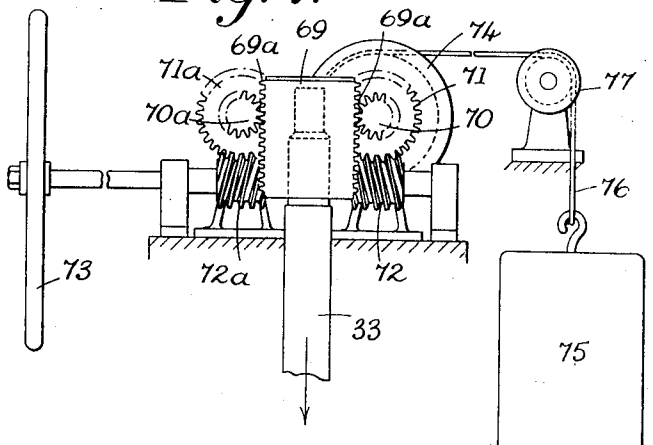


Fig. 7.



Inventor:-
Paul J. M. Escole,
By:- Smith, Michael & Gardiner,
Attorneys.

Patented Oct. 24, 1933 1,932,305

UNITED STATES PATENT OFFICE

1,932,305

SURFACING APPARATUS

Paul Joseph Maximilien Escole, Jeumont, France, assignor to Forges & Ateliers De Constructions Electriques De Jeumont, Paris, France, a joint-stock company of France

Original application June 10, 1932, Serial No. 616,560, and in France February 3, 1932. Divided and this application March 8, 1933. Serial No. 660,067

4 Claims. (Cl. 51—109)

This invention relates to surfacing apparatus for smoothing, grinding and polishing glass and analogous materials by the continuous method, in which the sheets of glass, plate-glass, marble or the like material to be worked to a plane surface are led by conveyors giving them uninterrupted support, beneath the smoothing, grinding and polishing tools which perform their respective operations continuously.

The present invention (which forms a division of my pending application Serial No. 616,560, filed June 10, 1932) has for its main object to provide for raising and lowering the rotary surfacing tools in order to bring them into contact with the material to be worked or to withdraw them from it, and for regulating the pressure with which the tools are forced against the material to be worked and for compensating the loss of pressure resulting from the wearing of the tools. The parts transmitting the forces necessary for the raising or for the pressing of the tools against the material are arranged in such a way that these forces are directed along the axis of the shaft carrying the rotary tools; this arrangement has the advantage of suppressing any tangential forces which might cause friction of the shaft in its bearings and thus allowing greater accuracy in the measurement of the vertical load pressing the tool down upon the material.

The invention is hereafter described with reference to the accompanying drawings, in which:—

Figure 1 represents an elevation, partly in section, of one embodiment of my improved device for lifting and pressing a rotary surfacing tool upon the material to be worked.

Figure 2 is a corresponding plan view.

Figures 3 and 4 are detail views respectively in elevation and in plan, showing the lifting and pressing device provided with an indicator.

Figures 5 and 6 illustrate two different positions of the indicator dial as seen from the front.

Figure 7 represents a detail modification of the lifting and pressing device, more especially suitable for a polishing tool.

The surfacing tools may consist of rotary grinders, smoothers, polishers or the like, according to the nature of the operations to be performed upon the glass sheets or other material to be worked.

In Figure 1, the support 30 carries a rotary grinding head 31 consisting of a carefully levelled block of cast iron, for example, bolted to the rim of a grinding disc, is fixed to a spider 32 fast upon a vertical shaft 33. The shaft 33 can slide axially in a guide 35 driven by known means, such as worm gearing 35′, spur or bevel wheels, sprocket wheels or the like. The shaft 33 is made fast with the guide 35 in its movement of rotation by means of keys, feathers, driving rollers or the like, indicated at 34.

The upper end of the shaft 33 is provided with a ball or roller thrust bearing 36 supported in a thrust box 37, provided on its opposite sides with two racks 37*a*. Pinions 38 fast with gear wheels 39 mesh with the racks 37*a*, the shafts of the pinions 38 and of the gear wheels 39 being supported by bearings 40 (Figure 2), preferably of the ball or roller type in order to reduce the friction of the mechanism.

A sprocket wheel 41 is fixed upon the shaft of one of the pinions 38; another sprocket wheel 42 of equal size and mounted in the same plane as the sprocket 41, is fast with a worm wheel 43 which can be turned by the rotation of a worm 44 (Figure 1) by means of a hand wheel 45. The shaft carrying the wheels 42 and 43 revolves in bearings 46 (Figure 2), while that of the worm 44 revolves in bearings 47.

The sprocket wheels 41 and 42 are connected by means of two lengths of chain 48*a* and 48*b*, fixed respectively at their opposite extremities to cylinders 49*a* and 49*b* and to rods 50*a* and 50*b*. Compression springs 51 and 52 are arranged in the interior of the cylinders 49*a* and 49*b* and around the rods 50*a* and 50*b*, which are terminated by piston discs and lock nuts allowing of compressing the said springs 51 and 52, these springs being preferably of equal flexibility or rate of compression.

The operation of the lifting and pressing device for the rotary surfacing tool is as follows:—

The grinding head 31 rests upon the sheet or plate of glass *v* to be worked, supported by the conveyor table 1. The total pressure of the grinding tool upon the glass is equal to the weight of the head 31, spider 32, shaft 33 and connected parts 36, 37, etc., increased by the thrust arising from the action of the spring 52 which is under compression. The lengths of chain 48*a* and 48*b*, cylinders 49*a* and 49*b*, rods 50*a* and 50*b* and springs 51 and 52 may be such that only one of the two springs can be compressed at a time or such that both can be brought under compression at the same time.

In order to effect the lifting of the grinding head 31, the hand wheel 45 is turned in a suitable direction for the wheel 42 operated by the wheel 43 and worm 44 to revolve in the direc-

tion of the arrow *a* (Figure 1), causing the spring 52 to relax. When the spring is entirely freed from compression, the total pressure exerted by the grinding head 31 upon the glass *v* is diminished and is now equal only to the weight of the various parts 31, 32, 33, 36, 37 etc. fast to the grinding head 31.

By continuing the movement of rotation of the wheel 42 in the direction of the arrow *a*, the spring 51 will be compressed. The upper end of the chain 48*a* comes under tension and by means of the sprocket wheel 41, gear 39, pinions 38 and racks 37*a*, there is applied to the shaft 33 a force proportional to the compression of the spring 51, acting in the opposite direction to the force due to the weights of the parts 31, 32, 33, 36, 37, etc. The pressure of the grinding head 31 upon the glass *v* diminishes up to the moment when the compression of the spring 51 is sufficiently great to balance the weight of the movable parts 31—37; the pressure upon the glass is then nil. If the movement of rotation of the wheel 42 in the direction of the arrow *a* is continued, the grinding head 31 will be lifted clear above the glass.

By revolving the wheel 42 in the opposite direction to the arrow *a*, there will be brought about the approach of the grinding head 31 to the glass *v* and then a contact without pressure; from this moment onwards, the position of the shaft 33 and of the racks 37*a* as well as the angular position of the pinions 38 will not vary. The continuation of the rotation of the wheel 42 in the direction opposite to the arrow *a* effects the slackening of spring 51. The rotation of the wheel 42 is proportional to the elongation of the spring 51, itself proportional to the loading of the grinder; it follows that the total pressure of the grinding head 31 upon the glass *v* will be proportional to the differential rotation or movement of the wheel 42 in relation to the wheel 41. When the spring 51 has been entirely relaxed, the total pressure of the grinding head 31 upon the glass *v* will be equal to the initial tension of the spring 51, which balanced the weight of the parts 31—37. By continuing the movement of rotation, the gradually increasing pressure of the spring 52 is added to that already obtained. If the springs 51 and 52 have equal rates of flexibility, the variation of loading corresponding to any given angular displacement of the wheel 42 will be constant. Suitable calibration of the springs will enable the operator to determine at any moment the total pressure upon the glass, or even the pressure per unit of surface area.

In order to facilitate the control and the regulation of this pressure, use may be made of the indicating device shown in Figures 3 and 4. Upon the shaft of one of the pinions 38, preferably that fixed to the sprocket 41, there is keyed a bevel wheel 53 meshing with a pinion 54 fast with a spindle 55; at the end of the spindle 55 a pointer 56 is fixed by a nut 57, in such a way that the pointer 56 can be set in any desired position. A bevel wheel 58 fast with the shaft upon which the wheels 42 and 43 are keyed, drives by means of a pinion 59 mounted loose upon the spindle 55, a dial 60 mounted behind the pointer 56. Any rotation of the wheel 42 produces a proportional rotation of the dial 60 in a corresponding direction; similarly any rotation of the wheel 41 produces a proportional rotation of the pointer 56 in the corresponding direction. The dial 60 can therefore be calibrated beforehand, each division corresponding to a given loading, indicating the pressure of the grinding head upon the glass, expressed for example in kilograms per square decimetre; the graduations are shown in Figure 5 at 0, 1, 2, 3, 4, etc.

When the grinding head 31 is lifted clear above the glass *v*, the dial 60 may occupy any position; the pointer 56 is then set in the zero position (nil pressure) and the nut 57 tightened. The lowering of the grinding head 31, as already described, brings about the rotation in the same direction of the wheels 41 and 42, and therefore of the pointer 56 and the dial 60, so that the pointer 56 remains in front of the zero graduation, indicating nil pressure, as seen in Figure 5. As soon as the grinding head 31 makes contact with the glass *v*, the movement of the shaft 33, pinions 38 and pointer 56 is stopped, but the continued rotation of the wheel 42, which causes the grinding head to press against the glass with increasing force or loading, will still rotate the dial 60 in the direction of the arrow *b* (Figure 6); the pressures indicated by the pointer 56 upon the dial 60 will increase in direct proportion to the pressures of the grinding head 31 upon the glass *v*.

If the thickness of the glass varies, the pointer 56 moves to indicate the difference of pressure. The operator in charge of the apparatus can then bring back the pointer 56 to the graduation corresponding to the desired pressure, by turning the hand wheel 45 in the proper direction.

It is evident that the hand operation of the wheel 45 could be replaced by a mechanical drive by electric or other motor operating the worm 44. Likewise the springs 51 and 52 can be of any desired variety or even replaced by pistons subjected to the pressure of a compressible fluid.

The lifting device above described may be provided with a counterweight intended more particularly for the retarded lowering and rapid raising of the polishing head or like tool. As shown in Figure 7, the driving shaft 33 is provided at its upper end with a thrust box 69 of which the outer sides are cut to form racks 69*a*. Two pinions 70 and 70*a* fast with worm wheels 71 and 71*a* mesh with the racks 69*a*; the two worms, 72 on the right and 72*a* on the left, mounted upon a common shaft, but having their screw threads of opposite hand, can be set in motion by means of the hand wheel 73. A drum 74, fixed upon the shaft of the pinion 70, is acted upon by a counterweight 75, by means of a flexible connection 76 passing over a jockey pulley 77.

The rotation of the hand wheel 73 in one direction brings about the lifting of the shaft 33 and of its polishing head or like tool, a fraction of the total load being balanced by the counterweight 75; the lifting movement can therefore take place more rapidly by reason of the reduction of the necessary work against gravity. This constitutes an important advantage in practice, the rapid lifting of the polishing head being often necessary in the case of an accident, breakage in the glass, loosening of the latter from its conveyor table, etc.

On the other hand, the descent of the shaft 33, due to the load constituted by the weight of the shaft and of its polishing head, is retarded by the action of the counterweight 77. The contact of the polishing head with the glass can thus be regulated more accurately in order to avoid breakages by shock, as might be caused by a sudden descent. Obviously, however, the balancing means 74, 75, 76, 77 can be suppressed, and

likewise the hand wheel 73 shown in Figure 7 can be replaced by an electric or other motor effecting the rotation of the worms 72 and 73a.

What I claim is:—

1. In a surfacing apparatus of the character described, means for lifting and pressing a surfacing tool, comprising a thrust member supporting the vertical driving shaft of the tool-head, vertical racks upon opposite sides of said thrust member, a pair of gear pinions meshing with said racks, chain and sprocket mechanism for revolving said pinions simultaneously in either direction, and resilient connections dividing the chain of said mechanism, one of said resilient connections being tensioned by movement of said mechanism to lift the surfacing tool, the other of said resilient connections being tensioned by movement of said mechanism to press the surfacing tool upon the material to be worked.

2. In a surfacing apparatus of the character described, means for lifting and pressing a surfacing tool, comprising a thrust member supporting the vertical driving shaft of the tool-head, vertical racks upon opposite sides of said thrust member, a pair of gear pinions meshing with said racks, chain and sprocket mechanism for revolving said pinions simultaneously in either direction, resilient connections dividing the chain of said mechanism, one of said resilient connections being tensioned by movement of said mechanism to lift the surfacing tool, the other of said resilient connections being tensioned by movement of said mechanism to press the surfacing tool upon the material to be worked, and indicating means operated by relative movement of the parts of said chain separated by said dividing connections.

3. In a surfacing apparatus of the character described, means for lifting and pressing a surfacing tool, comprising a thrust member supporting the vertical driving shaft of the tool-head, vertical racks upon opposite sides of said thrust member, a pair of gear pinions meshing with said racks, chain and sprocket mechanism for revolving said pinions simultaneously in either direction, resilient connections dividing the chain of said mechanism, one of said resilient connections being tensioned by movement of said mechanism to lift the surfacing tool, the other of said resilient connections being tensioned by movement of said mechanism to press the surfacing tool upon the material to be worked, and indicating means operated by relative movement of the parts of said chain separated by said dividing connections, said indicating means including a dial, a pointer co-operating with said dial, and means for initially setting said dial and pointer with said surfacing tool clear of said material.

4. In a surfacing apparatus of the character described, means for lifting and pressing a surfacing tool, comprising a thrust member supporting the vertical driving shaft of the tool-head, vertical racks upon opposite sides of said thrust member, a pair of gear pinions meshing with said racks, chain and sprocket mechanism for revolving said pinions simultaneously in either direction, resilient connections dividing the chain of said mechanism one of said resilient connections being tensioned by movement of said mechanism to lift the surfacing tool, the other of said resilient connections being tensioned by movement of said mechanism to press the surfacing tool upon the material to be worked, a dial, a pointer co-operating with said dial, means for revolving said dial by the rotation of one sprocket of said chain and sprocket mechanism, other means for revolving said pointer by the rotation of the other sprocket of said chain and sprocket mechanism, and a disconnectible coupling device in one of said revolving means.

PAUL JOSEPH MAXIMILIEN ESCOLE.