May 18, 1948. C. M. HERZ 2,441,701

AUTOMATIC RUBBING AND POLISHING MACHINE

Filed July 2, 1945 5 Sheets-Sheet 1

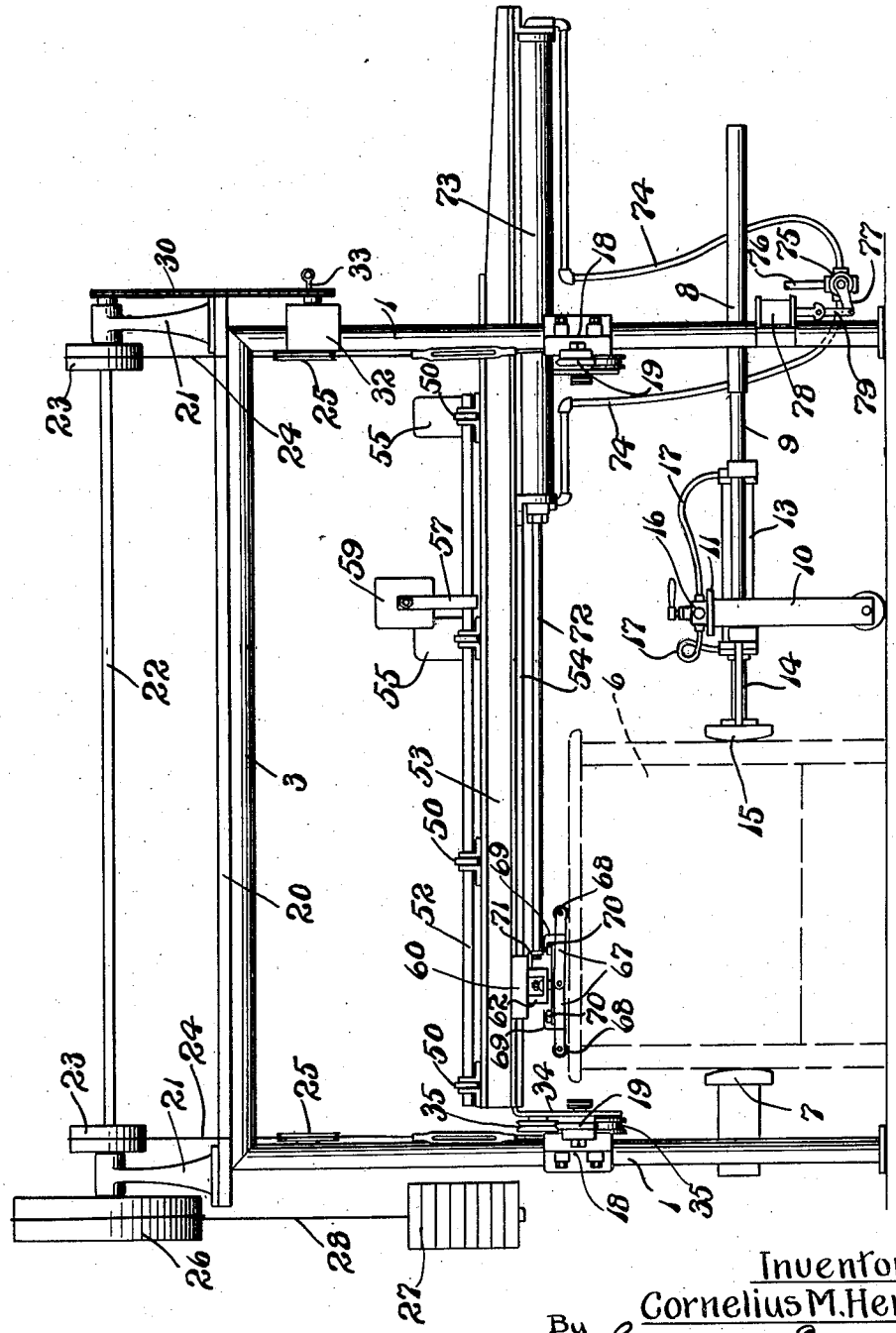


Fig. 1.

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AUTOMATIC RUBBING AND POLISHING MACHINE

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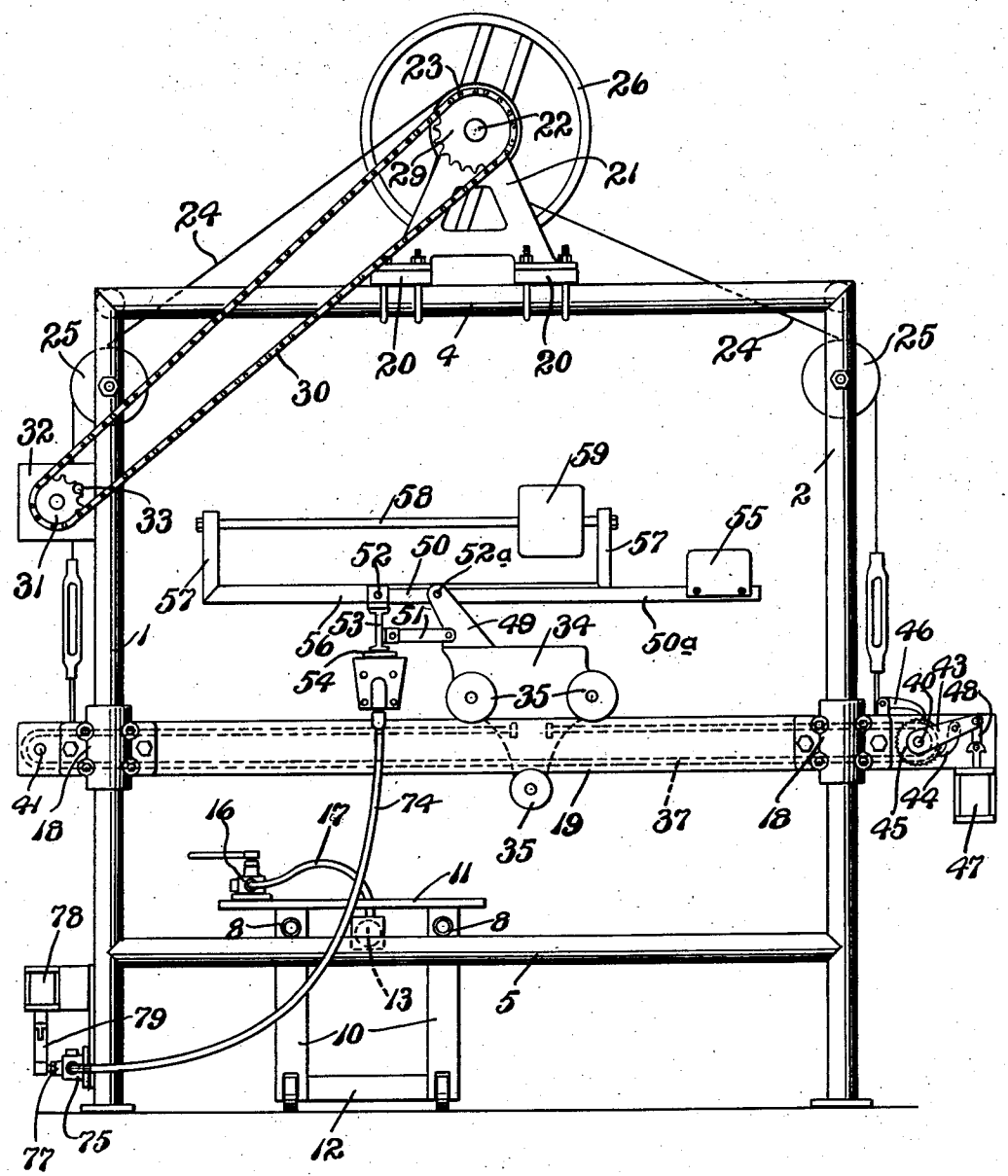


Fig. 2.

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AUTOMATIC RUBBING AND POLISHING MACHINE

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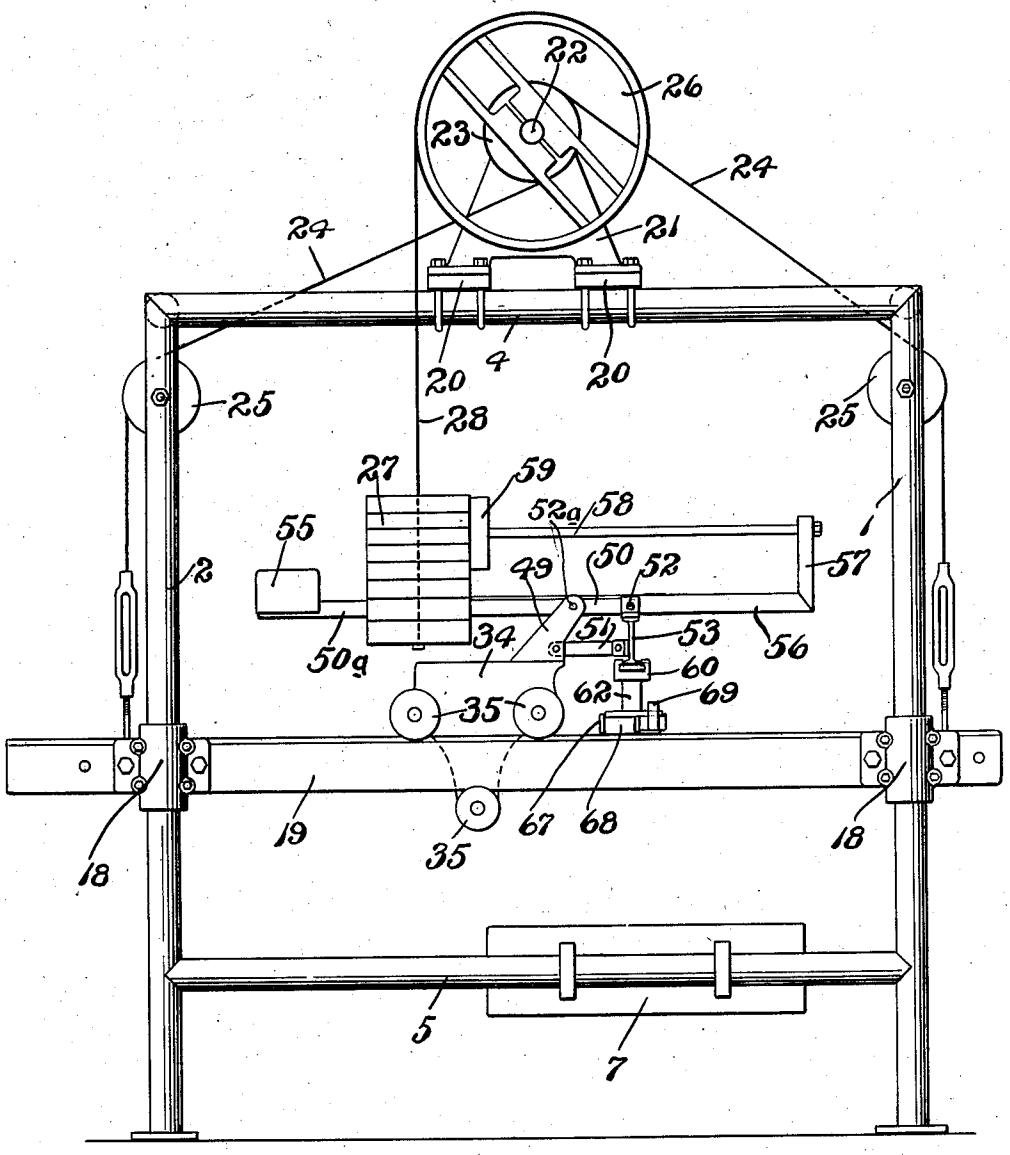


Fig. 3.

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AUTOMATIC RUBBING AND POLISHING MACHINE

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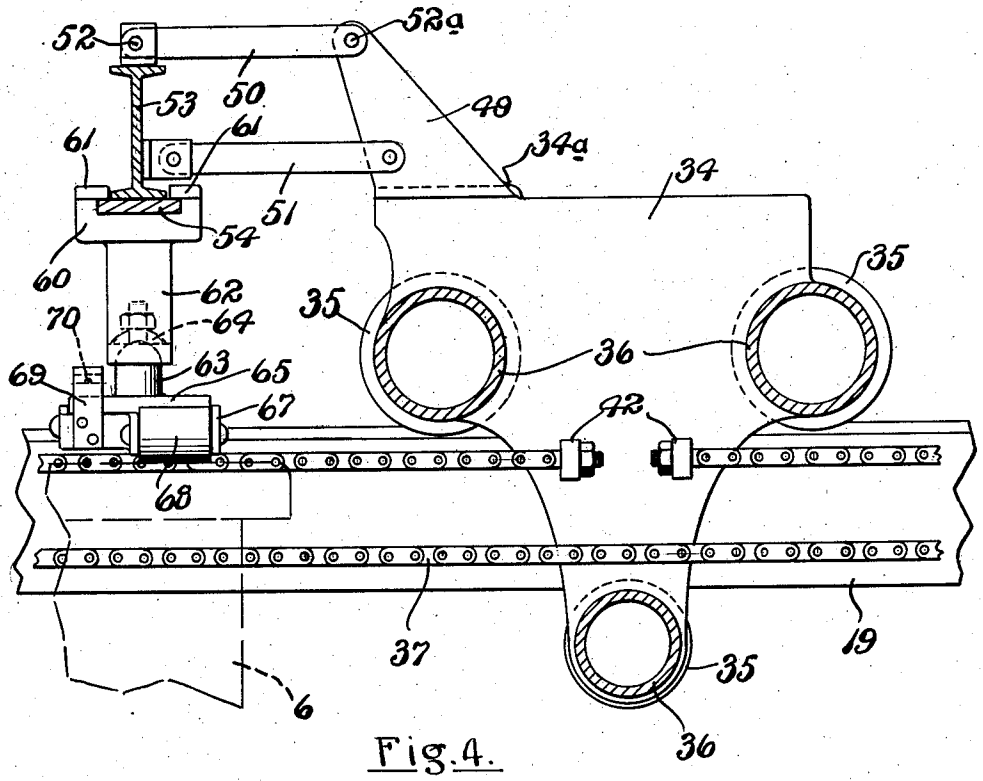


Fig. 4.

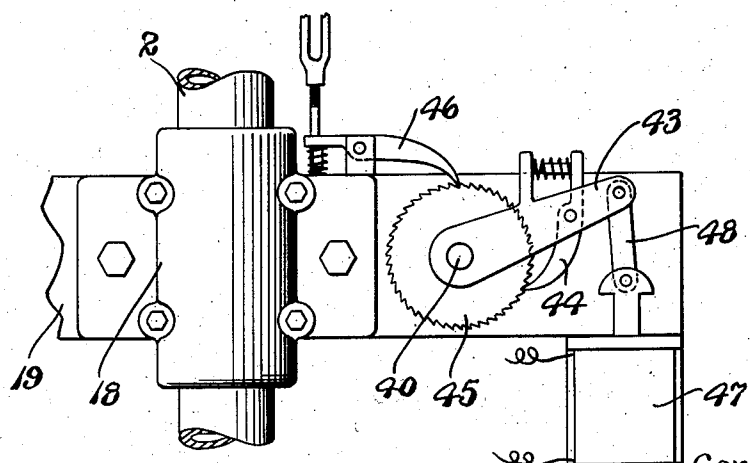


Fig. 5.

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AUTOMATIC RUBBING AND POLISHING MACHINE

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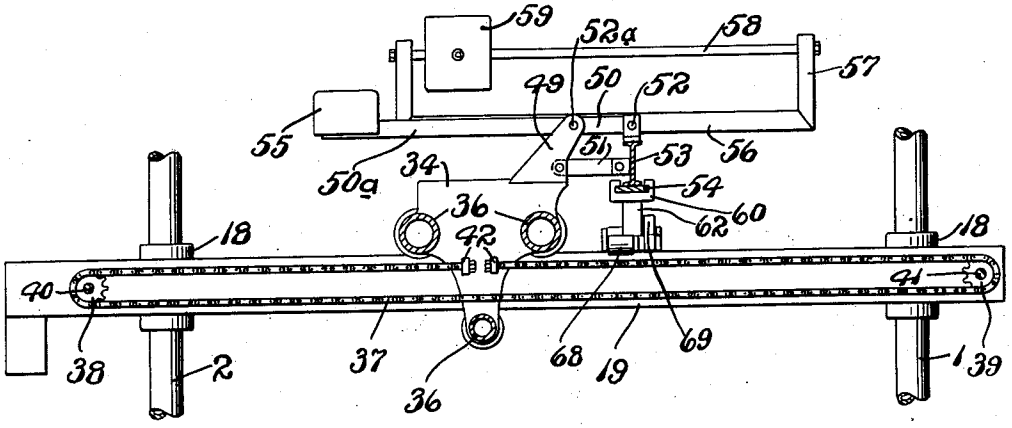


Fig. 6.

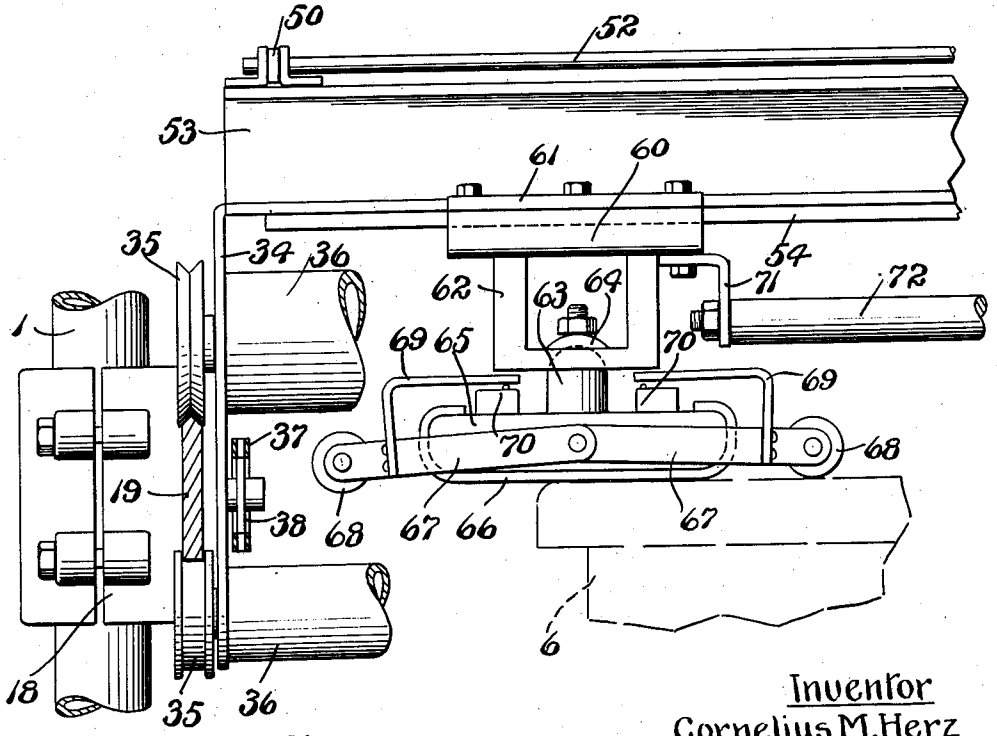


Fig. 7.

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Patented May 18, 1948 2,441,701

UNITED STATES PATENT OFFICE

2,441,701

AUTOMATIC RUBBING AND POLISHING MACHINE

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Application July 2, 1945, Serial No. 602,836

14 Claims. (Cl. 91—37)

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This invention relates to a machine for uniformly rubbing and finishing wood surfaces, for example the tops of many articles of furniture provided with horizontally exposed upper surfaces. With the machine which I have invented, a much better and more uniform accomplishment of the finishing steps is attained than heretofore and with a much greater rapidity.

The previous practice in finishing such surfaces, and particularly the process or step known as the rubbing in of filler or other material used, has been to perform the operation by hand or manually, requiring at least some degree of skill on the part of the operator and, even so, an impossibility of securing uniformity over an entire surface due to differing degrees of pressure supplied by the operator. Such work on the part of the operator also is of a heavy character, requiring physical strength and resulting in physical tiring because of the necessary exertion. The operation furthermore is slow and, therefore, expensive.

It is a primary object and purpose of the present invention to accomplish the finishing of articles of furniture in a much more expeditious and easy manner and with a substantial uniformity in the product obtained. An understanding of the invention, in a practical embodiment thereof, and of its operation may be had from the following description, taken in connection with the accompanying drawings, in which,

Fig. 1 is a front elevation of a machine embodying the invention.

Figs. 2 and 3 are end elevations at opposite ends of the machine.

Fig. 4 is a fragmentary vertical section, in a plane transversely of the machine from front to rear, showing the movable mounting of the reciprocating rubbing block or shoe thereon.

Fig. 5 is a fragmentary end elevation, at the same end of the machine as shown in Fig. 2, showing an enlargement of the mechanism provided for changing the position of the rubbing block or shoe between successive reciprocations thereof.

Fig. 6 is a view similar to Fig. 4, but on a reduced scale, and at the opposite side thereof, and

Fig. 7 is a fragmentary enlarged elevation showing the rubbing block or shoe, the overhead bar on which it is mounted for reciprocation and the mounting of the transversely moving carriage on which the bar is carried.

Like reference characters refer to like parts in the several figures of the drawings.

In the construction of the machine illustrated

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as one embodiment of the invention, a supporting frame is provided including four vertical corner posts. Two front posts 1 (Fig. 1) are spaced a distance from each other, and directly at the rear thereof and spaced therefrom, are two vertical rear posts 2. The upper ends of the posts 1 are connected by horizontal frame members 3, and the front and rear posts 1 and 2 by similar horizontal frame members 4 as shown in Figs. 2 and 3. At each end of the frame structure, horizontal frame members 5 extend between the front and rear posts 1 and 2 at a relatively short distance above their lower ends. While the various posts and frame members are shown of tubular form, the particular shape and form thereof is not in any way essential and may be varied considerably in detail.

At one of the ends of the machine, as shown in Figs. 1 and 3, a bumper or stop member 7 is secured to and extends inwardly from one of the frame members 5, providing a stop against which a vertical side of a desk, bureau or other like structure, indicated in dash lines at 6, may be placed within the machine. At the other end of the frame and secured to the opposite member 5, are two tubular supporting members 8, in which rods 9 are telescopically received extending inwardly (Fig. 1), and at their inner ends connected to a carrier. The carrier as shown (Figs. 1 and 2) has spaced vertical legs 10 with rollers at their lower ends, connected at their upper ends by a horizontal cross bar 11 and between the lower ends by a cross bar 12. A horizontal cylinder 13 is carried by said carrier and the rods 9 (Fig. 1) and from its inner end a piston rod 14 projects, having a head 15 at its free end as shown. A manually operable control valve 16 is mounted at the upper side and toward the front end of bar 11 having two air hose connections 17 leading from its opposite sides to the opposite ends of the cylinder 13.

With this construction, it being understood that a line carrying compressed air to the valve 16 leads to one side of the valve housing between the conduits 17, and that an exhaust opening is at the opposite side of the housing, compressed air may be selectively directed to either end of the cylinder 13 to move rod 14 and head 15 either in an outward or inward direction relative to the cylinder. When an article of furniture, as at 6, the top of which is to be processed is located with a side or end against the stop 7, the carrier 10 is moved to a position spaced a short distance from the opposite side or end thereof, the rods 9 being held by screws or other releasable holding

means against movement into the tubes 8 when such location of the carrier has been accomplished. Then by manual operation of the valve 16 in the proper direction, the head 15 is carried to press against said opposite side or end of the furniture article 6 which is thereupon clamped securely between said heads 15 and 7 and held clamped by air pressure. After the processing of the top has been completed, moving the valve at 16 in the opposite direction releases the article 6 for removal, the clamping head 15 being moved away, as is evident.

On each of the posts 1 and 2 an adjustable sleeve fixture 18 is slidably mounted, the fixture being in two parts for application to each post in a common and well known manner. At the inner sides of the post and at each end of the frame, extending between the front and rear posts 2 and beyond both at the front and rear of the frame a horizontal track bar 19 is secured to said fixtures, there being two of the bars 19, one adjacent each end of the frame.

Horizontal bars 20 (Figs. 1 and 2) are secured above and extending between the members 4 of the supporting frame. Brackets 21 are connected with the bars 20 adjacent their ends, and between and through bearings at the upper ends of said brackets a horizontal shaft 22 extends. The shaft carries spaced drums 23 to each of which two cables 24 are secured, at one end of the machine said cables extending, one rearwardly and the other in a forward direction to and over idle grooved pulleys 25, and thence toward the track bars 19 having suitable adjusting connections therewith adjacent the ends of said bars. At one end of the shaft 22 a larger drum 26 is fixed from which a weight 27 is suspended by a cable 28. The weight in part balances the weight of the track bars 19, the fixtures 18 and the carriage and other parts of the machine, hereafter described, which are mounted for movement on said track bars.

At the end of the shaft 22 opposite the drum 26, a sprocket wheel 29 is fastened (Fig. 2), around which an endless sprocket chain 30 passes. The chain also passes around a second sprocket wheel 31 mounted on the shaft of a motor 32 carried by the adjacent front post 1. By operating the motor the guide fixtures 18, track bars 19 and the parts carried thereby may be lifted to any desired position. When such position is reached, a removable pin 33 may be passed between two consecutive teeth of the wheel 31 into an opening in the motor housing 32 to maintain the bars 19 at a desired preselected level. It is of course apparent that the shaft on which the sprocket wheel 31 is connected may be turned in any desired manner as, for example, manually by a crank; the power used to elevate the track bars 19 being any which can be utilized. The lowering of the track bars and the carriage thereon will preferably be by gravity with the counterbalance weight 27 insufficient to wholly overcome the weight of the track bars and parts associated therewith.

A carriage is mounted on and extends between the horizontal track bars 19. It includes vertical ends 34 connected at their upper edges by a cross bar 34a (Fig. 4) and by horizontal tubes 36 extending between the ends 34. Two spaced rollers 35 at the outer side of each of the ends 34 ride upon the upper edge of each bar 19 adjacent each end 34 and a third roller 35 against the lower edge thereof (Figs. 2, 4 and 7). A sprocket chain 37 extends between and passes around two spaced sprocket wheels 38 and 39 on horizontal cross shafts 40 and 41 extending between and mounted at their ends on the track bars 19. The ends of the chains are connected to the ends 34 of the carriage at their inner sides at 42 (Fig. 6) so that on turning one of the shafts, for example the shaft 40, the position of the carriage relative to the track bars 19 on which it is movably mounted is changed.

The shaft 40 at the back of the machine at one end has an arm 43 thereon extending upwardly and rearwardly. The arm 43 carries a spring actuated dog or pawl 44 which normally is in engagement with the teeth of a ratchet wheel 45 fixed to the shaft 40. A second spring actuated retaining dog 46 has its free end in normal engagement with the ratchet wheel to hold it against turning in a reverse direction. A solenoid 47 is carried on the adjacent end of the track 19, being vertically positioned, and its armature is connected by a link 48 with an end of the arm 43. When the solenoid 47 is energized by the passage of electric current in one direction the armature may be moved downwardly with a resultant turning of shaft 40 a part of a revolution and when the flow of current is reversed, arm 43 is returned to its upper position for the next succeeding turning movement to be imparted to the shaft 40. In this manner the carriage is moved on the tracks 19 in short periodic steps of movement.

From the top and to one side of the carriage described, spaced arms 49 extend upwardly to which one end of parallel link bars 50 and 51 are pivotally connected. The upper links 50 have a pivotal connection at 52a with an elongated rod 52 secured at the upper side of a horizontal beam 53, preferably an I-beam, to the under side of which an elongated plate 54 is secured (Figs. 4 and 7). The lower links 51 are pivotally connected to the beam 53 by means of ears secured to the beam at lower positions thereon. As many of the links 50, as may be necessary are extended as shown at 50a (Figs. 2 and 3) to the opposite side of the arms 49 on which are mounted weights 55 adjustably carried on the arms 50a to in part at least, counterbalance the weight of the beam 53 and the parts mounted thereon as later described. In addition, on the rod 52 and the pivot rod 52a passing through the upper ends of arms 49 a frame is mounted and secured including a horizontal lower bar 56, vertical ends 57, on which a weight 59 is slidably mounted.

The immediate rubbing block or shoe is suspended from the plate 54 previously described and is slidably mounted for reciprocation thereon. The fork 60 (Fig. 4) has a lower cross member and upwardly extending legs between which the plate 54 is located. Overhanging retainer bars 61 secured to the upper ends of said legs project over the edges of the bar 54 thereby mounting said fork for free sliding movement lengthwise of the plate. At the under side of the fork 60 and extending downwardly therefrom is a yoke 62 of U-form, at the lower side of which a lug 63 having a rounded upper end is seated in a concave recess provided at 64, said leg 63 having a reduced threaded part at its upper end passing through the bottom of the yoke 62 and receiving a nut. The lug 63 is at the upper side of a block or shoe 65 and located substantially midway between its ends. At the under side of said block or shoe and extending around its ends to the upper side thereof a fabric cover 66 is secured. It is apparent that by reason of the mounting of said block or shoe as described, it may have a free tilting movement to conform to the upper surface of the top

of the furniture article 6 over which it is to be reciprocatingly moved.

Two yokes 67 having spaced arms are associated with the shoe 65, being pivotally connected thereto substantially midway between the ends of the shoe to turn about a horizontal axis and extending in opposite directions beyond the ends of the shoe (Fig. 7). Each carries a roller 68 which rides over the upper surface of the top of the furniture article 6 until it passes beyond an edge thereof. For example, in Fig. 7, the roller at the left has passed beyond the edge of the top 6 and has dropped to a lowered position, while the roller 68 at the right is maintained in an upper position by its contact with the top of the furniture article over which it moves. Each of the yokes 67 is provided with a switch actuating arm 69 extending upwardly and bent horizontally as shown for each to extend over a switch 70. When a roller 68 is at its upper position, as shown at the right in Fig. 7, the arm is out of engagement with the switch, but when the roller has dropped downwardly, after passing from the top of the furniture article over which it has been moving, as at the left in Fig. 7, the switch is operated and a circuit controlled thereby closed.

An angle bracket 71 (Figs. 1 and 7) is permanently secured to the sliding yoke, to which a piston rod 72 is fastened at one end. The piston rod enters a cylinder 73 at its opposite end, which cylinder is mounted at the lower side of the beam 53 and moves therewith. Air carrying conduits 74 are connected in conjunction with opposite ends of the cylinder, and are also connected to opposite sides of a valve housing 75 which has a suitable rotatable valve therein, and to which compressed air is carried by the pipe 76, the side of the valve housing opposite pipe 76 having an exhaust opening in the usual manner. The valve is turned to different positions by an arm 77 secured thereto. A solenoid winding 78 is mounted on the frame and its armature is connected by a link 79 to the outer end of the arm 77.

It is to be understood that the switches at 70 are alternately operated as the rubbing shoe moves back and forth across the furniture article 6, first one roller 68 and then the next dropping downwardly as they pass over and beyond the opposite edges of the top. Such switches are connected with and control electric circuits to direct a current through the solenoid 78, the winding which is connected with said circuits, to alternately move the armature thereof in opposite directions. This causes a passage of compressed air alternately to the ends of cylinder 73, and an alternate exhaustion of air likewise so that the piston rod 72 is reciprocated, and the rubbing block 65 is moved back and forth over the surface of the top of the article 6. Irrespective of the distance across the top, or of varying distances which there may be, for example, in irregular shaped tops, the reversal of movement occurs wherever one of the rollers 68 has passed from the top of the furniture article 6 and dropped down to close its switch 70. Thus there is an automatically controlled back and forth movement of the pressure or rubbing shoe 65 over the top which is being treated.

The solenoid at 47 is similarly connected with the circuits used with the solenoid at 78, with an elevation of the arm 43 at the end of one reciprocatory movement of shoe 65 and a pulling down of said arm at the end of the other movement a movement of the carriage over the track bars 19 takes place so that, at the end of each complete reciprocation, the position of the pressure and rubbing shoe 65 relative to the top which is being treated is changed. It is, of course, apparent that by duplicating the mechanism, which includes the chain 37, ratchet wheel 45 and parts associated therewith, and mounting it at the opposite end of the shaft 40, such transverse change in position of the shoe to the top being processed may occur at the end of each reciprocatory movement.

In the operation, the pressure with which the shoe 65 with under covering 66 bears against the upper surface of the article which is being processed, is controlled by the weight 59 being moved along the rod 58 to any desired position. For any particular height of a line of desks, bureaus, buffets or the like which may be processed, the track bars 9 are elevated and adjusted to the desired position with reference to the upper surface of the tops of such furniture articles. The carriage is moved along the tracks 19 so as to start the processing at a longitudinal edge of the top and the mechanism started in motion by closing a switch controlling the circuits associated with the solenoids 47 and 78. Thereupon the rubbing shoe is moved back and forth over the upper surface of the top, bearing thereagainst with a pressure which is uniform at all times. The automatic operation of the solenoid 47 feeds the carriage periodically between reciprocatory movements, laterally shifting the position of the rubbing shoe and such reciprocation of the shoe and periodic shifting of it to a new position continues until the opposite edge of the top is reached, whereupon the dropping of both rollers 68 with an actuation of both switches 70 simultaneously neutralizes the solenoids 47 and 78 and stops the machine in operation. The weight 59 is then slid along the rod 58 to overbalance the weight of the beam 53 and the parts carried, thereby lifting it and the rubbing shoe carried thereby above the top, the furniture article processed may be released by withdrawing the head 15, the article removed and replaced by another. By lifting the dog 46 the carriage and the parts carried thereby are returned to initial position to repeat the operations for processing the top of the next succeeding furniture article.

The structure described in practical use has proven very useful, economical and with it a much more rapid and a better finishing of the tops of articles of furniture or finishing of any wood surface which can be positioned and held in position horizontally is attained without tiring the operator. It is to be understood that the described structure is of a machine, the first one made, and that for productive manufacture of the machines in quantity for sale many changes in detail and design may be resorted to, but with an adherence to the principles of operation and structure to embody them, equivalent to the disclosure made. For example, fluid operation of the holding means for the furniture article, or for the reciprocation of the rubbing and polishing shoe, may be readily replaced by another type of structure which does not depend on fluid operation but which will be equivalent thereto, with the invention not departed upon and with no departure from the principles of operation outlined.

The invention is defined in the appended claims and is to be considered comprehensive of all forms of structure coming within their scope.

I claim:

1. A supporting structure within which an article having a horizontal upper surface is adapted to be placed, means for releasably engaging and holding said article in a fixed position, substantially horizontal tracks carried by said supporting structure, a carriage movably mounted on said tracks, a beam located transversely of said tracks, means movably connecting said beam to the carriage whereby the beam may be raised and lowered, a finishing member slidably mounted on said beam and adapted to engage against the upper surface of said article, and means for reciprocating said member while in engagement against said surface.

2. A construction as defined in claim 1, and means traversing said surface in synchronism with said finishing means for automatically controlling said reciprocating means for reversing it in operation when the finishing member alternately reaches the edges of the horizontal surface over which it is reciprocated.

3. A construction as defined in claim 1, means traversing said surface in synchronism with said finishing means for automatically reversing the reciprocating movement of said finishing member upon its reaching either of the edges of the surface over which it is moved, and additional means for automatically moving said carriage on its tracks a predetermined distance between reciprocatory movements.

4. A construction as defined in claim 1, means for adjustably mounting said tracks for simultaneous and equal vertical adjustment on said supporting structure, means for counterbalancing the weight of said tracks and the carriage and other parts thereon, and means for releasably holding said tracks against movement in any position to which adjusted.

5. In combination, a supporting structure within which an article of furniture having a horizontal top is adapted to be placed, means for releasably securing said furniture article in a fixed position relative to said support, spaced horizontal tracks mounted on said support, a carriage mounted on and extending between said tracks and movable thereover, a beam movably connected to the carriage whereby said beam may be raised and lowered with respect thereto, a finishing shoe slidably mounted on and located below said beam, means carried by said beam and connected with said shoe for moving the shoe back and forth on the beam, and automatic control means moving with said shoe and having parts extending opposite each other and beyond opposite ends of the shoe, said parts being movably mounted and held in an upper position when riding over the upper surface of said furniture article top by engagement therewith and dropping by gravity when moved beyond an edge of the top, said means automatically controlling said shoe moving means to reverse the direction of movement of the shoe.

6. A construction having the elements defined in claim 5, said shoe moving means comprising a horizontal cylinder located below one end portion of the beam and secured thereto, a piston rod entering said cylinder at one end and connected with the shoe at the other, a piston in said cylinder connected to said piston rod, conduits for carrying fluid pressure to each end of said cylinder, a valve to which said conduits lead, the turning of which directs fluid pressure into one end of the cylinder and exhausts it from the other and vice versa, and a solenoid having its armature connected with said valve to turn it in opposite

directions upon the shoe reaching opposite edges of said furniture article top and said parts carried thereby dropping by gravity.

7. A supporting structure within which a furniture article having a horizontal top may be received, means for releasably clamping said furniture article in a fixed position relative to said supporting structure, a rubbing shoe bearing against the top and mounted for reciprocation from one edge thereof to the other, means for reciprocating the shoe, and means traversing said top for controlling the reciprocating means to reverse its movement when the shoe reaches either edge of the top over and against which it is moving.

8. A construction as defined in claim 7, and a carriage for supporting said shoe carrying means, means for mounting the carriage for movement in a direction transverse to the movement of said shoe, and automatic means for moving said carriage a pre-selected distance between reciprocations of the shoe to periodically change the position of the shoe relative to the top over and against which it is moved.

9. Means for processing the upper surface of a horizontal top of a furniture article including, a carriage, means for movably mounting the carriage, a bar movably mounted on said carriage for raising and lowering, a processing member slidably mounted on said bar, means for reciprocating said member on said bar, means for reversing the direction of reciprocatory movement of said member upon it reaching the edges of said furniture article top, and means for moving said carriage to change the position of the processing member relative to the top.

10. In a construction as described, horizontal track supports, a carriage thereon movable on said tracks, a bar extending transversely of the tracks and movably mounted on the carriage for raising and lowering the bar, a processing member slidably mounted on said bar, means for moving said processing member back and forth on the bar, means for automatically moving the carriage periodically on said tracks in synchronized relation to the movements of the processing member.

11. A construction as defined in claim 10, means to counter-balance the weight of said bar, processing member and reciprocating means, and an adjustable weight carried by said carriage and connected with said bar, movement of which in one direction elevates the bar and attached parts and in the other direction lowers said bar and presses the processing member against the upper side of work to be processed thereby.

12. In a construction as described, spaced apart elongated tracks, a carriage thereon extending between the tracks, a bar located to one side of the carriage, means movably connecting said bar to the carriage whereby the bar may be raised and lowered, a processing member slidably mounted on said bar, means carried by said bar for moving said processing member back and forth on the bar, control means movably mounted on said processing member and extending therefrom beyond opposite ends thereof to ride upon the upper surface of articles being processed and dropped by gravity on leaving such surface, and means controlled thereby for reversing the processing member moving means upon downward movement of a control member.

13. A supporting structure within which an article having a horizontal upper surface is adapted to be placed, means for releasable en-

gaging and holding said article in a fixed position, substantially horizontal tracks carried by said supporting structure, a carriage movably mounted on said tracks, a bar located above and transversely of said tracks, means movably connecting said bar to the carriage whereby it may be raised and lowered, a rubbing or finishing member slidably mounted on said bar and adapted to engage against the upper surface of said article, means for reciprocating said member while in engagement against said surface, means for automatically reversing said member upon its reaching either of the edges of the surface over which it is moved, additional means for automatically moving said carriage on its tracks a predetermined distance across said surface between reciprocatory movements, said means for reciprocating the rubbing or finishing member being rendered inoperative and stopped from movement when said carriage has been moved a sufficient distance that said rubbing or finishing member is moved out of engagement with the upper surface of said article.

14. Means for processing the horizontal top of an article of furniture comprising, a movably

mounted carriage, supporting means for said carriage, a processing member to move back and forth over and against the furniture article top mounted for slidable movement and carried by said carriage, means for reciprocating said member, means for moving the carriage a predetermined distance at periodic intervals and between reciprocatory movements of said processing member, and means for automatically rendering the means for reciprocating said member inoperative when said carriage has been moved a distance sufficient to carry the processing member beyond the top of said furniture article.

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