Aug. 7, 1945. R. B. MENTZER 2,381,833

SURFACING MACHINE

Filed Aug. 18, 1942 3 Sheets-Sheet 1

Fig. 7.

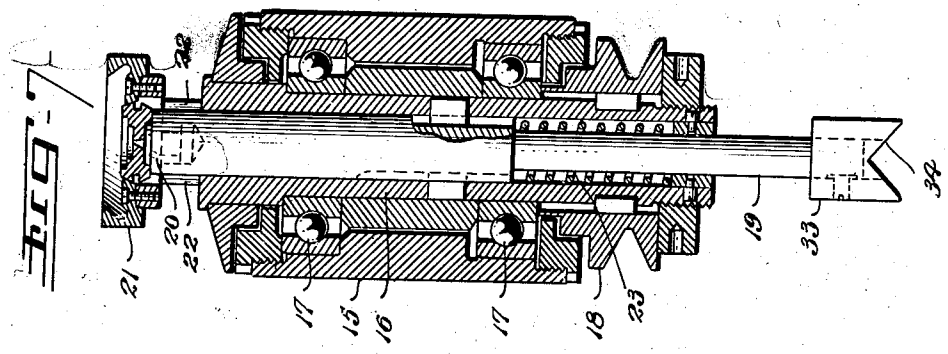


Fig. 1.

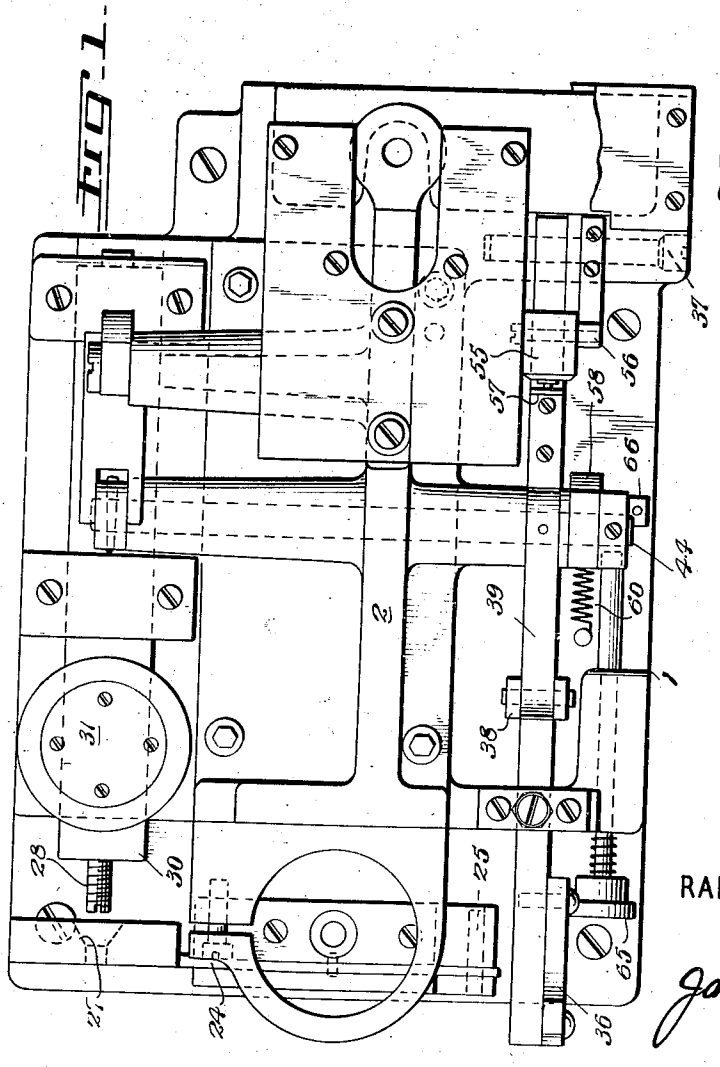
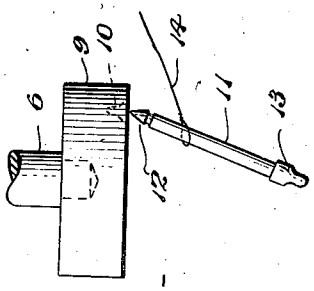


Fig. 6.



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Aug. 7, 1945. R. B. MENTZER 2,381,833

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Filed Aug. 18, 1942 3 Sheets-Sheet 2

Fig. 4.

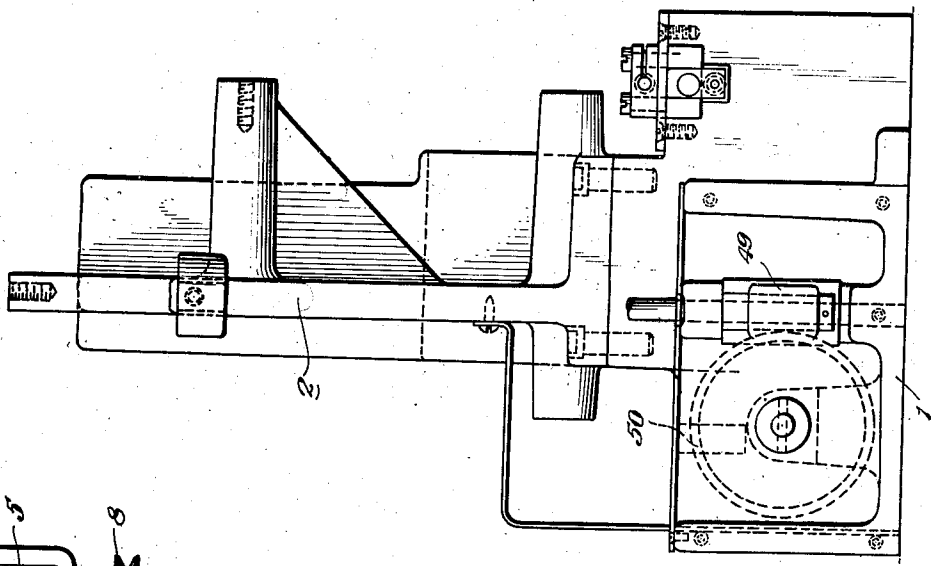
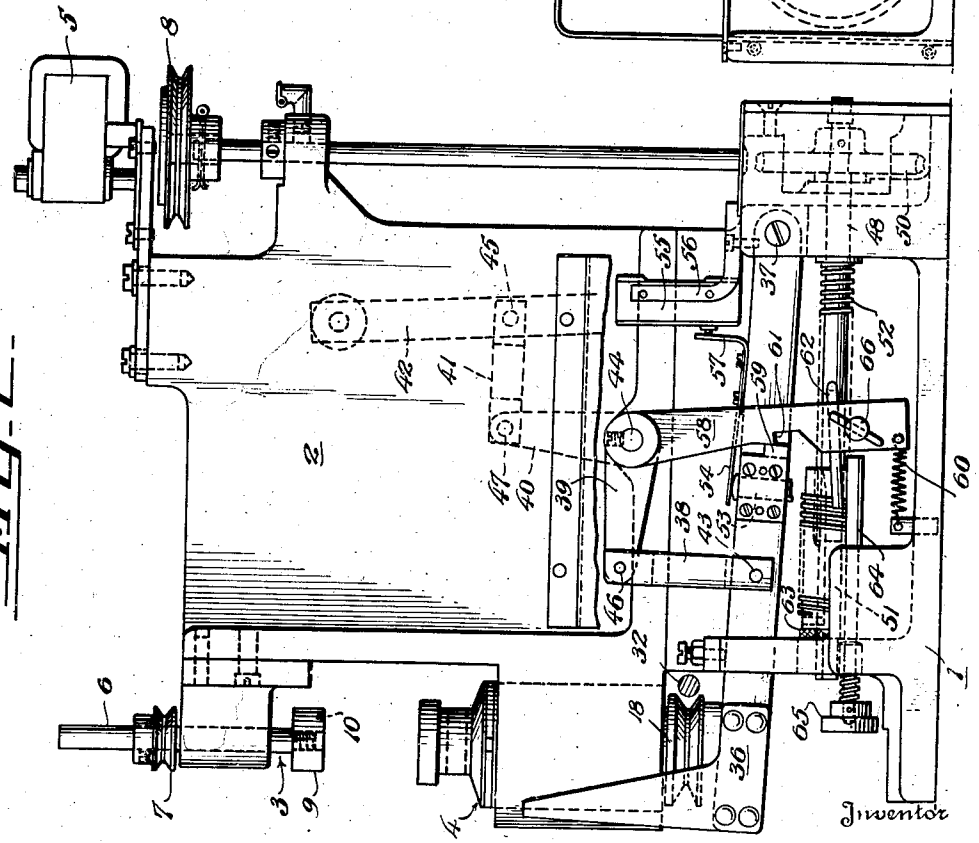


Fig. 2.



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Aug. 7, 1945. R. B. MENTZER 2,381,833

SURFACING MACHINE

Filed Aug. 18, 1942 3 Sheets-Sheet 3

Fig. 3.

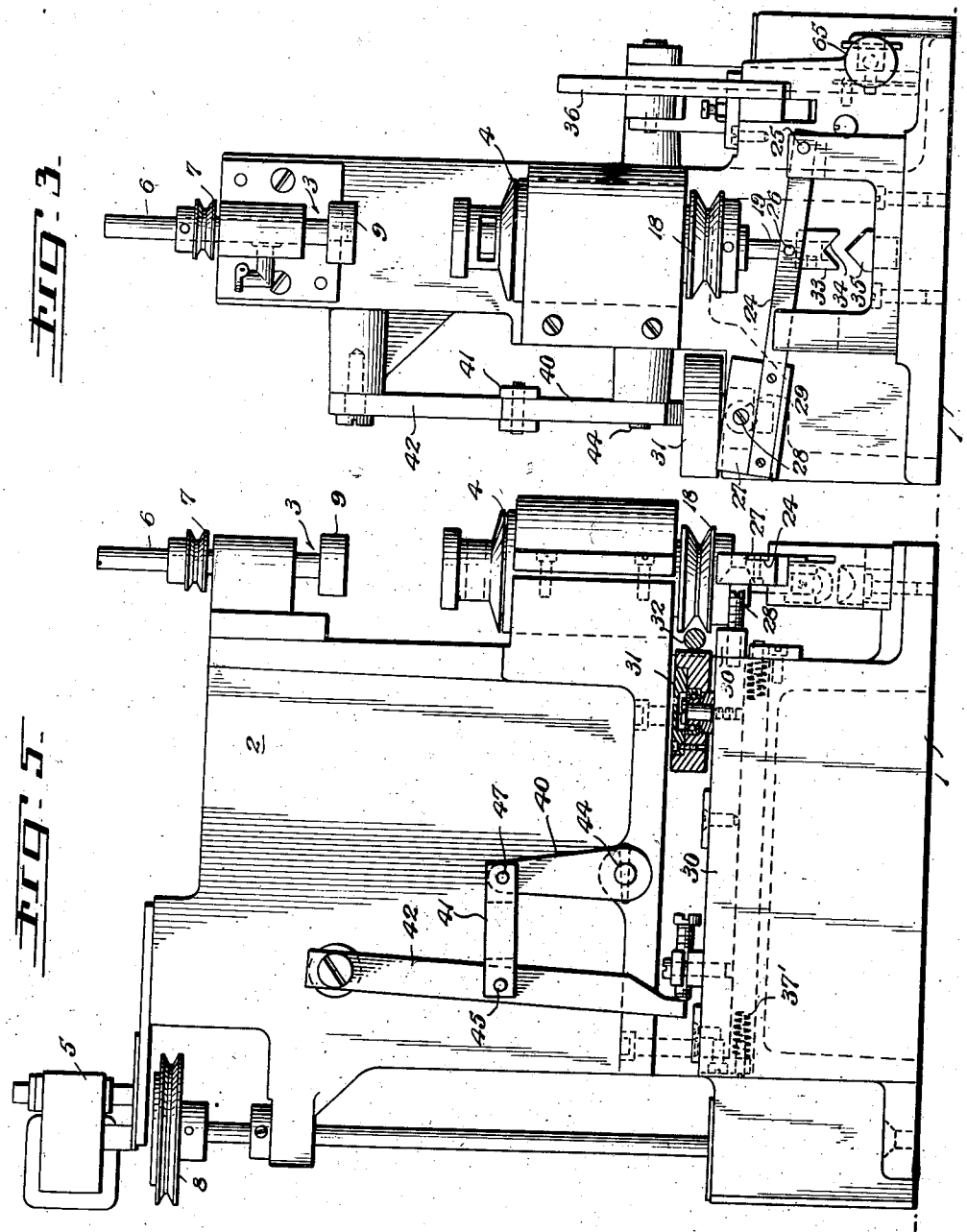


Fig. 5.

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UNITED STATES PATENT OFFICE

2,381,833

SURFACING MACHINE

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Application August 18, 1942, Serial No. 455,264

11 Claims. (Cl. 51—2)

This invention relates to automatic machines and has for its object the provision of improved means and method of automatically controlling and carrying out the operation of such machines.

Another object is to provide, in an automatic jewel machine, means and method of conjointly applying power delivery means and controlling relative movement between the toolholder and the workholder.

Another object is to provide improved relative arrangement and adjustment means of toolholder and workholder with respect to each other in an automatic jewel machine.

Another object is to provide an improved workholder assembly in an automatic jewel machine.

Another object is to provide means and method of timing the operation of automatic jewel machines.

Another object is to provide in an automatic jewel machine, a cofunctioning arrangement between a timing assembly and a power delivery assembly.

Another object is to provide, in an automatic jewel machine, a cofunctioning combination of a timing arrangement, power delivery application means, an improved arranged for the relative control and adjustment of the workholder and toolholder with respect to each other, and an improved workholder assembly.

Other and further objects will be apparent from the following specifications and from the drawings.

Referring to the drawings:

Fig. I is a plan view of a machine embodying an illustration of the invention;

Fig. II is a front side elevation of the machine of Fig. I;

Fig. III is a left end elevation of the machine of Fig. I;

Fig. IV is a right end elevation of the same machine;

Fig. V is a rear elevation of the same machine which has been reversed from left to right with reference to Fig. II;

Fig. VI is a detail of a toolholder arrangement used in this machine; and

Fig. VII is a central and vertical section of a workholder assembly used in the machine.

This invention is directed to an automatic machine with provisions for automatically timing the operation of the machine, for conjointly controlling relative movement between toolholder and workholder and bringing power delivery means into operation, for easy and efficient operation of the workholder, for general co-function throughout the machine and for particular co-function between the timing assembly and a power delivery control assembly.

A machine embodying the features of this invention is readily applicable to many uses, one of which may be in the surfacing of timepiece jewels, particularly in the formation of the cup and bevel surfaces of such jewels and particularly in the finish or polishing operations thereon. In the formation of the cup surface a male tool is used and in the formation of the bevel surface a female tool is used.

Essentially, the operation of the machine, as illustrated, is as follows: The workholder is adjusted to permit movement to the desired height with respect to the toolholder, a workpiece is inserted in the workholder, a tool is made ready on the toolholder, the automatic stop finger is adjusted to permit the desired period of operation, and the starting lever is depressed.

This movement of the starting lever causes several actions to occur substantially simultaneously. A switch is closed to start the motor which drives the tool spindle and the timing mechanism. A finger on the starting lever is brought into engagement with the thread of the timing sleeve so that continued rotation of the sleeve will move the sleeve toward such contact with the stop finger as will stop the machine. Also an idler roller carrying slide is so moved as to engage the idler roller with an already traveling belt and the belt in turn with the drive pulley of the workholder assembly and at the same time bring into position a finger which holds the workholder lifting lever in up or operating position.

When the timing sleeve engages and moves the stop finger, the various steps above are reversed and the machine returned to starting arrangement.

One effective method of operating this machine is to rotate the work at high speed, the tool at medium slow speed, and the timer at slow speed.

As in Fig. II, a base 1 is provided with an upright 2, with a toolholder assembly 3 and a workholder assembly 4 mounted on one end of the base, and a timing mechanism and tool assembly power supply motor 5 mounted on the other end of the base.

The toolholder assembly 3 comprises simply a shaft 6 on the upper portion of which is mounted a drive pulley 7 driven by a belt from a pulley 8 associated with the motor 5, and a tool support 9 secured to the lower end of the shaft 6 with an off-center tool receiving recess 10. (Fig. VI.)

The tool 11 may be of steel having an end portion 12 adapted to fit into the recess 10 and another end portion 13 of Wood's metal or similar low melting point solder which is the work contacting portion of the tool. The wire 14 is looped about a flat sided portion of the stick 11 and has a free end engaging the side of the machine to prevent rotation of the tool stick 11. This breaks up the pattern of the surfacing action and avoids concentric surfacing lines.

Thus upon the rotation of the spindle 6 the tool is oscillated over the surface of the work with a polishing action when abrasive is placed between the tool and the work.

The work-holder assembly 4 is illustrated in Fig. VII and comprises an outer housing 15 with a sleeve 16 mounted within the housing for rotation therein on bearings 17. A pulley 18 is secured to the sleeve 16 and is adapted to drive the sleeve in rotation upon the application of a drive belt to the pulley 18. A central shaft 19 is mounted within the sleeve 16 for rotation therewith and has at its upper end a workpiece base 20. When reference is made hereafter to a workpiece it is intended to mean either the workpiece itself or a workpiece holder such as may be used to mount timepiece jewels for operation thereupon in jewel machines. For the purpose of this description the jewel and such jewel mounting are considered to be the same.

The sleeve 16 is provided with a cap member 21 which acts as an upper seat or clamp for the workpiece mounted on the base 20. The sleeve 16 is also provided with side wall apertures 22 through which the workpiece is passed to mount or dismount it from the base 20. When the machine is in operation, the shaft 19 is positioned as shown in Fig. VII with a spring 23 providing resilient clamping action between the base 20 and the cap 21 on the workpiece. When it is desired to load or unload the workpiece from the holder, the shaft 19 is moved downward against the action of spring 23 until the base 20 is substantially in alignment with the apertures 22 through which the workpiece may then readily be inserted or removed.

When the machine is in operation, the shaft 19 is held in the general position shown in Fig. VII by a lever 24 (see Fig. III) which is pivoted to the base 1 at 25 and to the shaft 19 at 26. Lever 24 is provided with a weight 27 which tends to move the shaft 19 downward. This action is prevented during the operation of the machine by the insertion of a holding finger 28 (see Fig. I) in an opening 29 in the weight 27.

This finger 28 is mounted on a slide plate 30 which carries an idler roller 31 adapted to be so pushed against a drive belt 32 (see Fig. II) as to engage the belt with the workholder drive pulley 18. The manner and occasion of the movement of the slide plate 30 will be described hereafter.

With further reference to the workholder assembly of Fig. VII the shaft 19 is provided at its lower end with a locating member 33. This member is in the form of a cylindrical block secured to the lower end of the shaft 19 with a transverse V groove 34 in the lower end thereof. A fixed block 35 is secured to the base 1 and formed with an upper surface adapted to substantially fit within the V groove 34 so that when the shaft 19 is pulled downwardly by weight 27 or otherwise it is stopped in its rotation at a particular position by the mating of the blocks 33 and 35. Since the shaft 19 and the sleeve 16 are keyed for rotation together as well as for relative longitudinal movement with respect to each other, when the shaft 19 is stopped at a particular position the sleeve 16 is also similarly stopped and the loading apertures 22 also are stopped at a particular position. This position is chosen in order to present the loading apertures at the most convenient peripheral position of the workholder assembly 4, and the block 35 is so arranged as to provide the desired positional stop location of the apertures 22.

A starting lever 36 is pivoted to the base 1 at 37 (see Fig. II) and is normally held in out of operation position as shown in Fig. II by means of a spring 37', (Fig. V) which operates to keep the slide plate 30 in out of operation position. This is accomplished through a linkage arrangement involving levers 38, 39, 40, 41 and 42, with fixed pivots at 43, 44 and 45 and movable pivots at 46 and 47.

With this arrangement, movement of the starting lever 36 in a downward direction will cause the slide plate 30 and the idler roller 31 to be moved against the action of spring 37, and upon release of the starting lever 36, the spring 37 will operate through the linkage described to return the slide plate 32 to out of operation position and to lift the starting lever 36 to out of operation position.

A timing shaft 48 (see Fig. II) is driven by the motor 5 through gears 49 and 50. See Fig. IV. A timing sleeve 51 is mounted for rotational movement with and for longitudinal movement with respect to, the shaft 48, and is provided with an exterior thread. The sleeve 51 is normally held in out of operation position as shown in Fig. II by the spring 52 which is also mounted on shaft 48. A finger 53 is mounted on starting lever 36 and, upon depression thereof, is adapted to engage and follow the thread of sleeve 51, upon rotation thereof in consequence of the drive of shaft 48. The finger 53 is pressed downwardly by a spring 54 in order to avoid breakage in the event that the finger does not immediately locate itself in the thread of the sleeve 51.

When the starting lever 36 is depressed, a micro-switch 55 mounted on a bracket 56 secured to the base 1 is closed by the removal therefrom of the pressure of a contact finger 57 secured to the starting lever 36.

The microswitch 55 is the starting and stopping switch for the motor 5 which is the drive motor for the shaft 48 and associated timing mechanism. When the starting lever 36 is lifted to out of operation position the finger 57 opens the switch 55 and stops the motor 5.

Motor 5 having been started, the shaft 48 consequently rotates with the finger 53 located in and following the thread of the sleeve 51.

In order to hold the starting lever 36 in depressed position during the operation of the machine and to provide a support for a stop pin, a lever 58 is secured to the linkage system at the pivot 44 for free pivotal movement thereon irrespective of the movement of the linkage system. In out of operation position, lever 58 is held against an abutment 59 on the starting lever 36 by a spring 60 secured to the base 1. Upon depression of the lever 36 a shoulder 61 in the lever 58 is brought into engagement with the upper surface of the abutment 59 so as to hold the lever 36 down during the operation of the machine.

A stop pin 62 is mounted on the lever 58 to extend generally in the same direction as the shaft 48 and the sleeve 51 so that when the sleeve 51 has progressed along the shaft 48, in accordance with the rotation of the shaft 48 and the action of the pin 53 in the thread of the sleeve 51, to a given position, an abutment 63 on the sleeve 51 is brought into contact with the extended end of the stop pin 62. Further movement of the sleeve 51 pushes the pin 62 and consequently the lever 58 about its pivot 44 against the action of the spring 60 so as to disengage the recess 61 and the surface of the abutment 59 thereby releasing the starting lever 36

and permitting the spring 37 to force it upwardly out of operation.

This action opens the microswitch 55 so as to stop the motor 5, disengages the finger 53 from the thread of the sleeve 51, thus stopping the action of the timing mechanism and permitting the spring 52 to push the sleeve 51 back to the starting position, and also moves the slide plate 30 and the idler roller 31 out of operation so as to disengage the belt 32 from the pulley 18 and stop the rotation of the workholder assembly.

The retreat of the slide plate 30 removes the support finger 28 from the opening 29 in the weight 27 and permits weight 27 and lever 24 to pull shaft 19 downwardly so as to engage blocks 33 and 35 and to present the workholder in alignment with the loading apertures 22.

This stop action may be accomplished at will through the use of a manual stop pin 64 which has a finger button 65. Pressure on the button 65 will cause the inner end of the pin 64 to move lever 58 about its pivot and release the starting lever 36.

The time period of the operation of the machine may be varied either by using threaded timing sleeves with threads of different pitch and sleeves of different diameter, by adjusting the stop pin 62 so that the sleeve 51 will travel a greater or less distance as desired before contacting the pin or by operating the manual stop pin 64. Adjustment of pin 62 may be accomplished through a locking bolt 66.

Having described my invention, I claim:

1. A toolholder and a workholder mounted for such relative rotational movement with respect to each other as will cause a tool in said toolholder to operate on a workpiece in said workholder, and timing means adapted to automatically terminate said operation, said timing means including an exteriorly threaded sleeve mounted for longitudinal movement with respect to, and for rotational movement with, a driven shaft, a finger adapted to engage said thread and thereby cause said sleeve to progress along said shaft in accordance with the rotation thereof, and a stop member adapted to operate when said sleeve reaches a given position on said shaft.

2. A toolholder member and a workholder member mounted for straight line and rotational movement with respect thereto, power delivery means adapted to impart said rotational movement to said workholder member and being normally held in inoperative relation with respect thereto, and means adapted to conjointly control said straight line movement and bring said power delivery means into operative relation with said workholder member, said last named means including a lever connected to said workholder and a lever operated slide plate having an idler roller and a supporting portion adapted to limit the movement of said workholder lever.

3. A toolholder and a workholder assembly mounted for relative rotational movement with respect to each other, said assembly including a rotatable sleeve member having a side wall loading opening and a holding portion adjacent one end thereof, and a shaft member mounted in said sleeve member for rotation therewith and sliding movement with respect thereto, said shaft member having a base on one end thereof adapted to cooperate with said holding portion, and said sliding movement being such as to provide separation and closing action between said holding portion and said base sufficient to permit loading of a workpiece in said workholder assembly through said side wall loading opening.

4. A toolholder and a workholder assembly mounted for such relative rotational movement with respect to each other as will cause a tool in said toolholder to operate on a workpiece in said workholder assembly, and timing means adapted to automatically terminate said operation, said workholder assembly including a sleeve member and a shaft member in said sleeve with said members adapted for relative movement with respect to each other, one of said members having a holding portion and the other of said members having a base thereon, with said relative movement of said members being such as to provide separation and closing action between said holding portion and said base sufficient to permit loading and unloading of a workpiece in said workholder assembly, and said timing means including a threaded member and a member having a portion adapted to ride in said thread upon relative movement between said members, and means adapted to produce such relative movement between said members.

5. A toolholder and a workholder assembly mounted for such relative rotational movement with respect to each other as will cause a tool in said toolholder to operate on a workpiece in said workholder assembly, and timing means adapted to automatically terminate said operation, said workholder assembly including a rotatable sleeve member having a side wall loading opening and a holding portion adjacent one end thereof, and a shaft member mounted in said sleeve member for rotation therewith and sliding movement with respect thereto, said shaft member having a base on one end thereof adapted to cooperate with said holding portion, and said sliding movement being such as to provide separation and closing action between said holding portion and said base sufficient to permit loading of a workpiece in said workholder assembly through said side wall loading opening, and said timing means including an exteriorly threaded sleeve mounted for longitudinal movement with respect to, and for rotational movement with, a driven shaft, a finger adapted to engage said thread and thereby cause said sleeve to progress along said shaft in accordance with the rotation thereof, and a stop member adapted to operate when said sleeve reaches a given position on said shaft.

6. A toolholder member and a workholder assembly member mounted for relative straight line movement with respect to each other, the mounting of one of said members being, in addition, for such rotational movement as will cause a tool in said toolholder to operate on a workpiece in said workholder assembly, power delivery means adapted to impart said rotational movement to said one of said members and being normally held in inoperative relation with respect to said one of said members, means having portions adapted to conjointly control said straight line movement and bring said power delivery means into operative relation with said one of said members, and timing means adapted to automatically terminate said operation, said workholder assembly including a sleeve member and a shaft member in said sleeve with said members adapted for relative movement with respect to each other, one of said members having a holding portion and the other of said members having a base thereon, with said relative movement of said members being such as to provide separation and closing action between said holding portion and said base sufficient to permit loading and unloading of a work-

piece in said workholder assembly, and said timing means including a threaded member and a member having a portion adapted to ride in said thread upon relative movement between said members, and means adapted to produce such relative movement between said members.

7. A toolholder member and a workholder assembly member mounted for straight line and rotational movement with respect thereto, power delivery means adapted to impart said rotational movement to said workholder assembly member and being normally held in inoperative relation with respect thereto, means adapted to conjointly control said straight line movement and bring said power delivery means into operative relation with said workholder member, and timing means adapted to automatically terminate said operative relation, said workholder assembly including a rotatable sleeve member having a side wall loading opening and a holding portion adjacent one end thereof, and a shaft member mounted in said sleeve member for rotation therewith and sliding movement with respect thereto, said shaft member having a base on one end thereof adapted to cooperate with said holding portion and said sliding movement being such as to provide separation and closing action between said holding portion and said base sufficient to permit loading of a workpiece in said workholder assembly through said side wall loading opening, said control means including a lever connected to said workholder assembly and a lever operated slide plate having an idler pulley and a supporting portion adapted to limit the movement of said workholder assembly lever, and said timing means including an exteriorly threaded sleeve mounted for longitudinal movement with respect to, and for rotational movement with, a driven shaft, a finger adapted to engage said thread and thereby cause said sleeve to progress along said shaft in accordance with the rotation thereof, and a stop member adapted to operate when said sleeve reaches a given position on said shaft.

8. A toolholder and a workholder mounted for straight line and rotational movement with respect thereto, a starting member, power delivery means adapted to impart said rotational movement to said workholder and being normally held in inoperative relation with respect thereto, linkage means connected to said starting member, means, operable through said starting member and linkage, adapted to conjointly control said straight line movement and bring said power delivery means into operative relation with said workholder, and timing means adapted to automatically terminate said operative relation, said control means including a lever connected to said workholder and a slide plate having an idler roller and a supporting portion adapted to limit the movement of said workholder lever, and said timing means including an exteriorly threaded sleeve mounted for longitudinal movement with respect to, and for rotational movement with, a driven shaft, a finger mounted on said starting member and adapted to engage said thread and thereby cause said sleeve to progress along said shaft in accordance with the rotation thereof, and a stop member adapted to operate when said sleeve reaches a given position on said shaft.

9. A tool holder and a workholder mounted for such relative rotational movement with respect to each other as will cause a tool in said toolholder to operate on a workpiece in said workholder, a starting member, timing means adapted to automatically terminate said operation, said timing means including an exteriorly threaded sleeve mounted for longitudinal movement with respect to, and for rotational movement with, a driven shaft, a finger mounted on said starting member and adapted to engage said thread and thereby cause said sleeve to progress along said shaft in accordance with the rotation thereof, a holding device adapted to so detain said starting member as to maintain said finger in engagement with said thread, and a stop member mounted on said holding device and adapted, when said sleeve reaches a given position on said shaft, to so engage a stop surface, moved in concurrence with the longitudinal movement of said sleeve, as to release said holding device and said starting member.

10. A toolholder and a workholder mounted for straight line and rotational movement with respect thereto, a starting member, power delivery means adapted to impart said rotational movement to said workholder and being normally held in inoperative relation with respect thereto, linkage means connected to said starting member, means, operable through said starting member and linkage, adapted to conjointly control said straight line movement and bring said power delivery means into operative relation with said workholder, timing means adapted to automatically terminate said operative relation, said control means including a lever connected to said workholder and a slide plate having an idler roller and a supporting portion adapted to limit the movement of said workholder lever, said timing means including an exteriorly threaded sleeve mounted for longitudinal movement with respect to, and for rotational movement with, a driven shaft, a finger mounted on said starting member and adapted to engage said thread and thereby cause said sleeve to progress along said shaft in accordance with the rotation thereof, a holding device adapted to so detain said starting member as to maintain said finger in engagement with said thread, and a stop member mounted on said holding device and adapted, when said sleeve reaches a given position on said shaft, to so engage a stop surface, moved in concurrence with the longitudinal movement of said sleeve, as to release said holding device and said starting member.

11. A surfacing machine comprising a toolholder and a workholder assembly mounted for rotational and relative straight line motion with respect to each other, means for rotating said workholder, said workholder assembly including a sleeve formed with a holding member at one end and a shaft slidable in said sleeve formed with a base for cooperation with said holding member in supporting a workpiece, means for rotating said tool holder, a tool contacted at one end by said toolholder, said end being moved in a circular path, and said tool being moved in a conical path, the other end of said tool being formed with a ball shaped projection to provide a spherical contacting working surface, said working surface engaging said workpiece at the apex of the path of movement of said tool, means preventing rotation of said tool by said workholder while said workholder is rotating and means for bringing said tool into working contact with said workpiece for a limited period of time.

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