May 29, 1962 F. R. WHITCOMB 3,036,409

TOOL FEED CONTROL

Filed Nov. 2, 1960

FIG. 1

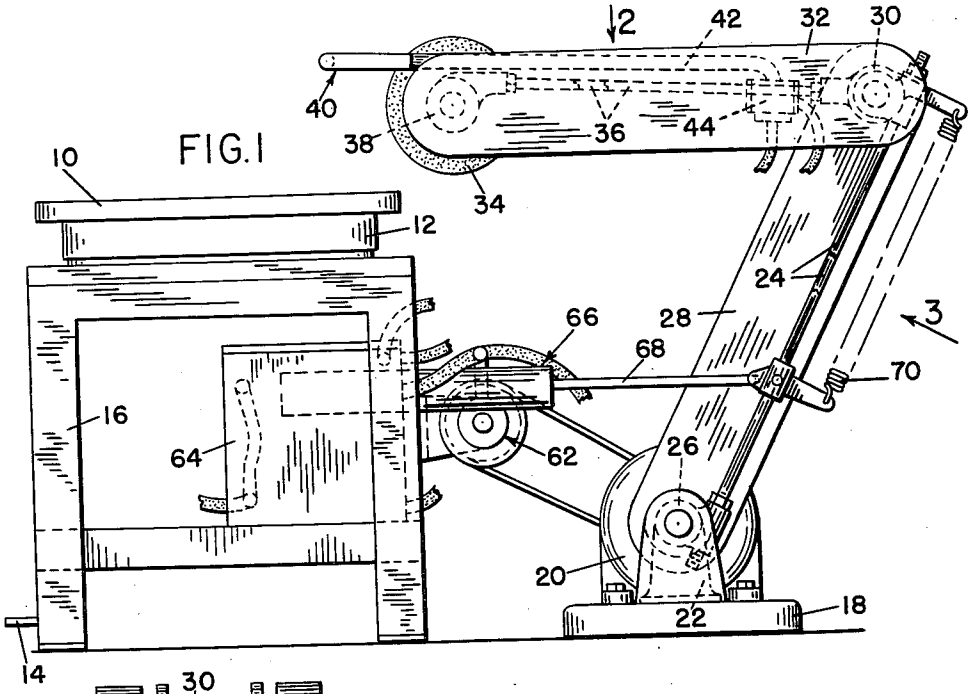


FIG. 2

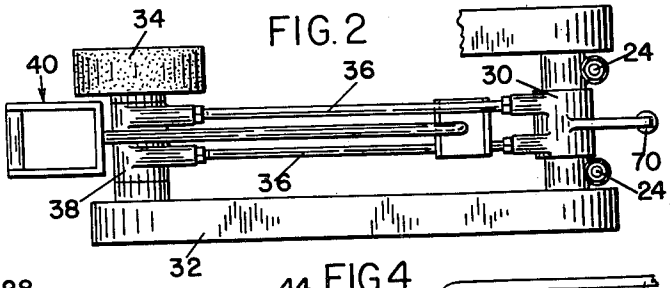


FIG. 3

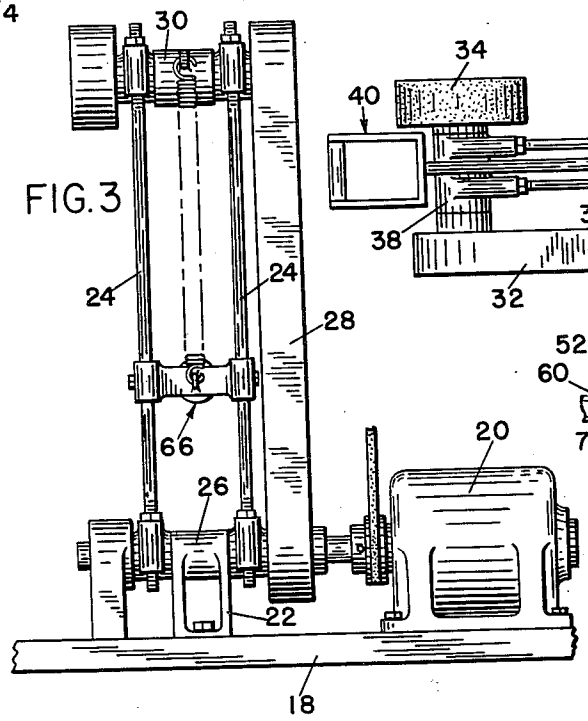
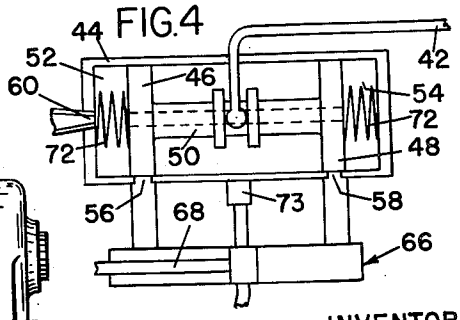


FIG. 4



INVENTOR

FORREST R. WHITCOMB

by Charles R. Fay.

ATTORNEY

United States Patent Office

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TOOL FEED CONTROL

Forrest R. Whitcomb, 152 Chandler St., Worcester, Mass.

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This invention relates to a new and improved tool feed control, and the principal object of the invention is to provide a movable tool which is completely under control of the operator as to the motion thereof relative to a workpiece, but at the same time is power-operated in the travel thereof and which is controlled by a new and improved mechanism to ensure that the travel of the tool is constant and is not affected by climb or resistance of the action of the cutting tool due to friction relative to the workpiece.

It is well known that when for instance a swing-type of rotary mounted tool is brought into contact with a workpiece, it tends to travel or climb in the direction of the rotation of the tool due to frictional engagement of the tool with the work. For instance, if a buffing wheel which is rapidly rotated and mounted on a freely movable swing, is brought into contact with the surface of a workpiece to polish the same, the tool if rotating toward the operator will in and of itself have a very definite and dangerous motion toward the operator, and of course the converse is true. This invention provides means overcoming this difficulty and controlling the feed of the tool positively and accurately by a very simple and efficient mechanism.

The invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly set forth in the appended claims.

Reference is to be had to the accompanying drawings, in which

FIG. 1 is a view in side elevation showing the invention;

FIG. 2 is a top plan view of a portion thereof;

FIG. 3 is a fragmentary end elevation, looking in the direction of arrow 3 in FIG. 1; and

FIG. 4 is a diagrammatic view showing a control valve.

In carrying out the present invention, the same is shown as being applied to a swing-type of tool which serves as a mount for a buffing wheel adapted to polish a workpiece which may be mounted on a work-table **10** rotatably mounted in turn on a rectilinearly movable table **12**. These work-supports may conveniently be controlled and locked as desired. The members **10** and **12** may be mounted in any way desired as on a framework **16** of more or less usual character, and it will be seen that the operator can position the work where desired.

In order to provide for a support for the present tool, there is provided a base plate **18** to the rear of the framework **16** and on this plate there may be mounted a motor **20** and a block or the like at **22** which provides a rotary mounting for a swing shaft. On the swing shaft there is mounted a standard **24** which in the case shown herein is conveniently provided by a pair of rods or tubes mounted to swing on the shaft located in the block **22** as for instance by a bearing or the like which is indicated at **26**.

The motor drives a pulley concealed in a guard **28** and this pulley may drive a belt, etc., also concealed within the guard **28** more or less as usual.

At the upper end of the standard **24**, there is provided a convenient housing **30** and this housing carries a jack shaft driven by the motor **20** which transfers the energy therefrom to a pulley mounted in another swing-like housing **32** again in more or less the usual manner. The guard **32** also conceals a pulley at the forward end thereof for driving the tool **34** which in this case is shown as a buffing wheel.

The housing at **30** may conveniently provide a support for a pair of forwardly-extending rods or tubes **36** and at their outer ends these rods or tubes provide a support for a bearing or housing which is indicated at **38**. The shaft directly driving the tool **34** is housed therein so that it will be seen that complete swinging tool type of device is power-driven. A handle generally indicated at **40** is provided by which the operator may swing the device in order to draw the tool down into contact with the work on the table **10** and also to move the tool **34** back-and-forth across the surface of the work.

The handle at **40**, however, in this invention is not mounted directly in fixed relation to the bearing housing at **38** but instead is mounted on a rod **42** which has a motion relative to said housing **38** and to the rod support **36** so that when handle **40** is grasped and pulled toward the operator, it has a slight motion forwardly relative to the tool.

The handle rod **42** is associated with a valve **44** which may be conveniently mounted on the rod support **36** and the handle member **42** controls the valve as will be seen from the diagrammatic view in FIG. 4. The valve **44** comprises in general a cylinder having a double-ended piston member **46**, **48**, connected by means of a member **50** which is bored from end-to-end so that the ends of the cylinder as at **52** and **54** communicate with each other. When the rod **42** is in neutral position, the valve members **46** and **48** completely cover ports **56** and **58**. There is a constant pressure applied through a port at **60**. This pressure may be obtained in any convenient way as by means of a conventional pump generally indicated at **62**, the same being conveniently driven from motor **20**. Other requisite means may also be provided such as the tank **64** and appropriate piping, etc. The ports **56** and **58** are connected to opposite ends of a ram generally indicated at **66** and comprising a cylinder mounted on the framework of the bench **16** and having a piston and piston rod **68** extending to and connected to the standard **24** by which means the ram **66** moves the entire standard and the tool forward and backward on the rock shaft in the block **22**. If desired, a balance spring **70** may be used to hold the tool **34** in its uppermost inoperative position as easily seen in FIG. 1.

When the operator grasps the handle **40**, thus moving rod **42** slightly forwardly, pressure entering port **60** will then travel through the slightly open port **56** to the left-hand end of cylinder **66** as seen in FIG. 4, thus moving the piston therein forwardly and moving the entire rocking or swinging tool forwardly at a controlled rate of speed. It is to be understood that although the motion of the rod **42** is limited to a relatively small travel, nevertheless by means of balance springs **72** within cylinder **44**, the operation or travel of the tool **34** is controlled very accurately so that the ports at **56** and **58** may be opened a relatively small amount for slow travel of the tool **34** in either direction, and they may be opened to greater degrees in order to provide for faster travel in corresponding degree. When the operator wishes to retract the tool, he merely pushes the handle to the rear. The pressure in both ends of the cylinder comprising the valve **44** is the same and this applies the pressure then to the opposite end of cylinder **66**, causing a controlled single speed retraction of the entire device as long as the operator keeps the handle in this position, i.e., by pushing slightly backwardly on it. Cylinder **66** exhausts from both ends at the opposite port **56** or **58**, depending upon which one is admitting pressure. Exhaust back to the tank is provided in the center of the valve **44** by means of the exhaust port at **73**.

It will be seen that this invention provides in a swinging tool mechanism a controlled forward and reverse feed under the control of the operator at all times by a

natural motion in the actuation of the machine in order to carry out its intended function; and no matter how hard the buffing tool or other tool is applied to the work, there will be no climb or unwanted progress of the tool due to the friction encountered between the tool and the work, and therefore the operator may carry out his operation quickly and easily and a great deal safer than with swing tools which are not controlled by power means such as is presented by the present invention. Particularly it is to be noted that the operator need only direct his attention to the work he is doing and need not consider with how much pressure he pulls the tool. In prior art devices of the class described, the operator must exert some skill in balancing the tool pressure on the work with the unwanted forward progress or rearward progress as the case may be, depending upon rotation of the tool.

One of the advantageous effects of this invention resides in the complete ease of control not only of the tool but also of the work which is clamped on the rotary table 10. By this means, it will be seen that the operator by either foot or hand controls, can reposition the work almost instantly while at the same time the tool is moved by power out of contact with the work. Thus odd shaped pieces may be quickly polished by power controlled operations both as to indexing of the work, rectilinearly and rotatably, and by the power occasioned travel of the tool backwards and forwards. As a matter of fact, shapes may be polished which may be done in no other way except by the old method of holding the piece of work in the hand and pushing it up to engagement with the stationary buff. Hence it is seen that the combination of the work-holding means and the tool is an extremely effective device for the quick, easy and accurate polishing of workpieces which could not be done in the prior art in any way except by a very skilled polisher, and the new invention provides for the action to be done better and much faster.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what I claim is:

1. A device of the class described comprising a base, a standard swingably mounted thereon, a second swinging member on said standard, a tool on said second swinging member, a handle adjacent said tool, said handle being slightly movable relative to said second swinging member and said tool, a valve on said second swinging member, a connection from the handle to the valve, a hydraulic cylinder mounted on said base, a piston and piston rod for said hydraulic cylinder connected to the standard and causing the same and with it the second swinging member to move in a swinging motion when actuated by the valve.

2. The device as recited in claim 1 wherein said valve comprises a balanced double-ended reciprocal valve connection and said valve being directly connected to said handle, a source of pressure at each end of said valve, one end of said cylinder being provided with pressure, depending upon the direction of actuation of said valve, and the other end of the cylinder acting as an exhaust.

3. The combination of a swingable standard, a tool on said standard for travel in a working path, a support, a work-holding member on said support, said work-holding member being mounted for combined rectilinear and rotary motion relative to said tool, the work holding member being rotatably mounted on an axis generally at right angles to the path of the tool, the path of said tool extending across the work-holding member, power means for traveling said tool relative to the work, said work-holding member and said tool being under the control of the operator at all times whereby the work-holding member may be shifted for a new stroke of the tool when the tool is retracted, the means for traveling said tool comprising a hydraulic cylinder, a piston and piston rod for the cylinder, said piston rod being connected to said standard for causing the same to swing, a valve and means under the control of the operator for operating said valve, said valve controlling the hydraulic piston in the reciprocal motion thereof.

4. The combination of a universally mounted work-holding table and a swinging buffing tool, said swinging buffing tool comprising a first standard mounted generally vertically to swing in a vertical plane and a second standard mounted generally horizontally at the upper end of the first standard, means mounting the second standard for swinging motion relative to the first standard, a buffing tool on said second standard, power means for moving the first standard on its axis to bring the buffing tool across the said work-holding table, and means located adjacent said buffing tool and under the control of the operator for controlling said power means.

5. The combination of claim 4 wherein the operator controlled means includes a handle mounted adjacent the buffing tool and in position to be grasped by the operator, and the control means being actuated by the said handle, said handle being movable relative to said second standard in order to accomplish the controlling function.

6. The combination of claim 4 wherein the operator controlled means for the power means includes a handle adjacent the buffing tool, a valve, said handle being connected to said valve for actuating the same forwardly and rearwardly, and wherein said power means includes a cylinder, and a piston rod therefor, said piston rod being connected to the first standard for moving the same on its axis, said second standard being generally free to move up and down under the control of the operator.

7. The combination of claim 4 wherein the operator controlled means for the power means includes a handle adjacent the buffing tool, a valve, said handle being connected to said valve for actuating the same forwardly and rearwardly, and wherein said power means includes a cylinder, and a piston rod therefor, said piston rod being connected to the first standard for moving the same on its axis, said second standard being generally free to move up and down under the control of the operator, and means balancing said second standard to maintain the buffing tool in a position above the work-holding table.

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