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SWITCH STRUCTURE FOR MOTOR-DRIVEN TOOLS

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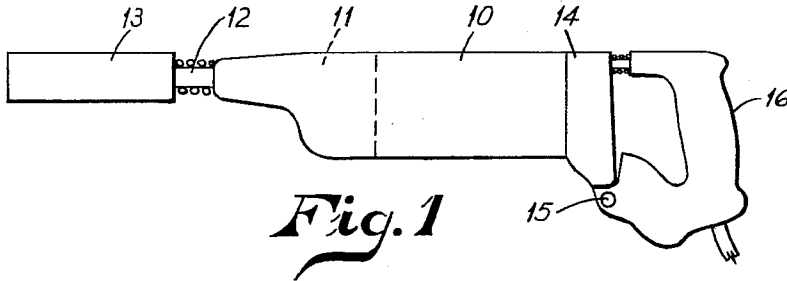


Fig. 1

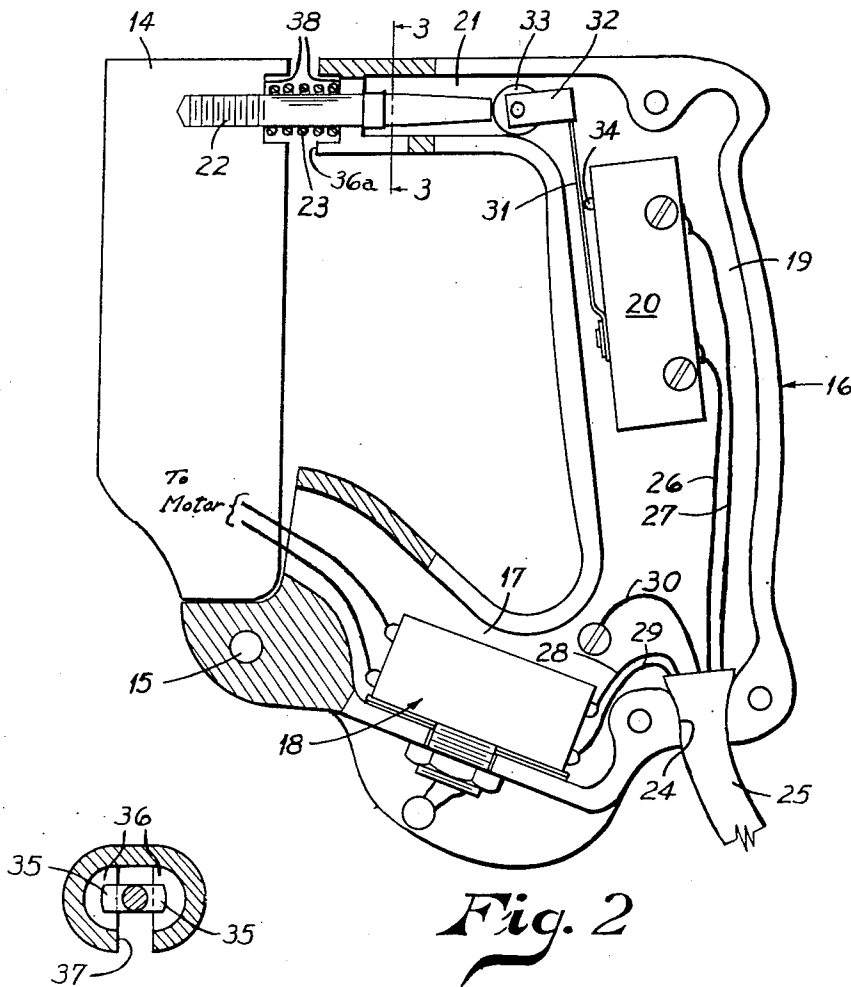


Fig. 2

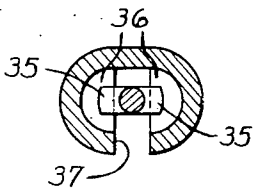


Fig. 3

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SWITCH STRUCTURE FOR MOTOR-DRIVEN TOOLS

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3 Claims. (Cl. 172—36)

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This invention relates to a control device for a hand-operated power tool such as a drill, tube expander, saw, or the like. For purposes of illustration this invention will be described with reference to its use on a tube expanding device.

There has been devised an electrical motor driven power tool for performing an expanding operation upon tubes to cause them to seize with a fluid-tight seal in a drilled tube sheet. Such a power tool is described for example in Dudley et al. Patent No. 2,431,316, dated November 25, 1947. The tool is designed to be advanced into a tube, and the amount of expansion of the tube is controlled by the length of time the tool operates against the tube and the closeness of the fit between the tube and its tube sheet. The amount of expansion, however, is critical. When the tube is overexpanded, it becomes brittle and cannot withstand the forces acting upon it while it is in normal operation. If, on the other hand, the tube is not expanded sufficiently, a tight joint will not be achieved and the tube will leak, thereby putting the associated apparatus out of working order.

To control the amount of rolling accurately and consistently, an electrical torque control has been devised, the control being inserted in the motor circuit in such a way that when the load on the motor reaches a predetermined value, the circuit through the motor is automatically cut off, thereby stopping the motor. The operation of the control involves a manual operation of a switch at the start of each rolling operation, in addition to the manually operated motor starting switch.

In order to reduce the number of special motions required of the operator, it is desirable that the manually operated switch for the control be actuated automatically by some necessary movement of the operator in the normal operation of the power tool.

The principal object of this invention is to provide a means for controlling a switch associated with a power tool, the switch being concealed and operated as an incident to the application of the normal pressure upon the power tool by the operator.

A more specific object of this invention is to provide a hinged handle for a hand-operated power tool, the handle having a limited angle of movement, with a switch of the micro switch variety concealed in the handle and operated by the oscillating motion of the handle about its hinge.

A feature of this invention is a construction of

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a hinged handle for a hand-operated power tool which permits the handle to be readily disassembled for inspection and repair.

These and other objects and features of this invention will become apparent from the following detailed description when taken together with the accompanying drawings, in which

Fig. 1 is a side elevation of a hand-operated power tool which incorporates a handle and a control switch made in accordance with this invention;

Fig. 2 is an enlarged view of the handle portion of the power tool of Fig. 1 with the cover removed to disclose the disposition of the switches and their operating means; and

Fig. 3 is a section taken through the handle of Fig. 2 along line 3—3.

The hand-operated power tool is comprised primarily of a motor 10, a gear box 11, the latter incorporating an automatically operated reversing gear which is made effective whenever the tool is withdrawn from the work; a spindle 12 driven from the gear box 11, and a suitable tool-receiving chuck 13 which is adapted to hold the expanding tool frictionally for rotation with spindle 12. The frame 14 of the power tool is provided at its lower end with a hinge pin 15 on which is mounted a U-shaped handle 16 which is gripped by the operator during the normal operation of the power tool.

As shown in Fig. 2, the handle 16 is provided with a cavity 17 in the lower leg of the U in which is disposed a toggle switch 18, a cavity 19 in which is disposed a micro switch 20 and a cavity 21 in the upper leg of the U in which is disposed a guide pin 22 secured to frame member 14. A spring 23 is compressed between handle 16 and frame 14 and normally tends to rotate handle 16 about hinge pin 15 in a clockwise direction as viewed in Fig. 2. An opening 24 is provided in the bottom of handle 16 through which a cable 25 passes, said cable having substantially five leads, two of which, 26, 27, are connected to micro switch 20, another two, 28, 29, are connected to toggle switch 18, and the fifth, 30, is connected to the handle and serves as a ground for the power tool. The leads 28, 29 are connected to a suitable source of power (not shown) and also to a control device (not shown) such as the aforesaid Dudley device. Leads 26, 27 are likewise connected to the said control device. The electrical circuits which may be used are not material to the operation of this invention and hence are not described in detail here.

Micro switch 20 has an arm 31 extending out-

wardly beyond the upper end of switch 20 and terminating in a bracket 32 in which is pivotally mounted a roller 33. Guide pin 22 is aligned with roller 33 such that upon pushing handle 16 toward the power tool, the end of pin 22 will contact roller 33 and urge said roller to the right as viewed in Fig. 2. A movable contact operating pin 34 is interposed in the path of movement of arm 31. As roller 33 is moved to the right, arm 31 is correspondingly moved to the right also. Pin 34 will be contacted by arm 31 and likewise will be moved to the right to operate the contacts within switch 20 (not shown). Inasmuch as switch 20 may be any commercially available micro switch, the details of construction thereof are not described herein in detail.

Pin 22 is formed with a pair of lugs 35 (Fig. 3) which abut on stops 36 formed in handle 16, thereby limiting clockwise rotation, as viewed in Fig. 3, of handle 16 about its hinge pin 15. Counterclockwise rotation of the said handle is limited by contact between the end 36a of the handle and the frame member 14. A slot 37 is formed in handle 16, the slot being wide enough so that when hinge pin 15 is removed to free the lower end of the handle, said handle may be rotated about pin 22 until lugs 35 are aligned with slot 37, whereupon handle 16 may then be withdrawn from the pin. This facilitates disassembly of the handle for inspection or repairs.

Suitable recesses 38 may be provided either in the handle or the frame 14 or both to receive spring 23 when the end 36a of the handle strikes frame 14, sufficient space being provided in the recesses to accommodate the entire spring 23 without compressing said spring to its solid height.

In the operation of the power tool, toggle switch 18 may be operated in the usual manner to start motor 10, and the tool is then moved to its work station. Pressure is applied upon handle 16 by the operator to the left as viewed in Figs. 1 and 2 to advance the tool into the tube to be rolled. The pressure overcomes the resistance of spring 23 and allows handle 16 to be rotated about its hinge pin 15 in a counterclockwise direction relative to frame member 14. The counterclockwise rotation in turn causes pin 32 to strike roller 33 thereby causing arm 31 to strike pin 34 and operate micro switch 20. This condition will obtain as long as pressure is exerted upon handle 16 to operate the tool in the tube. When the desired operation is completed at the selected work station, the tool is withdrawn by pulling to the right on handle 16. This, of course, reverses the thrust on the handle, causing the handle to be rotated in a clockwise direction about hinge pin 15, relieving the pressure between the end of pin 22 and roller 33, thereby allowing arm 31 to move to the left as viewed in Fig. 1 away from operating pin 34 and reversing the function of micro switch 20.

It will be apparent from the following description that the location and operation of micro switch 20 is such that no conscious effort on the part of the operator is required to effect its operation. The operator merely turns switch 18 to its "on" position and leaves it in that position while going from one work station to another, the motor being automatically started by the micro switch and stopped by the aforesaid control. The motor is reversed by the pull of the

operator on handle 16 to withdraw the tool from the tube, which automatically restores micro switch 20 to its initial condition.

Since the entire handle 16 moves to operate micro switch 20, it is not necessary for the operator to look for and depress a special button each time he changes work stations. This is particularly advantageous where unskilled labor is used.

When the handle 16 is to be removed for servicing or inspection, hinge pin 15 is removed and handle 16 is then rotated approximately 90° about pin 22 until lugs 35 clear stops 36, whereupon the handle is pulled to the right as viewed in Fig. 2.

It is understood that the foregoing description is illustrative of a preferred embodiment of this invention and that the scope of the invention is not to be limited thereto, but is to be determined by the appended claims.

What is claimed is:

1. In a portable electric tool having a casing and a motor therein, a substantially U-shaped grip, a hinged connection between the casing and one leg of the U, a guide pin on the casing, the other leg having an opening therein aligned with the pin, a motor-controlling switch in the grip having an operating lever aligned with the pin and adapted to be operated by the pin as the grip is rotated in one direction about the said hinged connection, resilient means interposed between the said other leg and the casing and urging the grip in one direction, and stop means on the casing cooperating with the grip and limiting the movement of the grip relative to the housing to an oscillatory movement.

2. In a tool having a casing, a substantially U-shaped grip, a separable pivoted connection between the casing and one leg of the U, a guide pin on the casing, the other leg having an opening therein aligned with the pin, a tool-control means in the grip, said means having an operating lever aligned with the pin and adapted to be operated by the pin as the grip is rotated in one direction about said pivoted connection, an abutment on the said other leg, and a stop on the pin adapted to strike said abutment to limit movement of the handle relative to said pin, said abutment being movable out of the path of the stop when the said pivoted connection is separated and the grip is rotated about the said pin.

3. In a tool, the combination as described in claim 2, said opening being of substantially the same contour as the stop such that when the grip is rotated about the pin, the stop will become aligned with the opening and will pass through the opening, thereby permitting a separation between the grip and tool.

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