# United States Patent

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[72] Inventor **Harold E. Wiggins**
**Clarkston, Mich.**



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[73] Assignee **Wells-Index Corporation**
**Three Rivers, Mich.**


[54] **MACHINE TOOL SWITCH UNIT ACTUATED BY LONGITUDINALLY AND ANGULARLY MOVABLE HANDLE**
**5 Claims, 5 Drawing Figs.**


[52] **U.S. Cl.** ..... **200/4,** 200/153 L, 200/157
[51] **Int. Cl.** ..... **H01h 25/06,** H01h 9/06
[50] **Field of Search** ..... 200/4, 157, 153 LA, 153 LB, 153, 153 K



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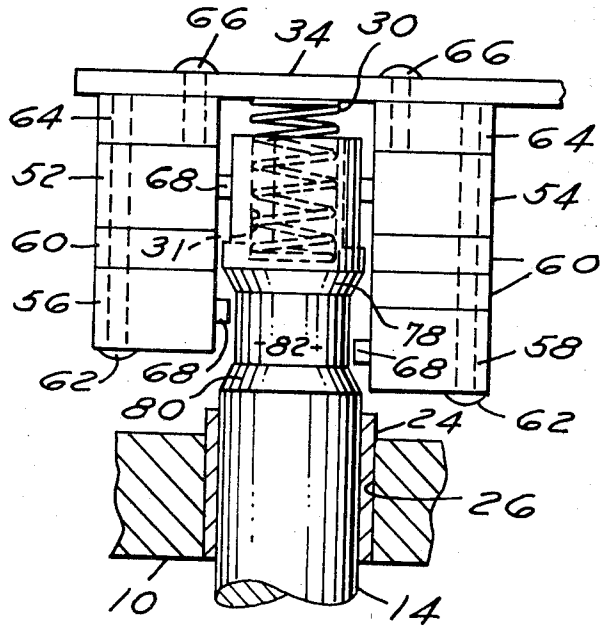
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*Primary Examiner*—Robert K. Schaefer
*Assistant Examiner*—Robert A. Vanderhye
*Attorney*—Barnes, Kisselle, Raisch & Choate



**ABSTRACT:** A switch unit for a machine tool having a handle which is manually movable in various directions from a neutral position to control the operation of a cutting tool. Upward and downward vertical displacement and counterclockwise and clockwise rotation of the handle from its neutral position actuates switches controlling electrical and/or hydraulic circuits which move the tool upward and downward vertically and rotate the tool counterclockwise and clockwise respectively. The handle can be rotated from any vertical position, and vertically displaced from any angular position.

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SHEET 1 OF 2

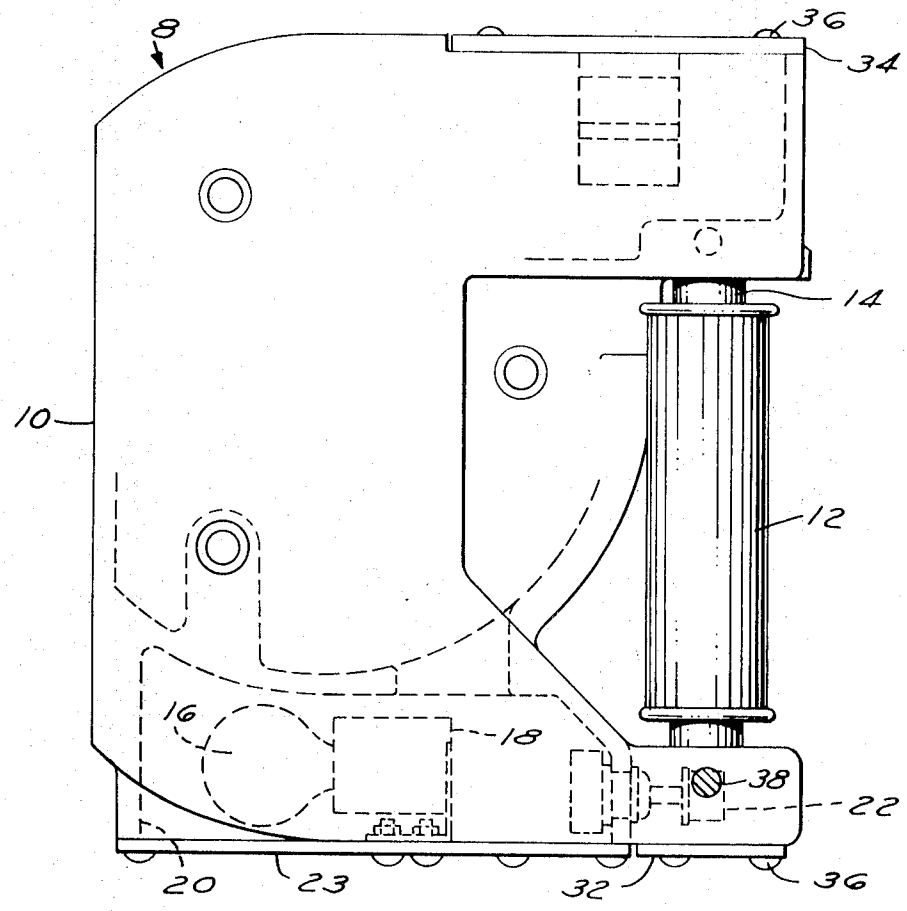



FIG. 1

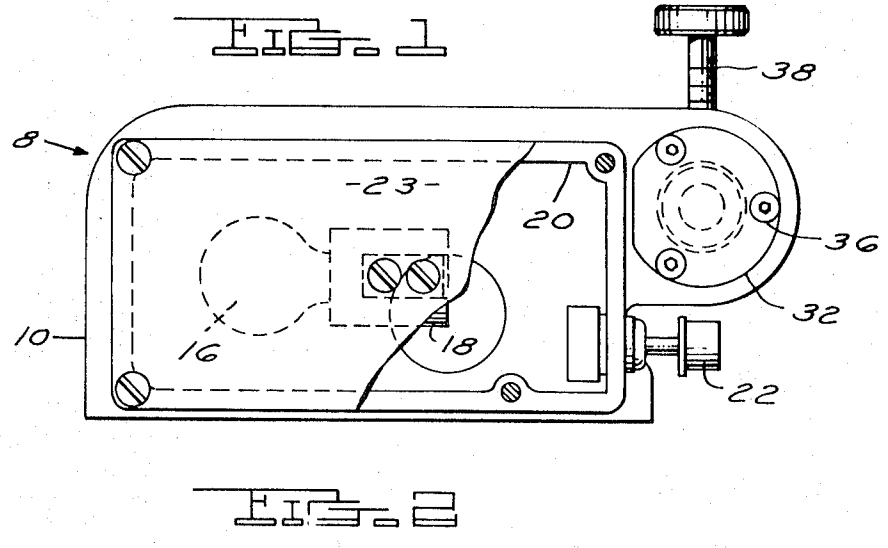



FIG. 2

INVENTOR
HAROLD E. WIGGINS
BY
Barnes, Kisselle, Raisch & Choate
ATTORNEYS

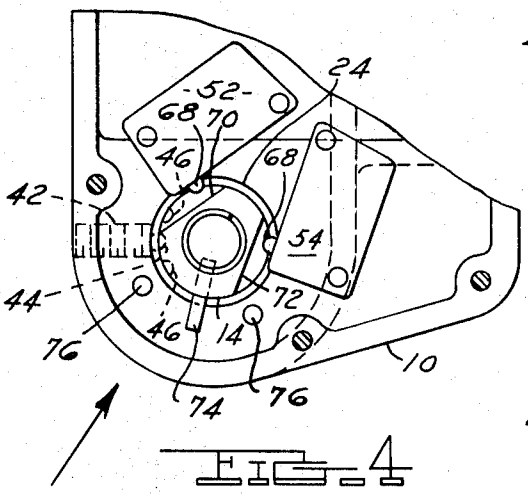



FIG. 4

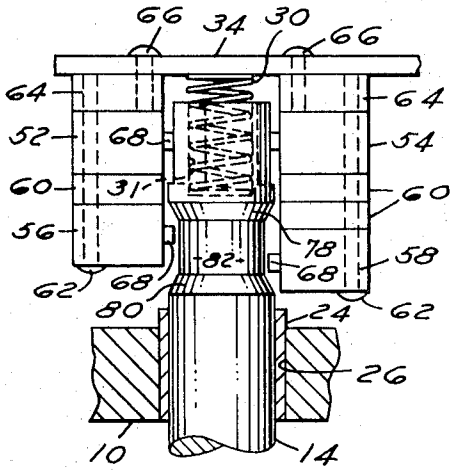



FIG. 5

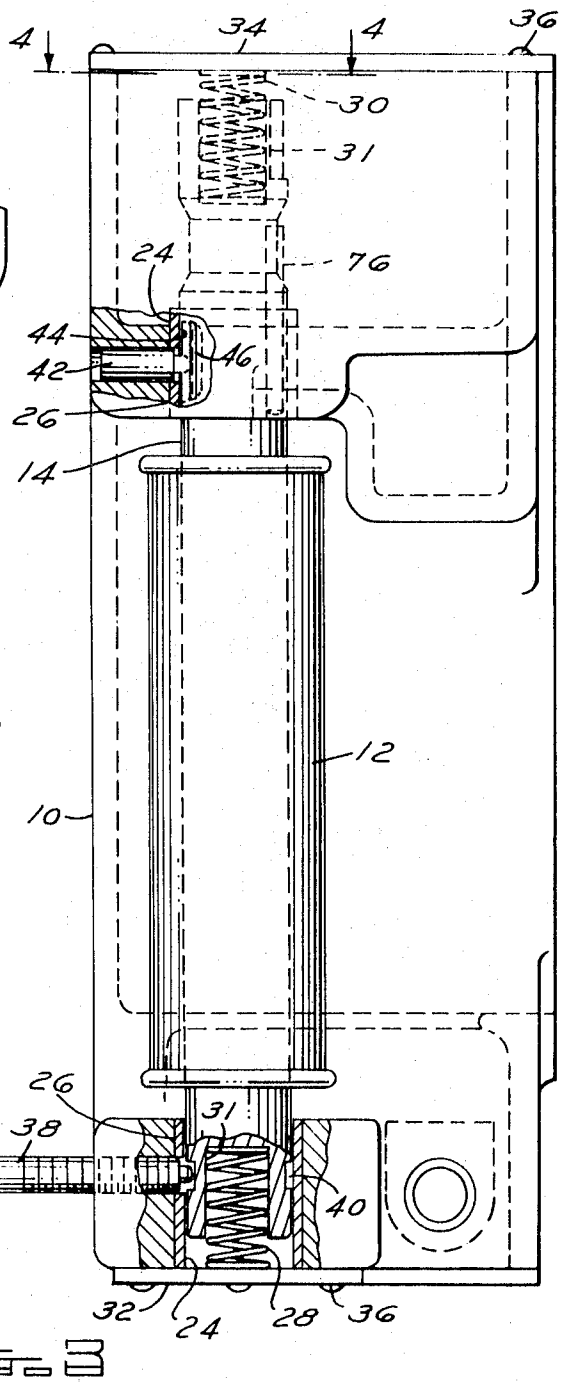



FIG. 3

INVENTOR
HAROLD E. WIGGINS
BY Barnes, Kisselle, Raisch & Choate
ATTORNEYS

# MACHINE TOOL SWITCH UNIT ACTUATED BY LONGITUDINALLY AND ANGULARLY MOVABLE HANDLE

This invention relates to a switch unit having a single handle for controlling several functions of a machine tool.

In many machine tools such as a radial drill, the tool spindle must be rotated in opposite directions and the tool-supporting head must be adjusted vertically up and down.

An object of this invention is to provide a machine tool switching unit with a single control handle which is of comparatively simple design and can be economically manufactured and assembled and readily serviced.

This and other objects, features and advantages of this invention are disclosed in the following detailed description and drawings in which:

FIG. 1 is a side elevational view of a switch unit of this invention illustrating the control handle in the neutral position.

FIG. 2 is a bottom plan view of the switch unit illustrating a built-in light.

FIG. 3 is an end elevational view of the switch unit illustrating the mounting of the control handle and shaft in the housing.

FIG. 4 is a fragmentary sectional view on line 4—4 of FIG. 3 illustrating an arrangement of cams and switches.

FIG. 5 is a fragmentary sectional view in the direction of the arrow in FIG. 4 illustrating the mounting of switches with respect to the control handle and shaft.

FIGS. 1 and 2 show a switch unit 8 with a C-shaped housing 10 and a control handle 12 fixed to a shaft 14. Unit 8 includes an illuminating light bulb 16 retained by socket 18 in a pocket 20 in the bottom of housing 10 and controlled by a switch 22. A transparent panel 23 extends over the lower open side of pocket 20.

As shown in FIG. 3, shaft 14 is mounted for axial displacement and rotation in housing 10 by bushings 24 press fitted into housing openings 26. Shaft 14 is vertically centered in a neutral position by compression springs 28 and 30 having substantially equal spring rates. Blind holes 31 in opposed ends of shaft 14 captivate springs 28 and 30 which bear on end plates 32 and 34 secured to housing 10 by screws 36. To lock shaft 14 in the neutral vertical position a thumb screw 38 threaded in housing 10 extends into a circular groove 40 in shaft 14. Shaft 14 is restrained in a neutral rotary position by yieldably biased detent assembly 42 engaging in a vertical slot 44 in shaft 14. Shaft 14 is yieldably restrained in both clockwise and counterclockwise positions of rotation from the neutral position by detent 42 and circumferentially spaced vertical slot 46 (FIG. 4). Slots 44 and 46 extend axially of shaft 14 sufficiently to allow the shaft to be fully displaced vertically from the neutral position while still restrained from rotation by plunger 42.

As shown in FIGS. 4 and 5, switches 52, 54, 56, 58 and spacers 60 are vertically stacked and secured by screws 62 to mounting pads 64. Mounting pads 64 are fastened to end plate 34 by screws 66. Each switch has a movable plunger or actuator 68 to open and close the switch. Actuator 68 is yieldably biased toward its extended position and if depressed will close the switch and when released will return to the extended position and open the switch. Switches 52 and 54 are operated by cam flats 70 and 72 on shaft 14. The actuators and cam flats are positioned so that cam 70 operates switch 52 through its actuator when shaft 14 is displaced counterclockwise from its neutral rotary position (as viewed in FIG. 4). Cam 72 operates switch 54 when shaft 14 is displaced clockwise from its neutral rotary position. A pin 74 fixed to shaft 14 and extending between two spaced apart positive stop pins 76 fixed to housing 10 limits rotation of shaft 14 in opposite directions such that switches 52 and 54 cannot be simultaneously operated. Switches 56 and 58 are operated by conical or axially inclined and radially curved cams or shoulders 78 and 80 on shaft 14 (FIG. 5). Switches 56, 58 and conical cams 78, 80 are axially spaced and positioned so that cam 78 operates switch 56 only when shaft 14 is displaced vertically downward from its vertically neutral position and cam 80 operates switch 58 only when shaft 14 is displaced vertically upward from its vertically neutral position. End plates 32 and 34 limit the extent of axial movement of shaft 14 in opposite directions such that switches 56 and 58 cannot be simultaneously operated. Cams 78 and 80 are circular so that switches 56 and 58 can be operated while shaft 14 is rotated to operate switch 52 or 54. Cam flats 70 and 72 are axially extended so that switches 52 and 54 can be actuated regardless of the vertical position of shaft 14. Shank portion 82 of shaft 14 between cams 78, 80 has a reduced diameter so that it does not interfere with the operation of switches 56 and 58.

In operation, switches 52, 54, 56 and 58 are connected to the electrical circuits of a machine tool controlling the counterclockwise and clockwise rotation of a tool spindle and the movement of a head carrying the spindle downward and upward vertically respectively. With handle 12 and shaft 14 of the unit in the neutral position and the electrical circuits energized, both the spindle and head are at rest. When it is desired to rotate the tool-supporting spindle counterclockwise, to back out a tap, for example, handle 12 is turned counterclockwise (as viewed in FIG. 4) so that cam 70 operates switch 52 by displacing its actuator 68. The spindle is rotated clockwise by turning handle 12 clockwise so that cam 72 operates switch 54 by displacing its actuator 68. When handle 12 is turned about its axis away from the neutral position, detent 42 engages one of slots 46 so that either switch 52 or 54 continues to be actuated and the spindle rotates until handle 12 and shaft 14 are returned to the neutral point. Thumb screw 38 is retracted from circular slot 40 in the lower end of shaft 14 when it is desired to shift handle 12 vertically. The machine tool head carrying the spindle is moved vertically downward by shifting handle 12 below its neutral position against the bias of spring 28 so that circular cam 78 operates switch 56 by displacing its actuator 68. The head is moved upward by shifting handle 12 above its neutral position against the bias of spring 30 so that circular cam 80 operates switch 58 by displacing its actuator 68. Vertical movement of the tool stops whenever handle 12 is released because springs 28 and 30 return shaft 14 to the neutral position thereby allowing switches 56 and 58 to open. The head and spindle can be simultaneously moved and rotated by manipulating handle 12 so that shaft 14 is both rotated and vertically displaced from its neutral position. For example, moving shaft 14 both downward and clockwise will both rotate the spindle and advance the head and spindle toward a workpiece. To prevent the head from being inadvertently moved vertically, thumb screw 38 is manipulated to engage in slot 40 of shaft 14.

I claim:

1. A switch control unit for a machine tool comprising a housing, a control shaft mounted in the housing for reciprocation and for rotation in opposite directions about its longitudinal axis through less than 180° from a neutral position, said shaft having a pair of flats thereon forming a pair of circumferentially spaced recessed around the outer periphery of said shaft, a pair of switches in said housing spaced circumferentially of the shaft and each having an actuator normally projecting into one of said recesses, said flats being disposed such that when the shaft is rotated in one direction from the neutral position one of said switches is actuated and when rotated in the opposite direction from the neutral position the other switch is actuated, said shaft also having a portion thereof disposed between its ends which is of reduced diameter, said portion of reduced diameter being defined at each end by an annular radially outwardly extending shoulder, a second pair of switches in said housing spaced apart axially of the shaft, each of said last-mentioned switches having an actuator projecting into the annular space between said shoulders, one of said last-mentioned actuators being disposed adjacent one of said shoulders and the other of said last-mentioned actuators being disposed adjacent the other shoulder so that when the shaft is actuated axially in one direction from the neutral position one of said last-mentioned switches is ac-

tuated and when the shaft is shifted axially in the other direction from the neutral position the other of the last-mentioned switches is actuated.

2. A switch control unit for a machine tool comprising a housing, a control handle having a longitudinal axis, means supporting said handle on the housing for rotation about said axis through a predetermined arc in opposite directions from a neutral rotary position and for axial reciprocation through a predetermined distance in opposite directions from a neutral axial position, said housing having a first and a second pair of switches mounted thereon with each switch having an actuator biased to an open position and movable to a closed position, said control handle having first and second pairs of cam surfaces thereon associated one with each of said switches for moving said actuators from open to closed position upon rotation and axial movement of said handle from said neutral positions, said first pair of cam surfaces comprising two circumferentially spaced abutments on said handle, each of said abutments extending axially of the handle a distance corresponding to at least the extent of said axial reciprocation of the handle from said neutral axial position, the switches of said first pair being associated one with each of the cam surfaces of said first pair of cam surfaces such that rotation of the handle, irrespective of its axial position, from said neutral position in one direction moves to actuator of one of the switches of said first pair to its closed position and rotation from said neutral rotary position in the opposite direction moves the actuator of the other switch of said first pair to its closed position, said second pair of cam surfaces comprising two axially spaced radial abutments of said handle each extending circumferentially thereof a distance corresponding to at least the extent of said rotary movement of the handle in opposite directions from said neutral rotary position, the switches of said second pair being associated one with each of said axially spaced radial abutments such that axial displacement of said handle, irrespective of its rotary position, in one direction from said neutral axial position moves the actuator of one of the switches of said second pair to its closed position and axial displacement of said handle in the opposite direction from said neutral axial position moves the actuator of the other switch of said second pair to its closed position, said means supporting the handle on the housing enabling simultaneous rotation and axial reciprocation of the handle, whereby a switch of both said first and said second pair can be simultaneously closed.

3. The switch control unit of claim 2 in which said second pair of cam surfaces is each frustoconical and integral with said control handle.

4. The switch control unit of claim 2 in which said first pair of cam surfaces each comprises a flat surface on and integral with said control handle, the actuators of said first pair of switches being radially and circumferentially spaced from said shaft for cooperation with said flat surfaces, said second pair of cam surfaces each comprises a frustoconical surface on and integral with said control handle, and the actuators of said second pair of switches being radially, circumferentially and axially spaced from said control handle for cooperation with said frustoconical surfaces.

5. The switch control unit of claim 2 in which said second pair of cam surfaces encircles the longitudinal axis of said control handle.

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