

Jan. 4, 1944.

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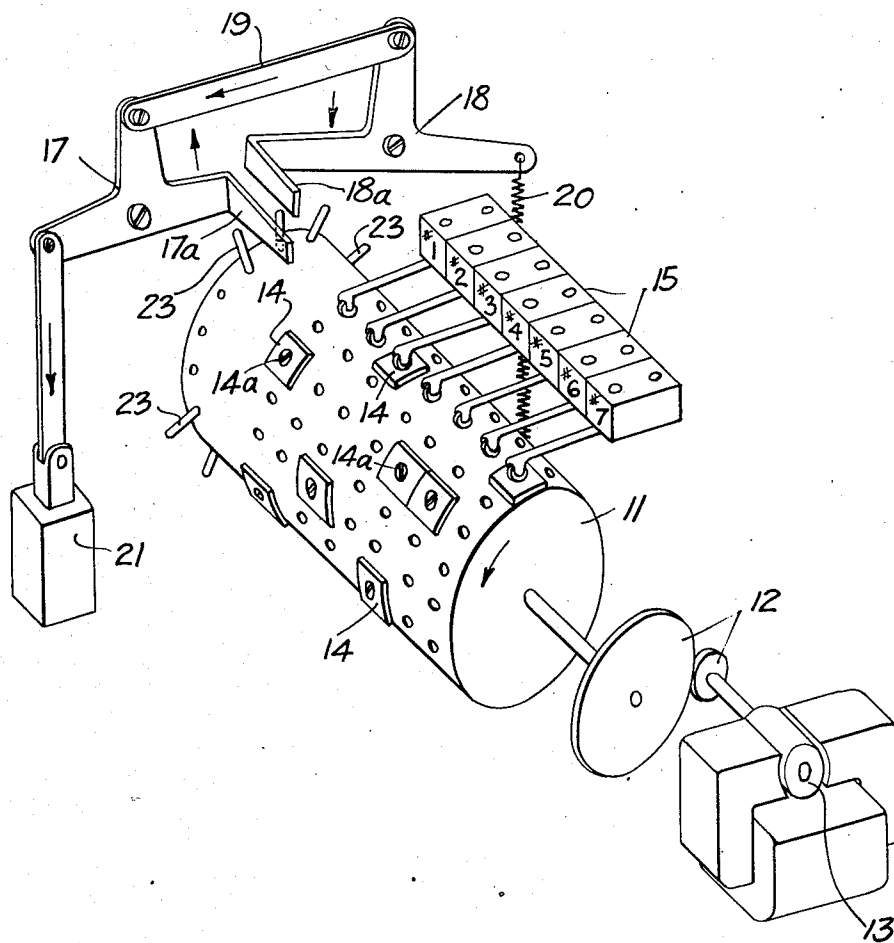
2,338,305

ELECTRIC CONTROL SWITCH

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4 Sheets-Sheet 1

Fig:1



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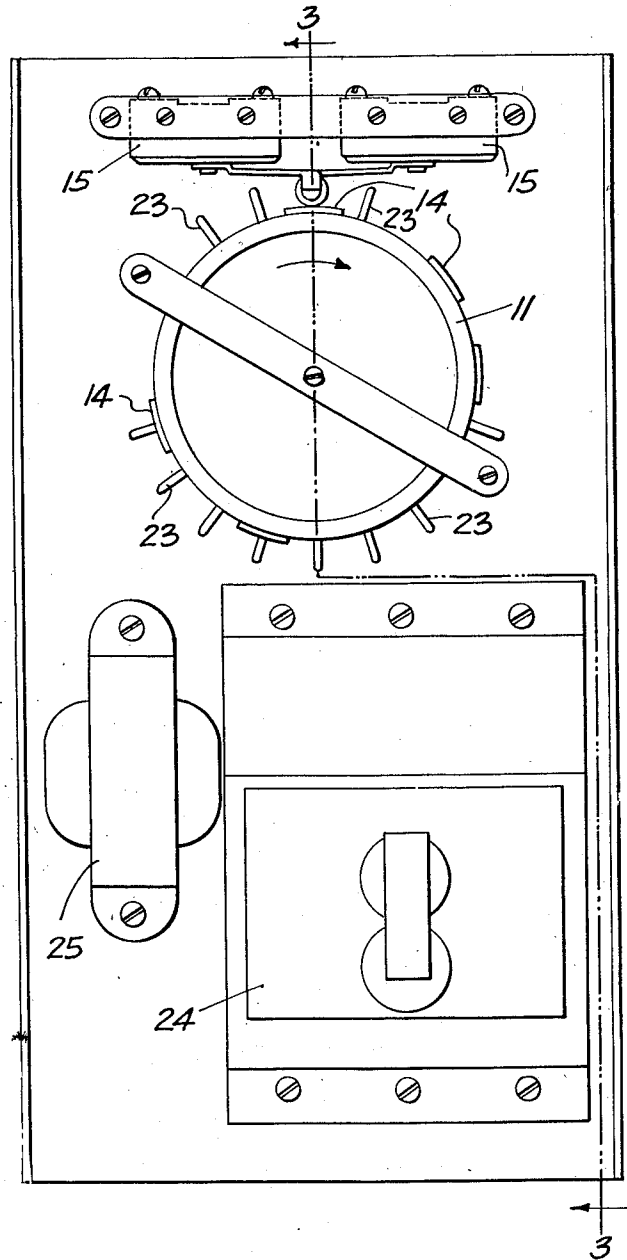
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Fig: 2



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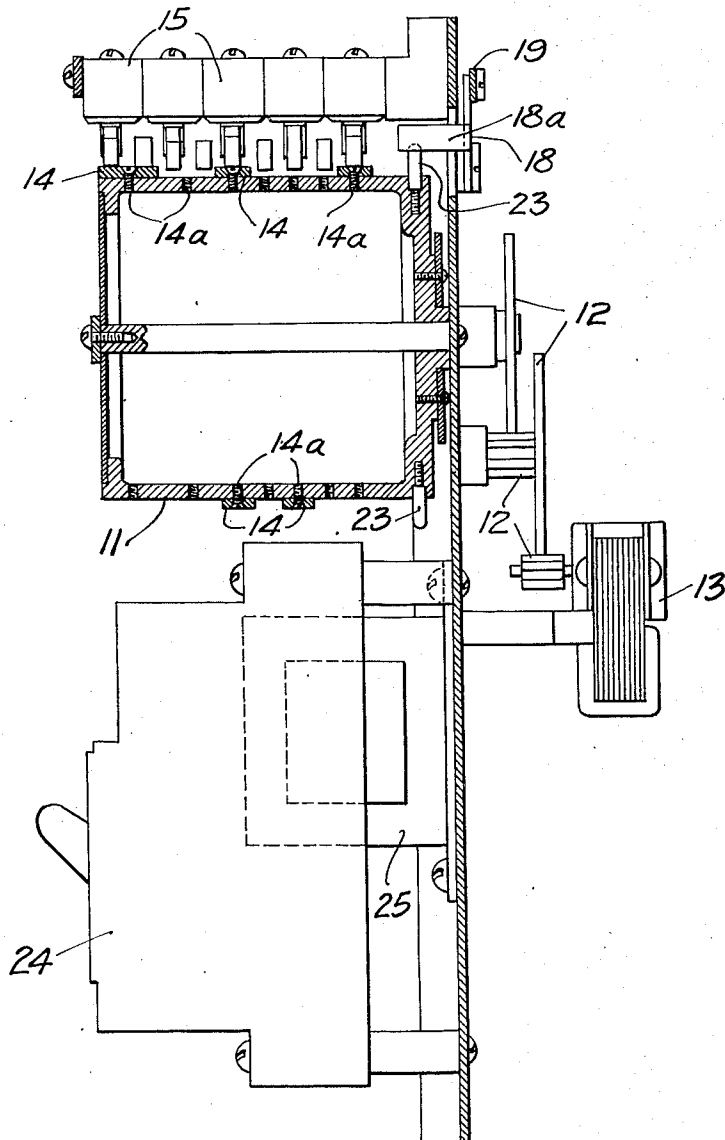
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Fig. 3



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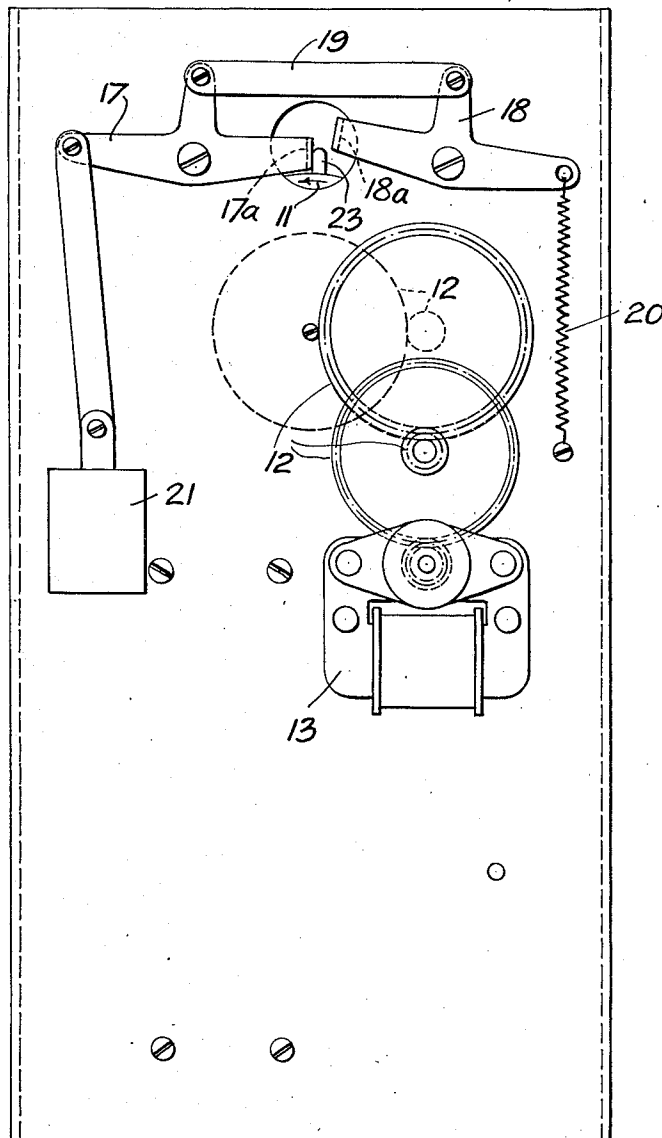
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Fig: 4



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ELECTRIC CONTROL SWITCH

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3 Claims. (Cl. 185-46)

It is the purpose of this invention to provide an electric control switch suitable for the control of various kinds of automatic machinery and more particularly of automatic machine tools.

The automatic sequence of operations in a machine tool can be obtained in two ways. The first way is by providing limit switches which are actuated by the tool carrier at the end of its stroke and which cause a sequence relay to assume its next position which in turn initiates the next operation. The second way is by merely allowing a fixed time for certain operations and simply initiating the next operation after the lapse of an appropriate length of time. For the main tools, the first expedient is usually more satisfactory since in this way one is certain that one tool has performed its function before the next tool starts its work. On the other hand, for many minor operations such a system would be unnecessarily cumbersome, and it is then preferable to control these operations by some sort of time switch. Minor operations of this character are, for example, the actuation of the collet in order to feed new stock, the release of a blast of compressed air in order to blow away chips, and many others.

The particular purpose of this invention is to provide a simple switch which performs both before mentioned functions. This is accomplished preferably by providing a rotating drum which is driven intermittently by an electric motor, this rotating movement being controlled by a solenoid actuated escape mechanism.

In the drawings in which a preferred embodiment of an electric control switch embodying the principles of the invention is shown,

Fig. 1 is an isometric view of the switch with its escape mechanism shown at the rear end of its operating drum instead of at the front for better illustrating the operation and in which the housing and other supporting members are omitted for sake of clearness;

Fig. 2 is an elevational end view of the switch and its support;

Fig. 3 is a sectional view, partly in elevation, along the plane of line 3-3 in Fig. 2; and

Fig. 4 is a rear elevational view of the same.

All parts are shown more or less diagrammatically.

Like characters of reference denote similar parts throughout the several views and the following specification.

With reference to the drawings, the main element of the control device is a rotating drum 11 which is driven through a train of gears 12 by

a small motor 13. This motor must be of such design that it can be stalled for relatively long periods of time without overheating, such type being generally referred to as a torque motor.

In other words, the drum is not continuously rotated but is merely urged by the motor to rotate in the direction indicated by the arrow.

A suitable number of holes are drilled and tapped into the circumference of the drum so that buttons 14 can be mounted therein wherever necessary by means of screws 14a. These buttons actuate small switches 15, so-called micro-switches, which control the various circuits of an automatic machine or an automatic machine tool.

In Fig. 1, I have shown seven switches 15 which may, for example, control respectively the following circuits of a typical automatic machine tool: Switches #1 and #2, motor forward direction; switches #3 and #4, motor reverse direction; switch #5, reciprocating movement of the tool-supporting turret; switch #6, reciprocating transverse movement of an additional tool holder; and switch #7, collet release in order to feed new stock. It will be understood that this is merely an example and that any other number of circuits may be controlled in the same manner if necessary. In Figs. 2, 3, and 4, nine micro-switches 15 are shown which, however, are arranged in two rows of four and five, respectively, in order to conserve space. The operation of the device is, of course, in no way affected by this different physical arrangement. The sequence of operations is controlled by the location of the buttons 14 on drum 11 and it is a particular advantage of this invention that their locations and thus the sequence of operations can be changed quickly and conveniently.

As mentioned above, the rotation of the drum is controlled by an escape mechanism which consists of two levers 17 and 18 which are linked by a connecting rod 19. These levers are urged in one direction by a spring 20 and in the other direction by solenoid 21. This solenoid in turn is controlled by one or several limit switches of the automatic machine tool so that it will be actuated as soon as one tool finishes its operation. Levers 17 and 18 have suitable abutments 17a and 18a projecting at right angles therefrom which cooperate with small pins 23 fastened to the outer circumference of drum 11. It will be clear that upon connecting solenoid 21 with a source of electric current, levers 17 and 18 move in the direction indicated by the arrows on Fig. 1, thus permitting one of the pins 23 to pass, so that

the drum is permitted to make a fraction of a revolution. In this particular instance provisions are made to mount twenty pins so that the drum would advance 18 degrees for each current impulse received by the solenoid.

However, it is not necessary that these pins are equally spaced and one or several of them may be omitted whenever desirable. I have, for example, shown gaps of this type in Figs. 1 and 2.

It will be clear that whenever the last pin preceding such a gap passes through the escape mechanism that then the drum will continue to rotate for the length of the gap and that during that time a number of timed operations may be automatically performed. The timing of these operations depends, of course, upon the length of the switch depressing buttons 14 and upon the speed with which the drum rotates. This control switch will therefore operate as a step relay as long as pins 23 are provided at regular intervals, but whenever larger gaps occur between pins, the device will work as a time switch causing timed operations to occur automatically.

To complement the device, in Figs. 2, 3 and 4 are also shown a main switch 24 and a small transformer 25 which are necessary for the operation of a machine tool to be controlled by the device forming the subject of this invention. These parts, however, are conventional and do not form a part of the invention proper.

It is understood that various changes in the form, proportion and minor details of construction may be resorted to without departing from the principles or sacrificing any of the advantages of the invention, as defined in the appended claims.

What I claim as new is:

1. In an electric control switch, a revolving drum, stops on said drum, an escape mechanism adapted to engage said stops, said mechanism 40

having two fulcrumed levers, each lever having a projection, a cross bar connecting said projections, a solenoid operatively connected to one of said levers, each of said levers having projecting abutments in spaced relation to each other to straddle one of said stops, the abutment of one of said levers being in position for engaging one of said stops while the abutment on the other lever is out of line of engagement with said stop when actuated by said solenoid, and vice versa.

2. In an electric control switch, a revolving drum, stops on said drum, an escape mechanism adapted to engage said stops, said mechanism having two levers fulcrumed at their centers and having each a projection therefrom, a cross bar connecting said projections, a solenoid operatively connected to one of said levers, each of said levers having projecting abutments in spaced relation to each other to straddle one of said stops, the abutment of the solenoid connected lever being out of line of engagement with one of said stops while the said other lever is engaging said stop, and vice versa.

3. In an electric control switch, a revolving drum, stops on said drum, an escape mechanism adapted to engage said stops, said mechanism having two levers fulcrumed at their centers and having each a projection therefrom, a cross bar connecting said projections, a solenoid operatively connected to one of said levers, and a spring connected to the other lever, said levers having projecting abutments in spaced relation to each other to straddle one of said stops, the abutment of the spring connected lever being in position for engaging one of said stops while the abutment on the other lever is out of line of engagement with said stop when actuated by said solenoid, and vice versa.

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