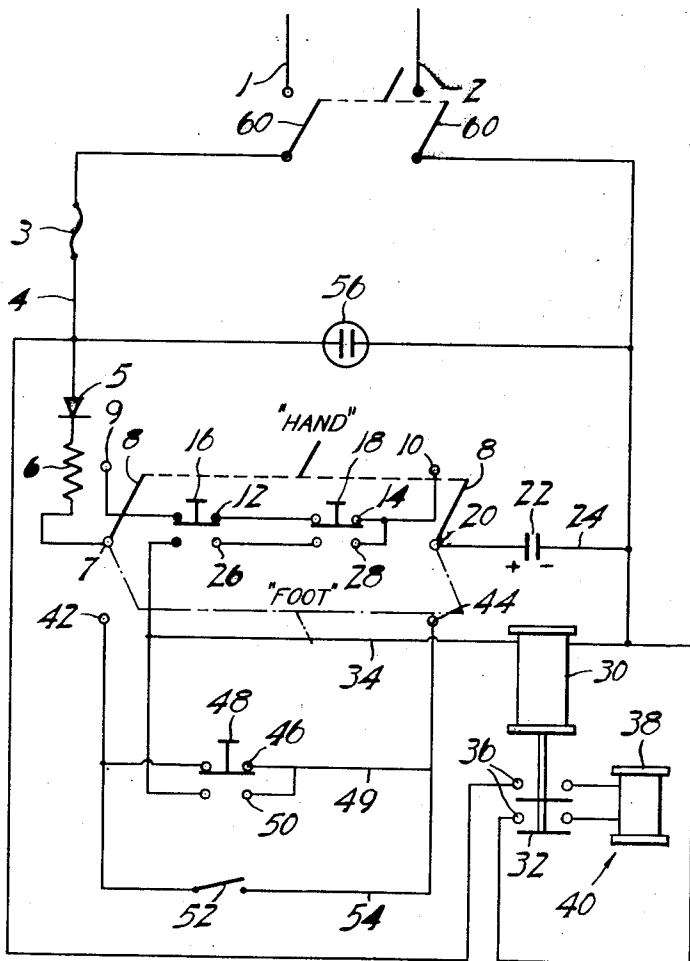


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ELECTRIC CONTROL DEVICE

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ELECTRIC CONTROL DEVICE

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1

This invention relates to timing devices, and more particularly to timing controls for repeat operation machines, such as punch presses and the like.

An object of this invention is to provide a timing device which will give control flexibility, and which is easy to use and fool-proof in operation; rugged, yet inexpensive to manufacture, and which will require minimum maintenance.

Another object of the invention is to provide a machine control which in no way depends upon any moving parts of the machine for synchronization.

More particularly, it is an object of this invention to provide an improved control for a punch press or the like which will be safe and reliable, and which will provide for either repeat or non-repeat operation of the press by simply throwing a switch, and which may be readily adapted to different control requirements.

Other objects and applications of my invention will be evident from the following specification and claims.

In the drawing, the figure shows a diagram of the circuit of one embodiment of my invention.

Alternating current from any suitable source is supplied to power supply leads 1 and 2. A fuse 3 is disposed in the lead 1 for overload protection. A conductor 4 connects to the lead 1 to supply current to a selenium or other suitable type rectifier 5 which in turn is connected to current limiting resistor 6. The resistor 6 supplies rectified potential to one center terminal 7 of a double pole double throw switch 8—8 which is manually operable to selectively control the mechanism for either hand or foot control operation. The switch 8—8 includes corresponding contacts 9—10 which are in series with the normally closed contacts 12—14 of a pair of manually operable spring-biased double throw push buttons 16—18. The other center terminal 20 of the double throw switch 8—8 is connected to lead 2 through a timing condenser 22 by means of a conductor 24.

The normally open contacts 26—28 of the push button switches 16—18 are connected in series between terminal 10 of the switch 8—8 and one side of the coil 30 of a double contact relay 32 by means of a conductor 34. The other side of coil 30 connects to lead 2. The contacts 36—36 of the relay 32 connect the coil 38 of the output control device which is indicated generally at 40 in series between the leads 1 and 2. The other contacts 42—44 of the switch 8—8 are connected in series through the normally closed con-

2

tacts 46 of a spring-biased double-throw pedal switch 48 by means of a conductor 49. The normally open contacts 50 of the switch 48 connect to conductors 34 and 49 respectively.

A single pole switch 52 is interposed in conductor 54 which shunts the normally closed contacts 46 of the foot pedal switch 48. A neon indicator lamp 56 is connected between the conductors 2 and 4. The lamp glows when voltage is present between conductors 2 and 4, thus indicating that the line switch 60—60 interposed within conductors 1 and 2, is closed, and that the fuse 3 is intact.

In operation, the line switch 60—60 is closed and the switch 8—8 is thrown either to "hand" or to "foot" whichever type control is desired. When switch 8—8 is thrown to "hand," its blades make a connection between terminals 7 and 9, and between 10 and 20 of the said switch; thereby connecting hand buttons 16—14 into the circuit, and disconnecting the foot pedal switch 48 from the circuit. Then rectified potential will be supplied from the rectifier 5 through the normally closed contacts 12—14 of buttons 16—18 to condenser 22, so as to charge the same. The value of resistor 6 is chosen to be high enough to protect the condenser 22 while still allowing it to charge in a very short time, in the order of one or two cycles of 60 cycle voltage. If, at any time after condenser 22 is charged, the operator presses both hand buttons 16—18, it will be seen that the aforescribed condenser charging circuit will be broken and a condenser discharging circuit will be established from one side of condenser 22 through the normally open contacts 26—28 of button switches 16—18, thence through the coil 30 and back to the other side of condenser 22.

The current flowing in the aforementioned discharge circuit energizes coil 30, so as to close relay contacts 36—36 of contactor 32. Thus output coil 38 is connected across the line, and the desired timed pulse is initiated. When the discharge current has decayed to the drop-out value of relay 32, the contacts 36—36 will reopen, thus ending the timed pulse. This timed pulse may be regulated for example to provide for only one cycle of operation of a machine to be controlled by the device of the invention, such as for example to cause a punch press clutch dog to engage for only one operation of the press ram.

It will be appreciated that if either button 16 or 18 is depressed enough to open contacts 12 or 14 respectively, then the charging circuit will be

3

broken, but the discharging circuit is not established until both buttons 16—18 are fully depressed simultaneously, so as to close contacts 26—28. When the buttons 16—18 are released, the discharge circuit is broken and the charge circuit is reestablished, so as to quickly recharge the condenser 22 for the next operation.

If the switch 8—8 is thrown to "foot," the blades thereof make connection between terminals 7 and 42, and between 20 and 44 of the said switch. Then if the switch 52 is open, the foot switch 48 controls charge and discharge circuits in the same manner as in the foregoing. However, if switch 52 is closed, then it will be seen that opening of contacts 46 by depression of pedal 48 has no effect; but the closing of contacts 50 by such depression establishes a circuit through the shunt 54 from the rectifier 5 directly to coil 30. Thus, coil 30 controlling contacts 36 and output coil 38 receives power continuously so long as the pedal 48 is pressed thereby providing for repeat cycling of the machine controlled by the device of the invention as long as the pedal is depressed. In this circuit condition, condenser 22 is in parallel with coil 30 through shunt 54, so as to filter the alternating component of the rectified current and thereby prevent "chattering" of the relay 32.

Although two hand buttons and one foot pedal have been shown in the foregoing embodiment of the invention, it will be understood that any number of hand or foot switches could be used. The shunt 54 has been shown only in the "foot" circuit. It will be obvious that an identical shunt could be placed in the hand circuit if desired. The length of the pulse can be very easily predetermined by the use of time delay condensers which are very easily changed to give pulses from a fraction of a second to many seconds in length. While originally planned for use in conjunction with punch presses, the invention is useful in any application where a single limited impulse or pulse of definite length is desired to control machinery, lights, signals, relays, solenoids and so forth. If, on the other hand, it is desired to change from an automatically timed pulse to one limited manually by the operator, a switch as shown at 52 is incorporated for this purpose.

Although only one form of the invention has been shown and described in detail, it will be apparent to those skilled in the art that the invention is not so limited but that various changes may be made therein without departing from the spirit of the invention or the scope of the appended claims.

We claim:

1. In a punch press control device, a source of electric potential having a direct component, a condenser, a relay, control means comprising spring biased switch means alternately connecting said condenser to said source through normally closed contact means for charging and to said relay through normally open contact means for discharging, and shunt means comprising a series connected switch, said shunt means being electrically connected in parallel with said normally closed contact means of said control means for connecting said condenser to said source independently of said control means, whereby operation of said control means against the spring means either disconnects said condenser from said source and connects said condenser to said relay for the energization of said relay for a limited period of time, or connects said relay in parallel with said condenser across

4

said source for energization thereby for so long as said control means remains operated against said spring means, depending on whether said series connected switch in said shunt means is open or closed, respectively.

2. In a control device, a source of electric potential having a direct component, a condenser, a work circuit, control means for alternately connecting said condenser to said source and to said work circuit, and controllable direct current shunt means electrically connected to complete a circuit between said source and said condenser in parallel with said control means in at least one circuit thereof for connecting said condenser to said source in filtering relation thereto, whereby the operation of said control means supplies current to said work circuit for a limited or unlimited time period depending on whether said shunt is open or closed, respectively.

3. In a control device, a source of electric potential having a direct component, a condenser, a work circuit, control means for alternately connecting one side of said condenser to said source and to one side of said work circuit, conductors connecting the other sides of said condenser and said work circuit together and to the return side of said source, and optionally closable direct current shunt means electrically connected in parallel with said control means and connecting said condenser to said source independently of said control means, whereby the operation of said control means supplies current to said work circuit from said condenser for a limited period or directly from said source in parallel with said condenser for an unlimited period depending on whether said shunt is open or closed, respectively.

4. In a control circuit, a source of electric potential having a direct component, a work circuit having an input, a condenser, first switch means having normally open contact means and normally closed contact means, second switch means, a condenser charging circuit comprising said source and said normally closed contact means and said condenser in series, a condenser discharging circuit comprising said condenser and said normally open contact means and said input of said work circuit in series, and an optional circuit comprising said second switch means and said normally open contact means and said input of said work circuit across said source in series.

5. In a punch press control device, a source of electric potential having a direct component, a condenser, a relay having an input, first switch means, a condenser charging circuit comprising said source and said first switch means and said condenser in series, an actuating circuit comprising said condenser and said first switch means and said input of said relay in series, said first switch means being adapted to close in said charging circuit and said actuating circuit alternately, second switch means, and optionally closable additional condenser charging means electrically connected in parallel with said condenser charging circuit across said source comprising said second switch means and said condenser in series, whereby said relay is energizable by said condenser in series when said second switch means is open and whereby said relay is energizable by said source in parallel with said condenser when said second switch means is closed and whereby energization of said relay is initiated by operation of said first switch means

5

regardless of the condition of said second switch means.

6. In a control device, a source of electric potential having a direct component, a condenser, a work circuit having an input, control means 5 for alternately connecting said condenser to said source for charging and to said work circuit for energization of the latter, said control means comprising hand switch circuit means and foot switch circuit means, each said switch circuit 10 means having normally closed switch means and an alternately closable normally open switch means, selection means electrically connected for alternately employing said hand switch circuit means and said foot switch circuit means in 15 said control means, a condenser charging circuit comprising said source and said selection means and the normally closed switch means of the switch circuit means employed in said control means by said selection means and said con- 20 denser in series, and a work circuit energizing circuit comprising said condenser and said selection means and the normally open switch means of the switch circuit means employed in said control means by said selection means and said input of said work circuit in series, and op- 25 tionally closable direct current shunt means electrically connected across said normally closed switch means of at least one of said switch circuit means for connecting said condenser to said 30 source independently of the thereby shunted normally closed switch means, whereby such shunting of a normally closed switch means to provide unlimited energization of said work circuit in parallel with said condenser is provided 35

6

on an individual switch circuit means basis so as to provide for unlimited operations only in the switch circuit means desired.

7. In a control circuit, a source of pulsating direct current, a direct current operable work circuit, a condenser, control means for alternately connecting said condenser to said source and to said work circuit, and controllable direct current shunt means electrically connected to complete a circuit between said source and said condenser in parallel with said control means for connecting said condenser to said source in filtering relation thereto, whereby current may be optionally supplied from said source through said controllable shunt means to said work circuit under the control of said control means.

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