May 14, 1957 T. M. BLEEZE 2,792,460

MACHINE CONTROL DEVICES

Filed March 31, 1954 3 Sheets-Sheet 1

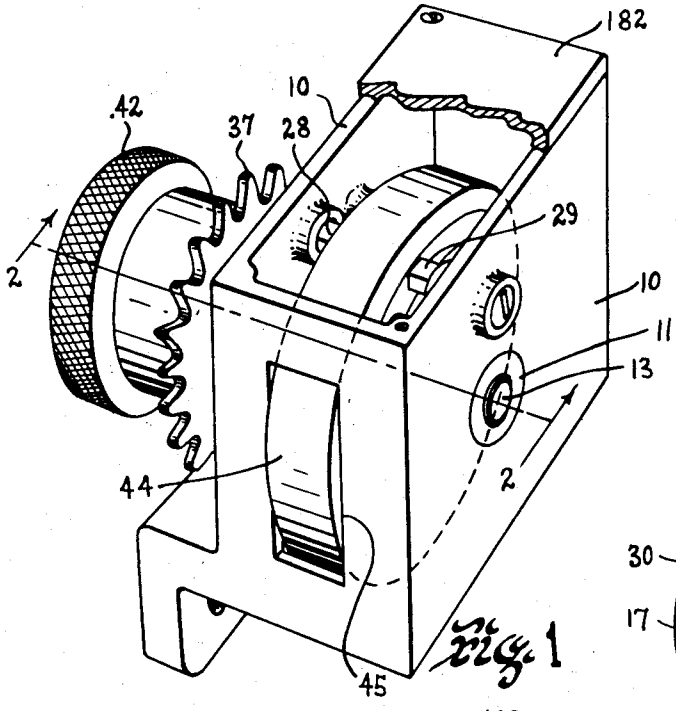


Fig. 1

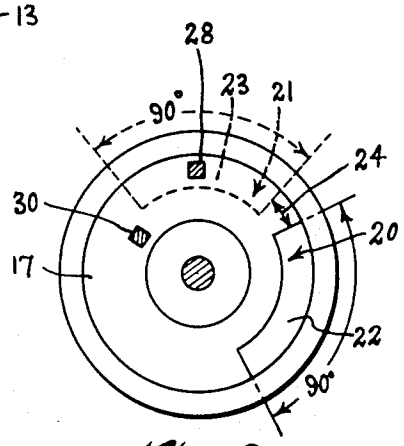


Fig. 3

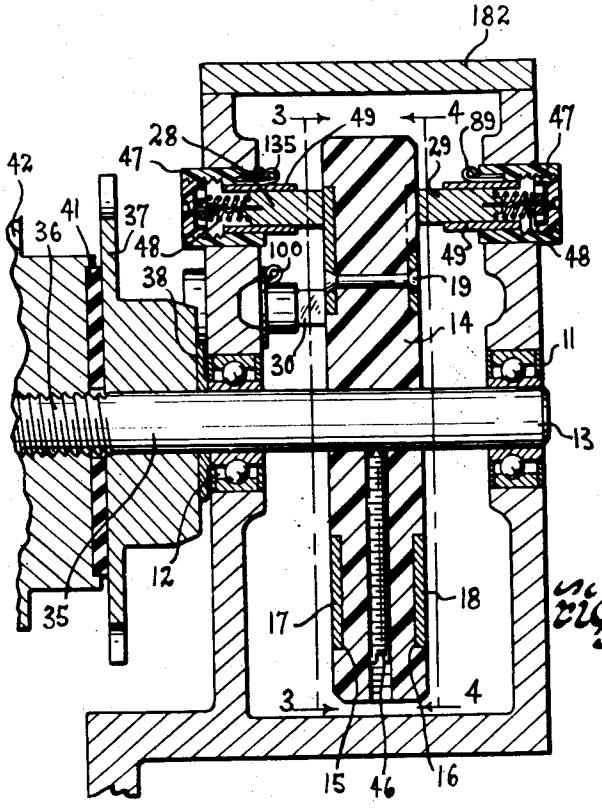


Fig. 2

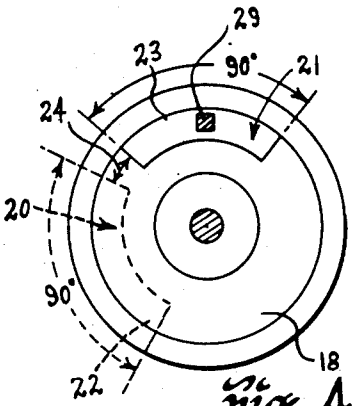


Fig. 4

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MACHINE CONTROL DEVICES

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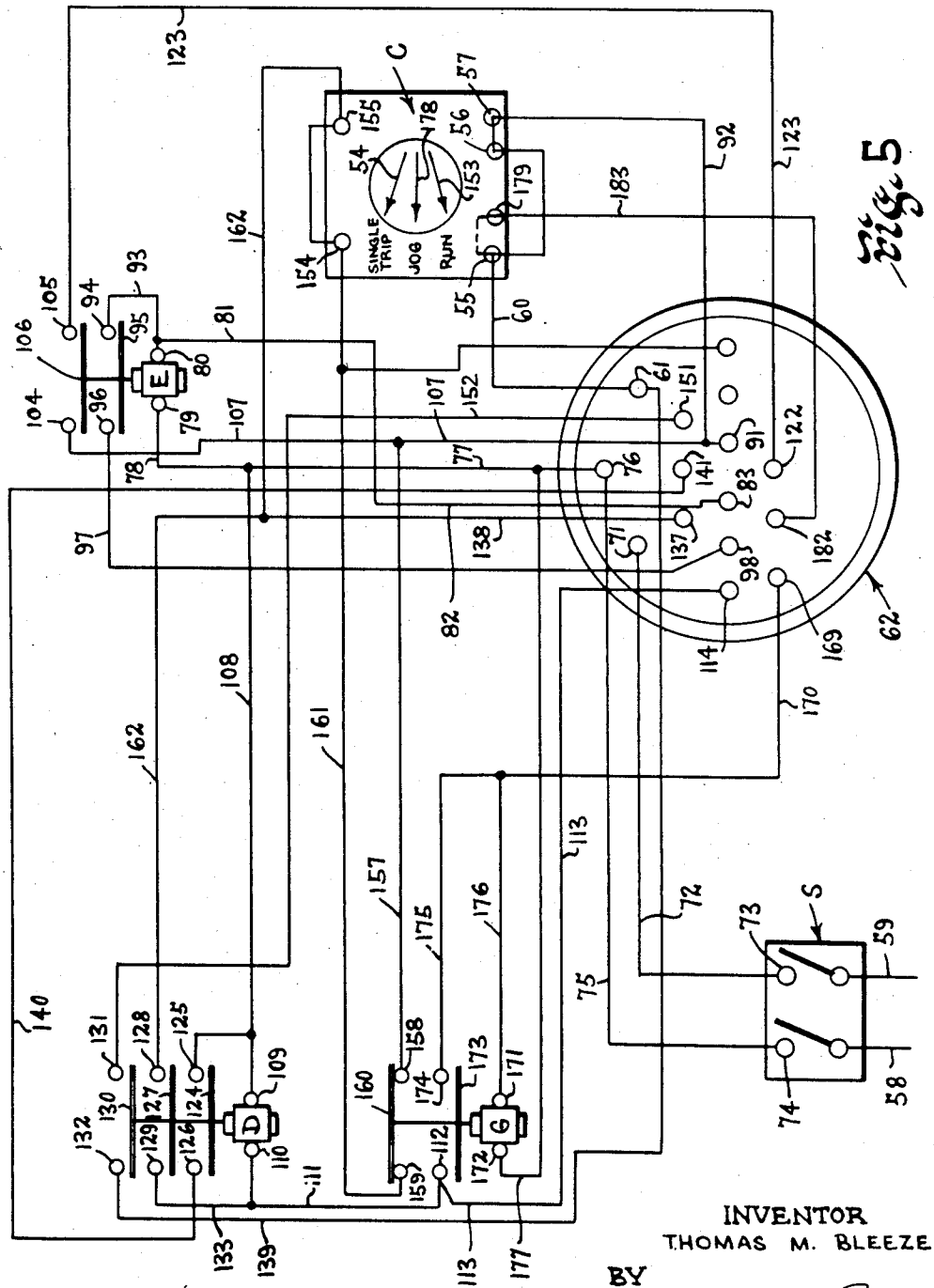


Fig. 5

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MACHINE CONTROL DEVICES

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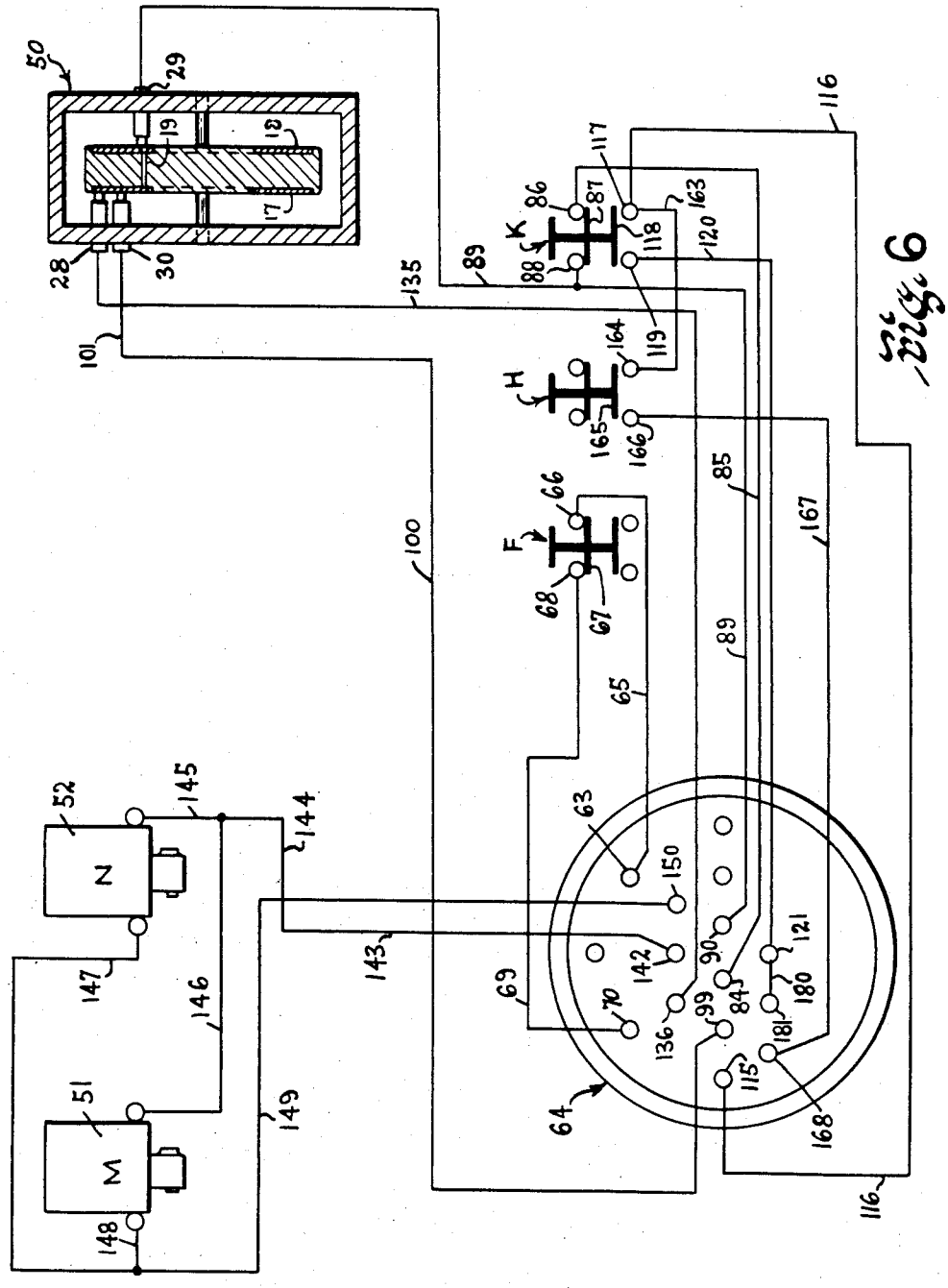


Fig. 6

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2,792,460

MACHINE CONTROL DEVICES

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Application March 31, 1954, Serial No. 420,133

10 Claims. (Cl. 200—24)

This invention relates to a control device for machines such as high speed presses and has particular reference to the provision of an improved adjustable electrical switch of the rotary type and cooperatively functioning electrical circuits for use with said switch for controlling the operative function of such machines.

One of the principal objects of the invention is to provide a novel rotary switch of the above character and associated electrical circuits connecting said switch with the conventional braking and clutching mechanisms of machines, such as presses and more particularly one which is simple, efficient, and inexpensive in construction and positive in its function in controlling the operative cycle or cycles of such machines, said rotary switch being adjustable to vary the stop position of the platen at any desired location and throughout a wide range of different speeds.

Another object is to provide a device of the above character which will function with accuracy at any speed of operation of the machine ranging from 45 to 550 R. P. M.'s.

Another object is to provide a device of the above character which will repetitively stop the platen of the press at any desired position within one cycle of movement of the platen and with extreme accuracy and simplicity.

Another object is to provide an adjustable device of the above character whereby the stopping point of the platen of the press may be changed in a simple and efficient manner regardless of the speed of operation of the press.

Another object is to provide a device of the above character wherein the conductive segments and brushes for contacting said segments are located on the sides of a rotating disc whereby they will be less susceptible to the accumulation of dirt, dust, etc., thereon.

Another object is to provide a control unit for use with a rotary switch device of the above character which may be made separately of said device and which may thereafter be operatively coupled with said device in a simple and efficient manner and at a location sufficiently remote from the press to prevent oil gaining access thereto or its otherwise being damaged.

Other objects and advantages of the invention will become apparent from the following description taken in connection with the accompanying drawings, and it will be apparent that many changes may be made in the details of construction and arrangement shown and described without departing from the spirit of the invention as set forth in the accompanying claims. I, therefore, do not wish to be limited to the exact details of construction and arrangement of parts shown and described as the preferred form only has been given by way of illustration.

Referring to the drawings:

Fig. 1 is a perspective view of the device embodying the invention;

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1 and looking in the direction indicated by the arrows;

Fig. 3 is a reduced sectional view taken as on line 3—3 of Fig. 2 and looking in the direction indicated by the arrows;

Fig. 4 is a reduced sectional view taken as on line 4—4 of Fig. 2 and looking in the direction indicated by the arrows; and

Figs. 5 and 6 are schematic views of the electrical circuits for use with the device shown in Fig. 1.

Referring more particularly to the drawings, the device comprises a housing **10** having spaced bearings **11** and **12** in the opposed side walls thereof. A stub shaft **13** is mounted in said bearings and has secured thereto a disc **14** of fibre or other suitable insulation material. The disc **14** has, in the opposed sides thereof, circularly formed recesses **15** and **16**. Mounted in the recesses **15** and **16** are plates **17** and **18** formed of electrical conductive material, such as copper, brass or the like. The said plates are connected with each other by rivets **19** of conductive material such as copper, brass or the like. Each of the said plates have a section thereof removed throughout an angle of substantially 90° as illustrated at **20** and **21** in Figs. 3 and 4, and in which are placed sections **22** and **23** of insulation material of a thickness substantially equal to the thickness of the plates **17** and **18** so as to have their outer surfaces in substantially flush relation with the outer surfaces of said plates **17** and **18**.

As shown in Figs. 3 and 4, the adjacent ends of the insulated sections **22** and **23** of the respective plates **17** and **18** are spaced from each other substantially ⅜" as indicated by the arrow **24** and each extend throughout an angle of substantially 90°. The plates **17** and **18** are secured together by rivets **19** of copper, brass or other conductive material to close a circuit between said plates. The ⅜" spacing, as illustrated by the arrows **24**, is used when the conductive plates **17** and **18** are formed approximately 3⅝" in diameter. This spacing may be varied with the variation of the diameter of the disc **14** and said conductive plates as desired and is controlled primarily to insure the re-establishing of electrical contact of the brushes **28** and **30** with the conductive plate **17** after the disc **14** has been rotated an amount sufficient to cause the insulation section **22** to break the circuit through said contacts. This re-establishing of the electrical contact of said brushes results from the tendency of the press to coast after the electrical contact through said brushes **28** and **30** has been broken by the insulation section **22** and prior to the subsequent stopping of the press by the clutch and braking mechanisms which function in response to said braking of the circuit through said brushes **28** and **30**. The dimensions of said disc **14** and the length and spacing of the insulation sections **22** and **23** are controlled according to the coasting characteristics of the press to bring about the above desired result of re-establishing electrical contact of the brushes **28** and **30** with the electrical conducting plate **17** to enable the restarting of the machine or press as will later be described more in detail.

The housing **10** has secured therein a plurality of brushes **28**, **29** and **30** which are adapted to engage the plates and sections of insulation material in controlled sequence as the disc **14** is rotated. The brushes **28** and **29** are positioned to engage the respective plates on the opposed sides of the disc **14** in substantially opposed aligned relation with each other and the brush **30** is spaced radially inwardly and in a controlled angular relation with the brush **28**, as shown in Fig. 3. The brush **30** has continuous electrical contact with the plate **18**, while the brush **28** has contact therewith throughout approximately 270° wherein it will engage the section **22** of insulation material throughout the remaining 90°. This same condition prevails with the brush **29**, with the

exception that the sections 22 and 23 are staggered relative to each other so that neither the brush 28 nor the brush 29 is disengaged from electrical contact when the other of said brushes is in engagement with its respective associated section of insulation material.

The stub shaft 13 has an outwardly extending portion 35 having a threaded end 36 thereon. Mounted on the end 35 is a sprocket 37 which is adapted to engage a washer 38 which, in turn, has side surface contact with the inner portion of the roller bearing 12 in which the stub shaft 13 is mounted. The sprocket is mounted for normally free rotation on the end 35 and is provided on the outer side thereof with a friction washer 41 sandwiched between the said sprocket and a knurled nut 42. The knurled nut 42 has a threaded opening therein for receiving the threaded end 36 of the outwardly extending portion 35 of the shaft 13, and is adapted, when tightened, to frictionally clamp the sprocket 37 between the friction washer 41 and the washer 38 to cause said sprocket 37 to rotate with the shaft 13 as a unit. By loosening the nut 42 the fibre disc 14 may be manually rotated to change its position relative to the sprocket 37, as will be defined more specifically hereinafter. The disc 14 has a portion 44 thereof extending outwardly of an opening 45 in the front end wall of the housing 10 as shown in Fig. 1 whereby it may be manually adjusted. Following the said adjustment the knurled nut 42 is again tightened to retain said adjustment. The sprocket 37 is connected through a suitable chain drive to a sprocket provided on the platen operating shaft of the machine or press so as to be rotated therewith when the press is operated.

The disc 14 is secured to the stub shaft by a screw or the like 46. The brushes 28, 29 and 30 are supported in insulation members 47 carried by the housing 10, and are each resiliently urged toward the disc 14 by coil springs or the like 48. The respective brushes are mounted in tubular members 49 of conductive material and which are each respectively mounted in the insulation members 47 in a conventional manner.

The device shown in Figs. 1 through 4 and as diagrammatically illustrated at 50 in Fig. 6 is electrically connected with a conventional brake valve operating solenoid 51 and a conventional clutch valve operating solenoid 52, as shown schematically in said Fig. 6. The brake and clutch valve solenoids are those of the conventional type used with machines such as punch presses or the like embodying clutch and brake mechanisms for controlling the starting and stopping of said machines under pneumatic control and the solenoids 51 and 52 are adapted to reverse the clutching and braking actions through the opening and closing of air valves.

The schematic wiring diagram illustrated in Figs. 5 and 6 provides an arrangement for controlling three different operative functions of the machine or press—one, a single trip, another, continuous run and another called jogging. The single trip is accomplished by setting the selector switch C to the single trip setting diagrammatically illustrated by the arrow 54. This closes a circuit through the poles 55, 56 and 57 of said switch. This energizes a relay E by closing a switch S which is connected by the leads 58 and 59 to a source of electrical energy. This energizing of relay E is accomplished by a circuit comprising a lead 60 which connects pole 55 to pole 61 of a prong plug 62. The pole 61 is connected to pole 63 of prong plug 64 which through the lead 65 is connected with the pole 66 of an emergency stop switch F. The pole 66 is connected through the upper blade 67 of the switch F to pole 68 which is, in turn, connected by the lead 69 to the pole 70 of the prong plug 64 which is, in turn, connected with pole 71 of prong plug 62. The pole 71 of prong plug 62 is connected by the lead 72 to one switch pole 73 of the switch S. The pole 74 of said switch S is connected by the lead 75 to pole 76 of prong plug 62 which is, in turn, connected by the leads 77 and 78 to pole 79 of relay E which is, in turn, connected to pole 80 of said relay. The pole 80 of relay E is connected by the leads 81 and 82 to the pole 83 of prong plug 62. Pole 83 is connected to pole 84 of prong plug 64 which is, in turn, connected by the lead 85 to pole 86 of a single trip switch K. The pole 86 is connected through the upper blade 87 of said switch to the pole 88 thereof. Pole 88 is connected by the lead wire 89 to pole 90 of prong plug 64. Pole 90 is connected to pole 91 of prong plug 62 which is in turn connected through the lead 92 to pole 57 of the selector switch C. Pole 57 is, in turn, connected through pole 56 to pole 55 as previously described. This closes a circuit from switch S to relay E and to emergency stop switch F and single trip switch K.

Since the circuit which energizes relay E passes through blade 87 of switch K, said circuit would normally be de-energized when switch K is depressed. However, a tie-in circuit through relay E is provided to retain the said relay in its energized condition. This is accomplished through the provision of a lead 93 which connects contacts 80 of relay E to contact 94 thereof. A switch blade 95 operated by said relay E closes contact 94 with contact 96. A lead 97 connects contact 96 to pole 98 of prong plug 62 which, in turn, is connected to pole 99 of prong plug 64. The circuit then continues through lead 100 and lead 101 to brush 30 of rotary switch 50. Brush 30, in contact with plate 17 of said switch and which is connected by pin 19 to plate 18 thereof, closes a circuit through switch 50 to brush 29. Lead 89 then connects brush 29 to pole 88 and from 88 to pole 90 of prong plug 64. Pole 90 is, in turn, connected to pole 91 of prong plug 62. From pole 91, the circuit continues through lead 92 to contacts 57, 56 and 55 of switch C then through lead 60 to pole 61 of prong plug 62 which, in turn, is connected to pole 63 of prong plug 64, and continues through lead 65 to contact 66, blade 67 and contact 68 of switch F. Contact 68 is then connected by lead 69 to pole 70 of prong plug 64 which, in turn, is connected to pole 71 of prong plug 62. The circuit then continues through lead 72 to contact 73 of switch S, contact 74 then continues the circuit through lead 75, pole 76 of prong plug 62, lead 77 and lead 78 to contact 79 thus completing the hold or tie-in circuit through relay E.

The energizing of relay E and the subsequent closing of contacts 104—105 through switch blade 106 serves to allow the completion of a circuit through the single trip push button K, emergency stop switch F and relay D by the operation of single trip switch K.

By depressing switch K, relay D is energized and the press is set in motion through circuits hereinafter described.

The energizing of relay E moves the switch blade 106 into engagement with contacts 104 and 105 and simultaneously moves the switch blade 95 into engagement with contacts 96 and 94. The contact 104 is connected by lead 107 to pole 91 of prong plug 62. The pole 91 is connected by the lead 92 to pole 57 of selector switch C. Pole 57, as previously stated, is connected to pole 56 and 56 is connected to 55 which is, in turn, connected by lead 60 to pole 61 of prong plug 62. Pole 61 of prong plug 62 is connected to pole 63 of prong plug 64 and by the lead 65 to the contact 66 of emergency stop switch F. The pole 66 is connected through the blade 67 of said switch F to the contact 68 thereof which is, in turn, connected by the lead 69 to pole 70 of prong plug 64. Pole 70 of prong plug 64 is, in turn, connected to pole 71 of prong plug 62. Pole 71 of prong plug 62 is connected by the lead 72 to the pole 73 of switch S. The opposite pole 74 of switch S is connected by the lead 75 to pole 76 of prong plug 62 which is, in turn, connected by the lead 77 to lead 78. A lead 108 extends from the junction of 77 and 78 to contact 109 of relay D. Contact 109 is connected through said relay to contact 110 which is, in turn, connected by lead 111 to contact 112 of a switch portion of relay G. A lead 113 from contact 112 connects said contact with pole 114 of prong plug 62. This

pole 62 is, in turn, connected with pole 115 of prong plug 64 and through the lead 116 is connected with contact 117 of single trip push button switch K. 117 is adapted to be connected by the blade 118 of switch K to contact 119 which is, in turn, connected by the lead 120 to pole 121 of prong plug 64. Pole 121 is connected to pole 122 of prong plug 62 which is connected through the lead wire 123 to contact 105 of relay E. The switch blade 106 of said relay, when in engaged relation with contact 105, is adapted to close a circuit to contact 104. This completes the circuit for energizing the relay D when push button of switch K is depressed. This causes switch blade 124 to close a circuit through contacts 125 and 126. Switch blade 127 closes a circuit through contacts 128 and 129 and switch blade 130 closes a circuit through contacts 131 and 132. Upon releasing push button of switch K wherein circuits through contacts 117 and 119 would normally be broken a hold or tie-in circuit is provided to retain the relay D energized. This tie-in circuit comprises a lead 133 which connects contacts 129 to contact 110. Contact 110 is connected with 109 which is, in turn, connected through lead 108 to lead 77. 77 is connected with pole 76 of prong plug 62 and lead 75 connects said pole 76 to contact 74 of switch S. The opposite contact 73 of switch S continues the circuit by its connection through lead 72 with pole 71 of prong plug 62, which is, in turn, connected with pole 70 of prong plug 64. Pole 70 of prong plug 64 is connected by lead 69 to contact 68 of emergency stop switch F and through the blade 67, said contact 68 is connected with contact 66 which is, in turn, connected by the lead 65 to pole 63 of prong plug 64. Pole 63 is connected with pole 61 of prong plug 62 and which is, in turn, connected through the lead 60 to poles 55, 56 and 57 of selector switch C. Pole 57 is connected by lead 92 to pole 91 of prong plug 62. Pole 91 is, in turn, connected with pole 90 of prong plug 64 which is, in turn, connected through a lead 89 to contact 88 of single trip switch K. Blade 87 of switch K closes a circuit across contacts 88 and 86 thereof and lead 85 connects said contact 86 to pole 84 of prong plug 64. Pole 84 is, in turn, connected with pole 83 of prong plug 62 which, by means of a lead 82 and the lead 81 is connected with pole 80 of relay E and also through lead 93 which is connected with contact 94 of said relay. The circuit continues through switch blade 95 to contact 96 and which is connected by lead 97 to pole 98 of prong plug 62. Pole 98 is connected with pole 99 of prong plug 64 which through the lead 100 is connected with the brush 30 of the rotary switch 50. When said brush is in engagement with the conductive plate 17 on said side of the disc 14, it closes a circuit through said conductive plate to the brush 28. The said brush 28 is connected by the lead wire 135 to pole 136 of prong plug 64. Pole 136 is connected with pole 137 of prong plug 62 and which is, in turn, connected through the lead 138 to contact 128 of relay D. The switch blade 127 which now engages contact 128 by reason of the energized condition of relay D, closes a circuit from 128 to 129. This completes the tie-in circuit to the relay D to maintain the said relay energized and, in turn, closes a circuit to switch 50.

Simultaneous to the energizing of the circuit to relay D and the bringing into play of the hold or tie-in circuit, which has just been described, brake solenoid M and clutch solenoid N are energized due to the closing of the switch blade 130 with the contacts 131—132 of said relay D. This is brought about by a circuit line 139 which connects contact 132 with pole 61 of prong plug 62. Pole 61 is connected with pole 63 of prong plug 64 which is, in turn, connected through the lead 65 to contact 66 of emergency stop switch F. Blade 67 connects contact 66 with contact 68 which is connected by lead 69 to pole 70 of prong plug 64. Said pole 70 is connected to pole 71 of prong plug 62 which, through the lead 72, is connected with contact 73 of switch S. The opposite contact 74 of switch S is connected by the lead 75 to pole 76 of prong plug 62 and pole 76 is connected by leads 77 and 108 to contact 125 of relay D and through blade 124 to contact 126 of said relay. Contact 126 is connected by the lead 140 to pole 141 of prong plug 62. Pole 141 is connected with pole 142 of prong plug 64 which is, in turn, connected by lead 143 to lead 144. Lead 144 is connected through lead 145 and lead 146 to clutch solenoid N and brake solenoid M respectively. These solenoids are connected by leads 147 and 148 to lead 149 which is, in turn, connected to pole 150 of prong plug 64. Pole 150 is connected to pole 151 of prong plug 62 then through lead 152 to contact 131 of relay D and through blade 130 to contact 132. This completes the circuit through brake solenoid M and clutch solenoid N. By so energizing solenoids N and M, the brake is released and the clutch engaged thereby setting the press in motion. The press continues to operate until brush 28 is positioned over the non-conducting segment 22 which is positioned in the path of said brush in flush relation with the conductive plate 17 of switch 50. The switch 50 is rotated by the operation of the press, as previously described. Movement of the disc 14 causes the insulation section 22 to engage brush 28 and thereby breaks the tie-in circuit to relay D. This causes the switch blades 124, 127 and 130 of relay D to be disengaged from the respective contacts of said relay. When the tie-in circuit is broken, as described above, the brake solenoid and clutch solenoid are de-energized thereby causing a reverse action whereby the clutch is released and the brake is applied to stop the press. This operation is known as the single trip operation.

It is particularly pointed out that while insulation section 22 is moved into contact with brush 28 to break the circuit therethrough and to stop the press that the inertia of the press prior to its stopping will be sufficient to move the disc 14 an amount to again bring the conductive plate 17 of the disc into contact with said brush 28 whereby operation of the switch K will again close a circuit through relay D in the above described manner. The disc 14 therefor is adjusted to bring about this result at a time interval which is controlled so as to have the platen of the press stop at the desired location, that is, either at the top position, intermediate, or low position, as desired.

The adjustment of the disc is accomplished by loosening the hand nut 42 whereby the disc 14 may be moved independently of the sprocket 37 as previously stated. It is further pointed out that another controlling factor is the air pressure which is applied to the brake, and this is controlled, in accordance with the adjustment of the disc 14, in order to stop the press platen in proper position. This control of the air pressure is by standard conventional means. The single trip operation of the press may thereby be repeated by depressing the single trip switch K as previously described.

It should be noted that the circuits described above all pass through contacts 66 and 68 of the emergency stop switch F. Therefore, if it is desired to stop the operation of the press independently of the switch 50, this may be accomplished by depressing the button of emergency stop switch F to open the circuit between contacts 66 and 68, thereby causing relay D to be de-energized and contacts 131—132, 128—129, 125—126 to be opened. By the opening of said contacts, the press is immediately stopped regardless of the position of the disc 14 of switch 50 since the circuit to brake and clutch solenoids M—N passes through contacts 131 and 132.

If it is desired to have the press run continuously, selector switch C is turned to "run" position as indicated by arrow 153. This electrically connects poles 154 and 155 and further electrically connects poles 55 and 57.

The circuit is generally similar to the single run circuit described above which, by depression of the button

of switch K, will energize relay D and start the press running, with the exception that there is included with the above-mentioned circuits a circuit through brush 28 connecting pin 19 and brush 29 of the rotary switch 50. Lead 89 connects brush 29 with pole 90 of prong plug 64 which is, in turn, connected to pole 91 of prong plug 62. The circuit then continues through leads 107 and 157 to contact 158 of relay G. Contacts 158 and 159 being normally closed by blade 160, the circuit continues through lead 161 to contacts 154 and 155, respectively, of selector switch C and then to lead 162 and contact 128 of relay D. Since relay D is energized the circuit will continue through blade 127; contact 129, leads 133 and 139, respectively, through contact 112, lead 113 to pole 114 of prong plug 62 which, in turn, is connected to pole 115 of prong plug 64. The circuit will continue through lead 116, contacts 117 and 119 of switch K and lead 120 to pole 121 of prong plug 64 which, in turn, is connected to pole 122 of prong plug 62. Lead 123 connects pole 122 to contact 105 of relay E. The circuit continues through blade 106 to contact 104, through leads 107 and 92, respectively, to contacts 57 and 55 of switch C, then through 60 to pole 61 of prong plug 62 which, in turn, is connected to pole 63 of prong plug 64. Lead 65 connects pole 63 to contact 66 of switch F and the circuit continues through blade 67, contact 68 and lead 69 to pole 70 of prong plug 64 which, in turn, is connected to pole 71 of prong plug 62, then through lead 72 to contact 73 of switch S. From contact 74 of switch S, the circuit continues through lead 75 pole 76 of prong plug 62, lead 77, lead 78, contacts 79 and 80 of relay E, lead 93, contact 94, blade 95, contact 96 and lead 97 to pole 98 of prong plug 62 which, in turn, is connected to pole 99 of prong plung 64. Lead 100 now connects brush 30 to pole 99 completing the circuit through brushes 30 and 29.

With this described circuit through brushes 30 and 29 and the circuit through brushes 30 and 28 of rotary switch 50, which was described previously for the single trip operation, the press will run continuously since the circuit through brushes 29 and 30 will be operative until the non-conducting portion 23 of plate 18 is positioned over brush 29 at which time the circuit through brushes 30 and 28 will cause the press to continue to run until the brush 29 is again positioned over the conducting portion of the plate 18.

This continuous operation of the press will exist until either the "top stop" push button H or the "emergency stop" push button F is depressed.

Since all circuits described above pass through contacts 66 and 68 of push button F, the press may be instantly stopped by depressing said button F thereby breaking the circuits and de-energizing relay D.

Under normal operation, however, it would be desirous to stop the press at the top of the stroke. This may be accomplished by depressing "top stop" push button H, which energizes relay G through a circuit from contact 73 of switch S which is connected by lead 72 to pole 71 of prong plug 62. Pole 71 of prong plug 62 is connected with pole 70 of prong plug 64 which is, in turn, connected with contact 68 of emergency stop switch F. The circuit through the blade 67 from the contact 68 is made with contact 66 which is connected by lead 65 to pole 63 of prong plug 64. Pole 63 is connected with pole 61 of prong plug 62 which is, in turn, connected to 55 and through selector switch C to pole 57. Pole 57 is connected through lead 92 to pole 91 of prong plug 62 and by the lead 107 to contact 104 of relay E. The switch blade 106 which is in contact with 104 closes a circuit to contact 105 which is connected by the lead 123 to pole 122 of prong plug 62. Pole 122 is connected to pole 121 of prong plug 64 which is, in turn, connected by the lead line 120 to contact 119 of switch K. Contact 119, when the switch blade 118 is in engagement therewith, closes a circuit to contact 117 which is connected by the lead 163 to contact 164 of switch H. Contact blade 165 of switch H, when in engagement with contact 164, closes a circuit to contact 166 which is connected by the lead wire 167 to pole 168 of prong plug 64. Pole 168 is connected with pole 169 of prong plug 62 and is connected by lead 170 to pole 171 of relay G and which is, in turn, connected with pole 172 through said relay. Pole 172 is connected by the lead 177 to pole 76 of prong plug 62 which is, in turn, connected by the lead 75 to contact 74 of switch S.

Since, upon releasing "top stop" push button of switch H wherein the circuit through contacts 164 and 166 would normally be broken, a hold or tie-in circuit is provided to retain the relay G energized. This tie-in circuit is comprised of the tie-in circuit for relay D as described previously for single trip operation, with the addition of lead 111 which connects contact 110 of relay D to contact 112 of relay G. Since relay G is energized, blade 173 closes the circuit from contact 112 through blade 173, contact 174, lead 175, lead 176, contact 171, contact 172 and lead 177 to a junction at lead 77.

With relay G energized and retained in this position by the circuits described above, contacts 158 and 159 are now broken and the circuit through brushes 30 and 29 of the rotary switch 50 is no longer operative. The press will now continue to run or operate on the circuit through brushes 30 and 28 which was described previously in the single stroke position. When the non-conducting portion 22 of the plate member 17 engages brush 28, the circuit through brushes 30 and 28 will be broken and relay D will drop out thereby de-energizing the brake M and clutch N solenoids which will cause the clutch to disengage and the brake to be applied. The press will now stop at the top of the stroke assuming, of course, that the disc 14 has been properly adjusted to bring about this result.

The continuous run operation may be started by again depressing push button K since relay G was de-energized and returned to its normal position when relay D dropped out.

If it is desired to jog the press forward, the selector switch C is turned to the "jog" arrow 178 of Fig. 5. This connects contact 55 with contact 179 and simultaneously disconnects contact 154 from contact 155 and contact 57 from contact 55. With contacts 29, 154 and 155 disconnected, it can be seen that the rotary switch 50 is disconnected and is not used for this operation and the press is now controlled by push button K only.

When push button K is depressed, a circuit to relay D is completed from contact 117, through blade 118 to contact 119 of switch K. The circuit then continues through lead 120 to pole 121 of prong plug 64 and then through connection 180 to pole 181 of prong plug 64 which, in turn, is connected to pole 182 of prong plug 62. Lead 183 then connects pole 182 to contact 179 of selector switch C, Contact 179 and contact 55 are connected together in switch C as described above. From contact 55, the circuit continues through lead 60 to pole 61 of prong plug 62 which, in turn, is connected to pole 63 of prong plug 64, then through lead 65 to contact 66, blade 67 and contact 68 of switch F and lead 69 to pole 70 of prong plug 64 which, in turn, is connected to pole 71 of prong plug 62. Lead 72 then connects the circuit to contact 73 of switch S. The circuit then continues from contact 74 of switch S through lead 75, pole 76 of prong plug 62, lead 77, lead 108, contacts 109 and 110 of relay D, lead 111, contact 112 of relay G and lead 113 to pole 114 of prong plug 62 which, in turn, is connected to pole 115 of prong plug 64. Lead 116 then connects the circuit to contact 117 of switch K thereby completing the circuit to relay D.

Since the blade 130 and the contacts 132—133 of relay D control the circuit to the brake and clutch solenoids M and N, as described previously, the press is intermittently started and stopped as the push button K is

depressed and released. The press will run as long as switch K is depressed and will stop when switch K is released since the circuit to relay D is broken when contacts 119 and 117 are opened thereby allowing relay D to drop out.

It will be seen from the foregoing that a simple, efficient and economical control device and electrical circuits therefor have been provided whereby the rotary switch and controls therefor may be formed as a separate unit and may be readily coupled with cooperating circuits to complete the operative arrangement. When it is desired to vary the stop position of the platen of the press, it is merely necessary to loosen the hand nut 42, manually rotate the disc 14 and the contact plates thereon to vary their relation with the brushes and with the sprocket 37 and thereafter tightening the hand nut 42 to retain said adjustment.

By reason of the fact that the contacting plates are on the sides of disc 14 and that the brushes engage said plates on the opposed sides of the disc, there is much less tendency for accumulation of dirt, dust, etc., thereon and any residue resulting from wear of the brushes will also be prevented from accumulation on the disc. The general construction of the device is such that replacement of parts may be accomplished with ease and simplicity.

It is particularly pointed out that when the adjustment of the disc 14 is made as specified above to vary its relation with the sprocket 37 that the speed of operation of the press and the inertia thereof is taken into consideration so that the rotary switch will operate at a proper time to insure that the platen of the press is stopped in the position desired. This position is preferably at the top of the stroke but may be varied as desired by proper adjustment of the disc 14 with respect to the sprocket. This is accomplished by the contact of the brush 28 with the section of insulation material 22 on said side of the disc 14 as is accomplished with the single trip function of said rotary switch.

The operation of the rotary switch in accomplishing all of the above specified functions is as previously described, and it will be seen that the rotary switch device may be adjusted in a simple and efficient manner in order to accomplish all of said desired results.

The housing 10 in the completed structure is provided with a cover 182 which is attached thereto with suitable screws or the like for concealing the effective portions of the brushes and the contact plates of the disc 14 internally of said housing to protect same from the accumulation of dirt, dust, etc. Due to the fact that the disc has a peripheral portion 44 extending outwardly of an opening 45 formed in the end wall of the housing said disc may be manually adjusted without having to remove the cover.

From the foregoing description it will be seen that simple, efficient and economical means and associated circuits have been provided for accomplishing all of the objects and advantages of the invention.

Having described my invention I claim:

1. A device of the character described comprising a housing having spaced bearings in opposed side walls thereof and an opening in an end wall, a shaft rotatably supported in said bearings, a disc of non-conductive material on said shaft in said housing having a peripheral portion thereof extending outwardly of the opening in the end wall, said disc having annular grooves in the opposed side walls thereof, a ring of conductive material in each of said annular grooves having a continuous, uninterrupted annular conductive side surface area and radially offset recessed areas and sections of non-conductive material in each of said recessed areas in substantially flush relation with the opposed side surfaces of said disc and rings, spaced brushes carried by one of the side walls of the housing, one of said brushes having constant electrical contact with the continuous uninterrupted conductive area of one of said rings of conductive material and the other being positioned to engage another portion of said ring and to lie in the path of said section of non-conductive material in said ring, and an additional brush supported by the opposed side wall of the housing positioned to engage the ring of conductive material and section of non-conductive material on said side of the disc when said disc is rotated, said shaft having a portion extending outwardly of one side of the housing and having a threaded end portion, a sprocket rotatably mounted on said outwardly extending portion of the shaft, a hand nut threaded on the threaded end of said shaft and a friction washer intermediate said hand nut and sprocket adapted to frictionally lock the sprocket on said outwardly extending portion of the shaft to cause said shaft to rotate with the sprocket to in turn rotate said disc of non-conductive material when the nut is tightened and to permit the disc of non-conductive material to be rotated independently of said sprocket when the nut is loosened by engaging the peripheral portion of said disc which extends outwardly in the end wall of the housing.

2. A device of the character described comprising a housing and having spaced bearings in opposed side walls thereof and an opening in an end wall, a shaft rotatably supported in said bearings with a portion thereof extending outwardly of the housing and having a threaded end, a disc of non-conductive material attached to said shaft internally of said housing and having a peripheral portion extending outwardly of the opening in the end wall, a sprocket loosely mounted on a portion of the shaft extending outwardly of the housing, a hand nut threaded on the threaded end of said shaft, frictional means between said nut and said sprocket which, when the nut is tightened, is adapted to cause the sprocket to rotate the shaft when said sprocket is rotated, relatively flat conductive and non-conductive areas on the opposed sides of said disc in substantially flush relation with said sides, means extending through said disc electrically connecting the opposed conductive areas, electrical conductive brushes carried by the opposed side walls of said housing and having ends to contact said conductive and non-conductive areas on said disc, the conductive area on one side of said disc having an annular portion in continuous contact with one of said brushes and an associated conductive and non-conductive portion positioned in the path of another of said brushes, and the relatively flat conductive and non-conductive areas on the opposed side of said disc being positioned in the path of a brush carried by said side of the housing.

3. A device of the character described comprising a housing having spaced side walls and an end wall with an opening therein, a shaft rotatably supported in said side walls with a portion thereof extending outwardly of the housing, a disc of non-conductive material attached to said shaft internally of said housing and having a peripheral portion extending outwardly of the opening in the end wall, a drive member loosely mounted on a portion of the shaft extending outwardly of the housing, clamp means adjustably connected to the outer end of said shaft, frictional means between said clamp means and said drive member which, when the clamp means is tightened, is adapted to cause the drive member to rotate the shaft when said drive member is rotated, contact members embodying conductive and nonconductive sections on the opposed sides of said disc in substantially flush relation with said sides, electrical conductive brushes carried by the opposed side walls of said housing and having ends to contact said conductive and non-conductive sections, the contact member on one side of said disc having a portion in continuous contact with one of said brushes and having its combined non-conductive and conductive portion in the path of another of said brushes, and the other of said contact members on the opposed side of said disc having its non-conductive and conductive portions located in the path of a brush carried by said side of the housing and means extending through said disc and electrically con-

necting said conductive sections on the opposed sides of said disc.

4. A device of the character described comprising a housing having spaced bearings in opposed side walls thereof and an opening in an end wall, a shaft rotatably supported in said bearings with a portion thereof extending outwardly of the housing and having a threaded end, a disc of non-conductive material attached to said shaft internally of said housing and having a peripheral portion extending outwardly of the opening in the end wall, a sprocket loosely mounted on a portion of the shaft extending outwardly of the housing, a hand nut threaded on the threaded end of said shaft, frictional means between said nut and said sprocket which, when the nut is tightened, is adapted to cause the sprocket to rotate the shaft when said sprocket is rotated, means having conductive and non-conductive plate-like sections on the opposed sides of said disc in substantially flush relation with said sides, means electrically connecting said conductive sections, and electrical conductive brushes carried by the opposed side walls of said housing, two of which are located in a path to have end contact with said conductive and non-conductive sections and another having contact with a continuous conductive portion of one of said means on the sides of said disc.

5. A device of the character described comprising a housing having spaced bearings in opposed side walls thereof and an opening in an end wall, a shaft rotatably supported in said bearings with a portion thereof extending outwardly of the housing, a disc of non-conductive material attached to said shaft internally of said housing and having a peripheral portion extending outwardly of the opening in the end wall, a drive member loosely mounted on the portion of the shaft extending outwardly of the housing, an adjustable binding member on the outer end of said portion of the shaft, means between said binding member and said drive member which, when the binding member is tightened, is adapted to cause the drive member to rotate the shaft when said drive member is rotated, relatively flat conductive and nonconductive means on the opposed sides of said disc in substantially flush relation with said sides, electrical conductive contact members carried by the opposed side walls of said housing and having ends to contact said conductive and non-conductive means on said disc, the conductive means on one side of said disc having a continuous portion in contact with one of said contact member and having combind non-conductive and conductive portions in the path of another of said contact members, and the other of said conductive and non-conductive means on the opposed side of said disc being positioned in the path of another contact member carried by said side of the housing and means extending through said disc and electrically connecting said conductive means on the opposed sides of said disc.

6. A device of the character described comprising a housing having spaced bearings in opposed side walls thereof and an opening in an end wall, a shaft rotatably supported in said bearings with a portion thereof extending outwardly of the housing, a disc of non-conductive material attached to said shaft internally of said housing and having a peripheral portion extending outwardly of the opening in the end wall, a drive member loosely mounted on the portion of the shaft extending outwardly of the housing, an adjustable binding member on the outer end of said portion of the shaft, means between said binding member and said drive member which, when the binding member is tightened, is adapted to cause the drive member to rotate the shaft when said drive member is rotated, relatively flat means having conductive and non-conductive sections on the opposed sides of said disc in substantially flush relation with said sides, means electrically connecting said conductive sections, and electrical conductive contact members carried by the opposed side walls of said housing, two of which are located in a path to have end contact with said conductive and non-conductive sections and another having contact with a continuous conductive portion of one of said means on the sides of said disc.

7. A device of the character described comprising a housing having bearing means in the side walls thereof and an opening in an end wall thereof, a shaft rotatably supported in said bearing means with a portion thereof lying inwardly of the said housing and a portion extending outwardly of said housing, a disc member of non-conductive material on said shaft internally of said housing and having a peripheral portion extending outwardly of the end wall, a sprocket member mounted on said portion of the shaft extending outwardly of the housing, one of said members being attached to the shaft and the other of said members being loosely mounted thereon, said shaft having a threaded portion and means thereon having frictional side surface engagement with said loosely mounted member, and a hand nut threadedly connected with said threaded portion and, when tightened, being adapted to clampingly force said means into binding engagement with said loosely mounted member to cause it to rotate with said shaft when the sprocket member is rotated, said disc member having conductive and non-conductive portions on the opposed sides thereof and electrical conductive means carried by said housing and positioned in the path of and to engage said conductive and non-conductive portions when the disc member is rotated and means electrically connecting said conductive portions on the opposed sides of said disc.

8. A time cycle control mechanism comprising a housing having spaced bearings in the opposed side walls thereof and an opening in the front wall thereof, one of the inner portions of said bearings having an exposed end portion, a shaft rotatably supported in said bearings with a portion thereof extending outwardly of the housing and of said bearing having the exposed end portion and having a threaded outer end thereon, a disc of non-conductive material attached to said shaft internally of said housing and having a peripheral portion extending outwardly of the opening in the end wall, a sprocket normally loosely mounted on the portion of the shaft extending outwardly of the housing, a hand nut threaded on said threaded end of said shaft, friction binding means on said shaft adjacent a side surface of said sprocket which, when the nut is tightened, is adapted to cause the sprocket to move toward the exposed end of the bearing to a position at which said friction binding means will frictionally bind with the sprocket and cause it to rotate the shaft when said sprocket is rotated, said opposed sides of said disc having combined conductive and non-conductive portions arranged in an arcuate path about the axis of rotation of the shaft and further having on one side thereof a continuous, uninterrupted annular conductive portion arcuately related with the axis of rotation of the shaft and offset radially with respect to the arcuate path of the combined conductive and non-conductive portions, said conductive portions on the opposed sides of said disc being electrically connected and said housing having yieldingly supported brushes respectively located in said arcuate paths and adapted to selectively engage with the respective combined conductive and non-conductive portions and with said conductive portion.

9. A time cycle control mechanism comprising a housing having spaced bearings in the opposed side walls thereof and an opening in the front wall thereof, one of the inner portions of said bearings having an end lying in a plane outwardly of the adjacent side wall of the housing, a shaft rotatably supported in said bearing with a portion thereof extending outwardly of the housing, said portion of said shaft having a threaded end thereon, a disc of non-conductive material attached to said shaft internally of said housing and having a peripheral portion extending outwardly of the opening in the end wall, a sprocket having relatively flat engagement areas on the

opposed sides thereof, said sprocket being normally loosely mounted on the portion of the shaft extending outwardly of the housing, a hand nut threaded on said threaded end of said shaft, friction binding means between said nut and the adjacent relatively flat engagement area of said sprocket which, when the nut is tightened, is adapted to secure the sprocket in binding relation with the shaft to cause it to rotate therewith when said sprocket is rotated, said opposed sides of said disc having combined conductive and non-conductive portions thereon and arranged in end-to-end relation with each other in an arcuate path about the axis of rotation of the shaft as a center and further having on one side thereof a continuous, uninterrupted annular conductive portion arcuately related with the axis of rotation of the shaft and offset radially with respect to the arcuate path of the conductive and non-conductive portions on said side of said disc, said conductive portions on the opposed sides of said disc being electrically connected, and said housing having yieldingly supported brushes respectively located in said arcuate paths and adapted to selectively engage with the respective combined conductive and non-conductive portions and with said conductive portion.

10. A time cycle control mechanism comprising a housing having an opening in an end wall thereof and a shaft rotatably supported therein with a portion of said shaft extending outwardly of one side of said housing, said outwardly extending portion of said shaft having a threaded end thereon, a disc of non-conductive material attached to said shaft internally of said housing and having a peripheral portion extending outwardly of the opening in the end wall, a sprocket loosely mounted on the portion of the shaft extending outwardly of the housing, a hand nut threaded on said threaded end of said shaft, a disc of resilient friction binding material on said shaft which, when the nut is tightened, is adapted to exert side binding pressure on said sprocket to bindingly lock it onto the shaft to cause the shaft to rotate when the said sprocket

is rotated, conductive and non-conductive means on the opposed sides of said disc in substantially flush relation with said sides, said conductive means each being in the form of an annular plate portion, each having a continuous uninterrupted annular conductive side surface area and radially offset removed sections, said non-conductive means being shaped to and lying within said radially offset removed sections with the outer surfaces thereof in substantially flush relation with the outer surfaces of said conductive portions, said removed sections being circumferentially in staggered relation with each other on the opposed sides of the disc with one end of one section being in adjacent circumferentially spaced relation with the end of the other section and with the other ends of said sections being spaced apart a distance greater than the length of said removed sections, said respective removed sections being of a length extending substantially throughout an angle of 90°, electrically conductive brushes carried by the opposed side walls of said housing and being arranged so that one of said brushes contacts the combined conductive and non-conductive means on one side of said disc, another of said brushes contacts the combined conductive and non-conductive means on the other side of said disc and another brush engages with the continuous uninterrupted annular conductive side surface area on one side of said disc, and said conductive means on the opposed sides of said disc being in electrically connected relation with each other.

References Cited in the file of this patent

UNITED STATES PATENTS

847,877	Bachelet	Mar. 19, 1907
1,347,408	Rossini	July 20, 1920
2,133,161	Colbert	Oct. 11, 1938
2,421,881	Heasty	June 10, 1947
2,577,882	Foster	Dec. 11, 1951
2,675,507	Geiger	Apr. 13, 1954