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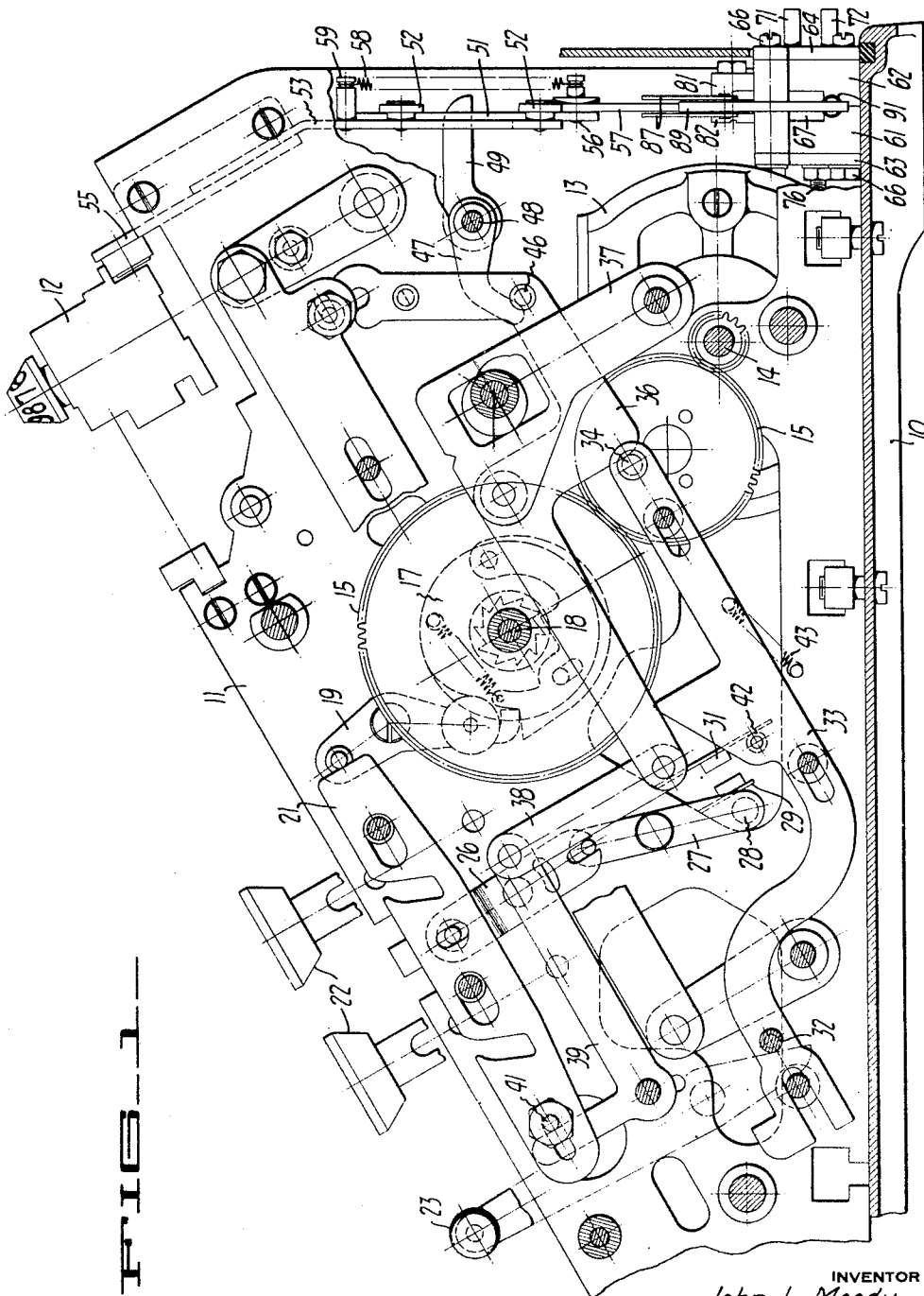
J. L. MOODY

2,334,430

CALCULATING MACHINE

Original Filed March 4, 1940

3 Sheets-Sheet 1



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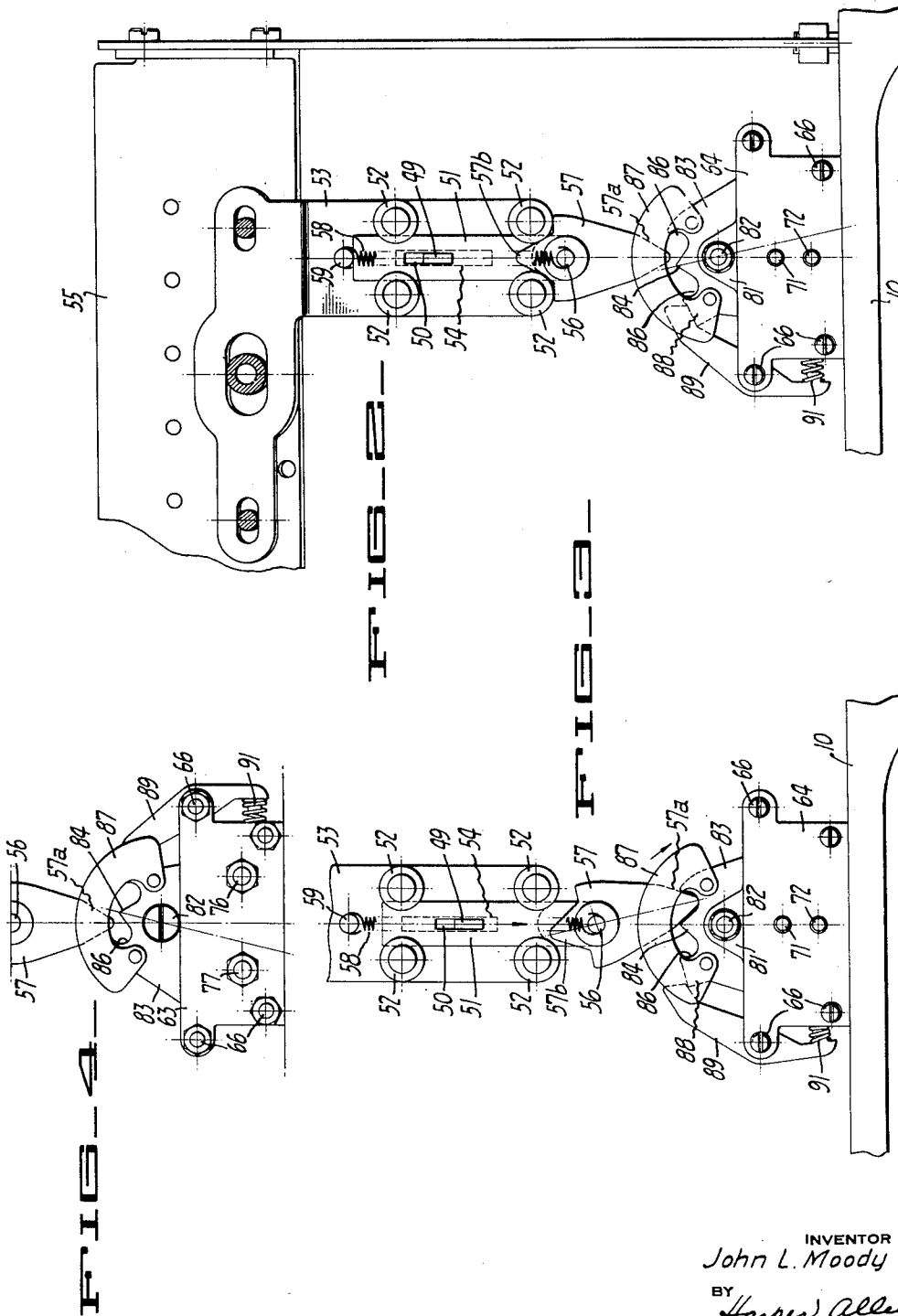
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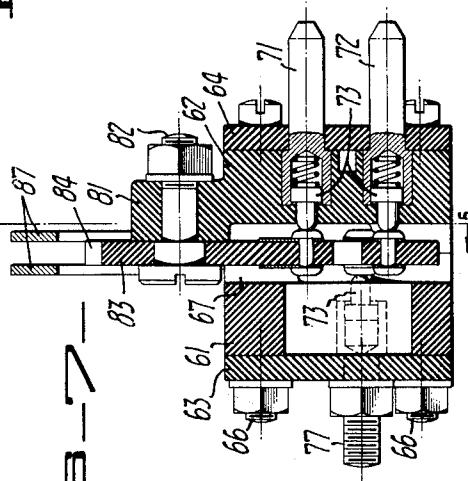
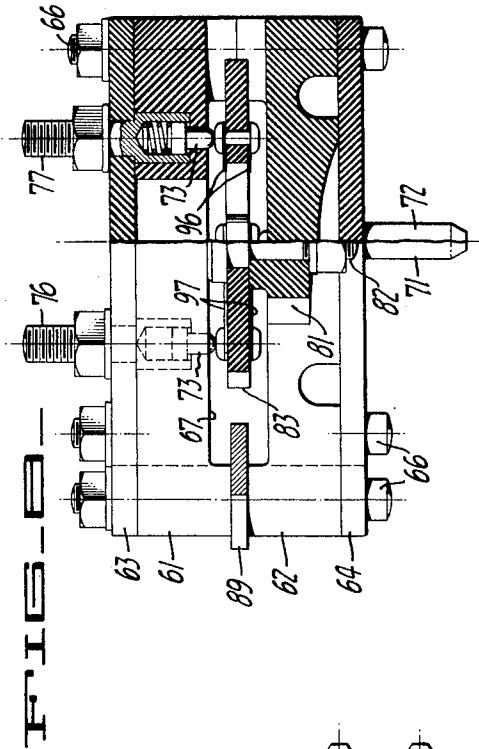
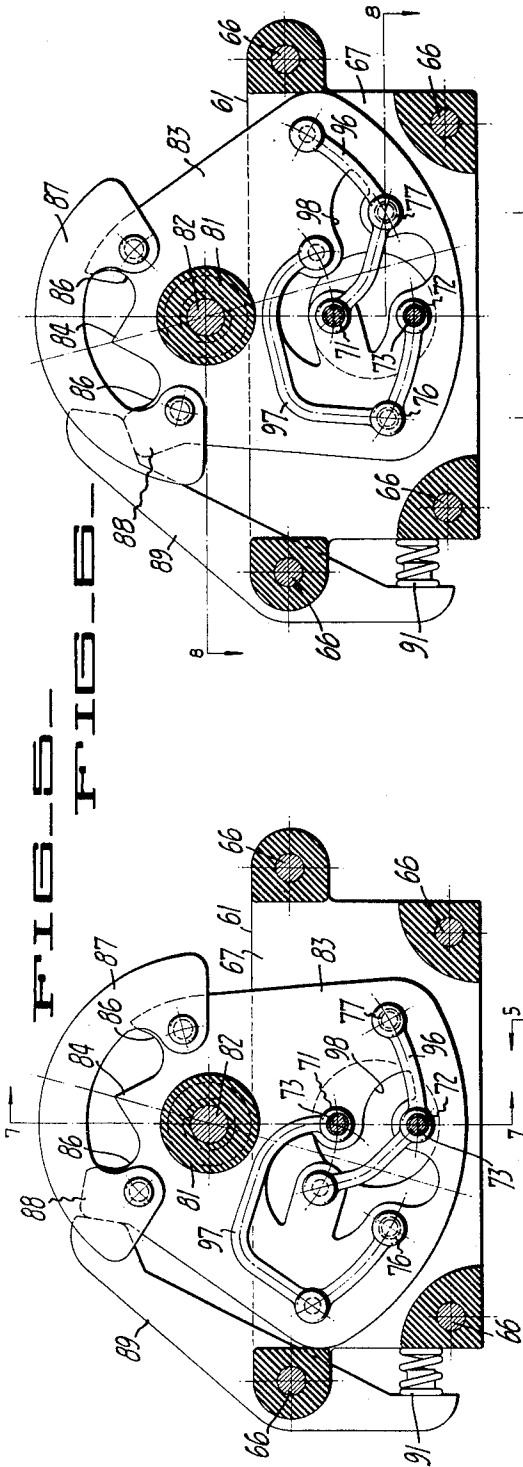
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UNITED STATES PATENT OFFICE

2,334,430

CALCULATING MACHINE

John L. Moody, Oakland, Calif., assignor to Friden Calculating Machine Co., Inc., a corporation of California

Original application March 4, 1940, Serial No. 322,092. Divided and this application August 18, 1941, Serial No. 407,275

2 Claims. (Cl. 172-239)

This invention relates to calculating machines or the like and is concerned more particularly with the provision of improved circuit control means for such machines when driven by direct current motors.

This application is a division of my copending application, Serial No. 322,092, filed March 4, 1940, now Patent No. 2,279,080, of April 14, 1942, for "Calculating machine."

It is a general object of the invention to provide improved means for reversing the current in a direct current circuit of a motor driven calculating machine or the like.

Another object of the invention is to provide a device of the character referred to, wherein the reversing of the circuit is controlled by an operating control of the calculating machine.

Other objects and advantages will appear from the following description of a preferred embodiment of the invention as illustrated in the accompanying drawings, in which:

Figure 1 is a sectional elevational view of a calculating machine with which the instant invention can be employed.

Figure 2 is a fragmentary rear elevational view of the polarity reversing switch as mounted in the calculating machine.

Figure 3 is a view similar to Figure 2 showing the parts in an intermediate operating position during a reversing operation.

Figure 4 is a rear elevational view similar to Figure 2.

Figure 5 is a sectional elevational view of the reversing switch showing one operating position thereof. The section being indicated by the line 5-5 of Figure 7.

Figure 6 is a sectional elevational view similar to Figure 5 showing another operating position thereof.

Figure 7 is a vertical transverse sectional view taken in a plane indicated by the line 7-7 in Figure 5.

Figure 8 is a horizontal sectional view taken in planes indicated by the line 8-8 in Figure 6.

In electrical devices such as calculating machines, for example, having direct current driving motors which are started and stopped by means of a pair of make and break contacts, maintaining the polarity of the circuit in a given direction causes a build-up on one of the pair of contacts and a corresponding erosion of the other contact, as a result the contact surfaces become irregular and require frequent servicing or replacement for satisfactory operation. In accordance with the

instant invention the foregoing disadvantages are eliminated by the provision of means for periodically reversing the polarity of the circuit. In this way the metal is first deposited on one contact and then on the other, with sufficient frequency to prevent an undue buildup and to maintain the contacts in good condition over a long period of life.

The invention may be employed for example in a calculating machine of the type disclosed in the copending application of Carl M. Friden, Serial No. 35,619, filed August 10, 1935, for "Calculating machine."

Referring to Figure 1, the calculating machine may include a base 10 upon which the frame including a side plate 11 is mounted. A shiftable register carriage 12 of the usual construction may be provided. The driving mechanism for the calculating machine may include a direct current electric motor 13 having a drive shaft 14 connected by gearing 15 with a cyclically operable clutch 17, providing a cyclic drive for a transverse drive shaft 18. The clutch 17 may be controlled by a lever 19 operated through a slide 21 suitably mounted on the frame for endwise movement and adapted to be operated by suitable control means for example by keys 22 or by a control lever 23 for an operation such as division.

For opening and closing the motor circuit simultaneously with the disengagement and engagement of the clutch, the slide 21 is connected by lever 26 with a pivoted lever 27 having an insulated pin 28 overlying a contact 29 adapted for engagement with a second contact 31. Contacts 29 and 31 are placed in the motor circuit in any convenient manner to control the energization thereof.

Division lever 23 (Figure 1) is cooperatively related to a pin 32 on a division setting slide 33 which in turn has a roller 34 operatively related to a settable control bellcrank. Control bellcrank 36 is suitably pivoted on a control arm 37 and is connected by link 38 with a bellcrank 39 having its upper arm operatively related to a pin 41 carried by the slide 21. Thus, upon movement of the division lever 23 in a counter-clockwise direction as viewed in Figure 1, slide 33 moves to the right and rocks bellcrank 36 and bellcrank 39 to operate slide 21 and thereby engage the clutch and move contact 29 into position to energize the motor. At the same time insulated roller 42 upon slide 33 engages an end of contact arm 31 to move contact 31 away from contact 29 and thereby prevent energization of the motor until release of the division lever 23. The

slide 33 and the division lever 23 are restored to normal position upon release of lever 23 by spring 43 connected to slide 33. Thus division lever 23 has a setting or conditioning movement during which the machine is conditioned for operation, and a further movement to actually start the operation by energizing the motor. During the setting movement of division lever 23, bellcrank 36 also operates through pin 46 to rock arm 47 and shaft 48 on which the arm is secured, and this movement, as later described, is utilized to operate the polarity reversing switch.

As seen in Figure 1, shaft 48 also carries an arm 49 which projects rearwardly and engages a vertical slot 50 in a vertically disposed actuated slide 51 guided between spaced rollers 52 carried by bracket 53 which is slotted at 54 to receive arm 49. Bracket 53 is secured to and depends from a cross bracket 55 of the frame. Slide 51 has a pin 56 on which is pivoted an operating pawl 57 having a V-shaped lower nose 57A and a V-shaped upper nose 57B for centering engagement with the lower pair of rollers 52. The slide 51 is urged to its raised position by spring 58 extending between pin 56 and stop pin 59 on bracket 53. From the foregoing description it will be seen that each time the division lever 23 is operated the slide 51 and its pawl 57 will be moved downwardly. This movement is used to control the reversing movement of an insulated contact member carrying the reversing elements of the switch.

Referring to Figure 5 to 8, the reversing switch may comprise a pair of opposed blocks 61 and 62 formed of suitable insulating material such as "Bakelite." Blocks 61 and 62 are held between similar retaining plates 63 and 64, also of insulating material, by suitable fastening studs 66. Blocks 61 and 62 are cut away at their facing surfaces to provide a space 67 in which the reversing contact element is positioned as later described.

As seen in Figures 7 and 8, the block 62 carries vertically spaced apart input terminals 71, 72 mounted in suitable recesses in the block 62 and retained therein by plate 64. Each terminal is recessed to receive a spring urged contact 73 associated therewith and having a reduced end projecting into the space 67. Similarly, the block 61 carries transversely spaced output terminals 76 and 77, also having spring urged contacts 73 associated therewith and projecting into the space 67. Preferably, terminals 76 and 77 lie in the same arcuate line as contact 72 with respect to a pivotal axis 82 referred to hereinafter. To provide a mounting for the reversing contact element, block 62 (Figure 7) has an upstanding boss 81 carrying a pivot stud 82 for the reversing contact element 83. The reversing element 83 may be formed of some wear-resistant insulating material, for example, "Micarta."

As shown in Figures 5 and 7, the oscillatable reversing element 83 has at its upper end a V-shaped nose 84 and a pair of arcuate sockets 86 adjacent thereto. Nose 84 presents cam surfaces for engagement with pawl 57 to enable back and forth actuation of element 83. Spaced apart guides 87 are provided at either side of the element 83 to receive the pawl 57 to prevent lateral deflection thereof. To control the rocked position of the element 83 a V-shaped centralizing nose 88 is provided thereon for cooperation with a suitable centralizing lever 89 pivoted between blocks 61 and 62 and spring-urged against the nose 88 by compression spring 91.

As shown in Figures 5 and 6 the element 83 can be rocked to position its nose 84 to approxi-

mately 15° to either side of a central position so that the point of the actuating pawl 57 is first opposed to one side of the V-shaped nose 84 and then to the other. If pawl 57 moves downwardly from the position shown in Figure 2, it will engage the right-hand cam surface of nose 84 and be deflected to engage in the arcuate portion 86 to the right of nose 83 in a clockwise direction to carry the centralizing nose 88 past the center of the nose of centralizing pawl 89 whereupon the spring 91 becomes effective to complete the rocking movement of the member 83. When pawl 57 is subsequently retracted, its point is operatively related to the left-hand side of the V-shaped nose 84 on element 83, so that a subsequent depression of the pawl 57 will rock the element 83 in a counter-clockwise direction, that is back to the position shown in Figures 2 and 6.

In order to control the reversing of the circuit by the rocking movement of the reversing element 83 such element is provided with two sets of thin contact strips of suitable conducting material, such as beryllium, to make contact as desired in its two positions. For example as seen in Figures 5 and 6, one pair of contact strips 96 is provided having a slightly arcuate shape, while another pair of V-shaped strips 97 are provided. The strips of each pair are similar and are riveted to opposite sides of the element 83 by rivets 99 to be electrically connected to each other to form an electrical conducting lead. If desired, the element 83 may be provided with an aperture 98 of irregular outline to provide air gaps between contacts 96 and 97. Contact strips 96 and 97 both have a pair of rivets 99 in the arcuate line of terminals 72, 76, 77, and spaced apart a distance equal to the spacing of terminals 76 and 77 from terminal 72. Contact strips 96 and 97 also both have a rivet 99 mounted for movement in an arcuate line including terminal 71 and adapted for alternative engagement therewith upon rocking movement of plate 83.

With the reversing element 83 in the position shown in Figure 5, the strips 96 serve to connect input terminal 72 with output terminal 77, and strips 97 serve to connect input terminal 71 with output terminal 76. With the reversing element adjusted as seen in Figure 6, the input terminal 71 is connected to the output terminal 76 so that the polarity of the circuit is reversed from the condition shown in Figure 5.

It will be noted that because the element 83 is operated by the actuating pawl 57 while the contacts 31 and 29 are open that no arcing can occur because of such reversal, but that the reversal always occurs while the circuit is dead.

I claim:

1. In a machine of the class described having an electric motor adapted for operation from a source of direct current, a pair of make and break contacts for controlling the operation of said motor, a polarity reversing switch in the circuit with said contacts, means for initiating operation of said machine including means for maintaining said contacts open while conditioning the machine for operation and for thereafter closing said contacts, and means controlled by said operation initiating means for operating said reversing switch during said machine conditioning and before closing of said contacts.

2. In a machine of the class described having an electric motor adapted for operation from a source of direct current and a pair of make and break contacts for controlling the operation of

said motor, a polarity reversing switch in the circuit with said contacts, a control member for initiating operation of the machine, said member having an initial movement to condition the machine for operation and a subsequent movement to start operation of the machine; a controlling connection for said contacts operable by said member, said connection being operated

5 during said initial movement of said member to hold said contacts open and during said subsequent movement to enable closing of said contacts, and a control linkage for said reversing switch operated by said controlling connection during said initial movement of said member to operate said reversing switch.

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