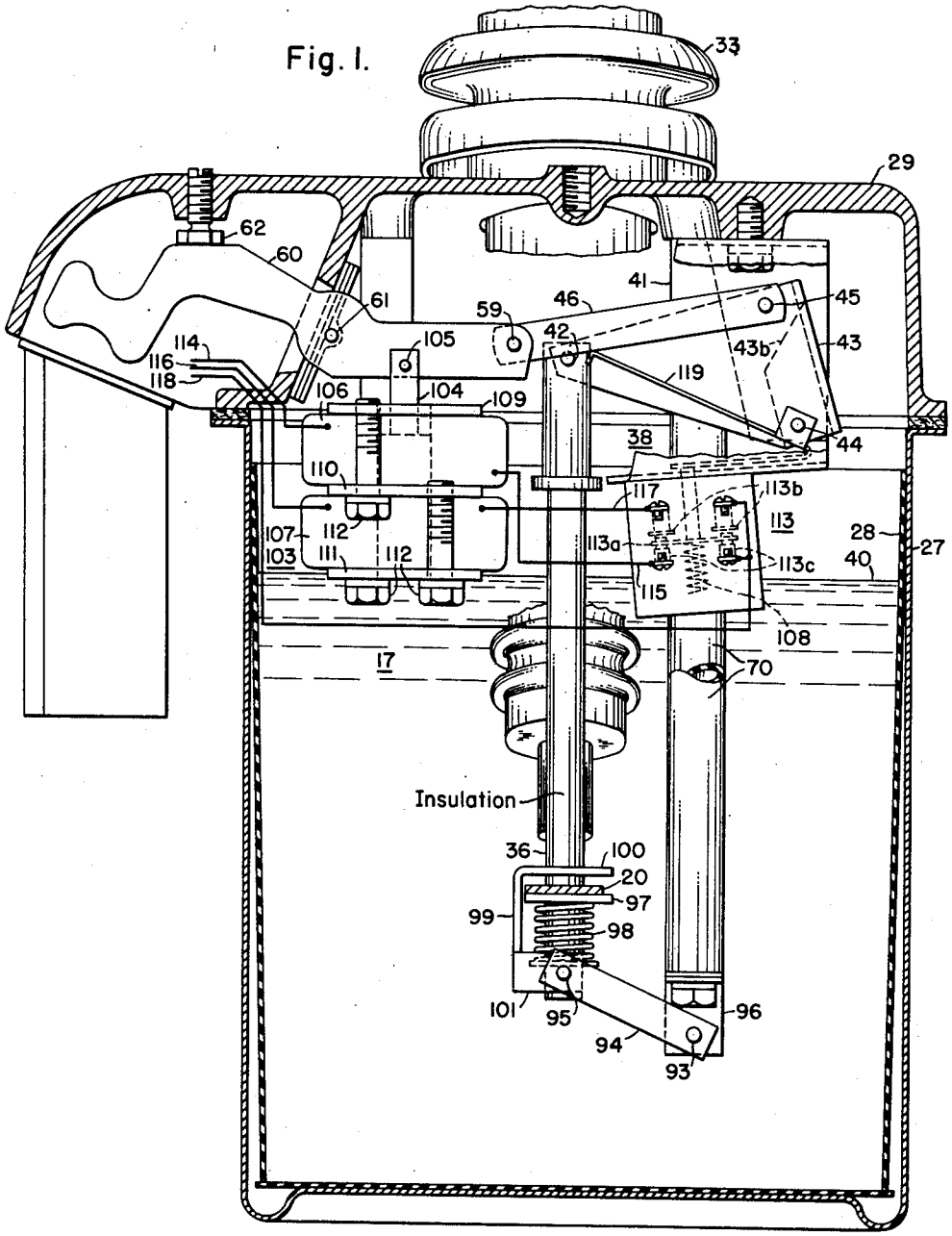
Feb. 8, 1955 A. W. EDWARDS ET AL 2,701,828

ELECTRICALLY OPERATED SWITCH AND SECTIONALIZER

Filed Sept. 29, 1950 3 Sheets-Sheet 1

Fig. 1.



WITNESSES:

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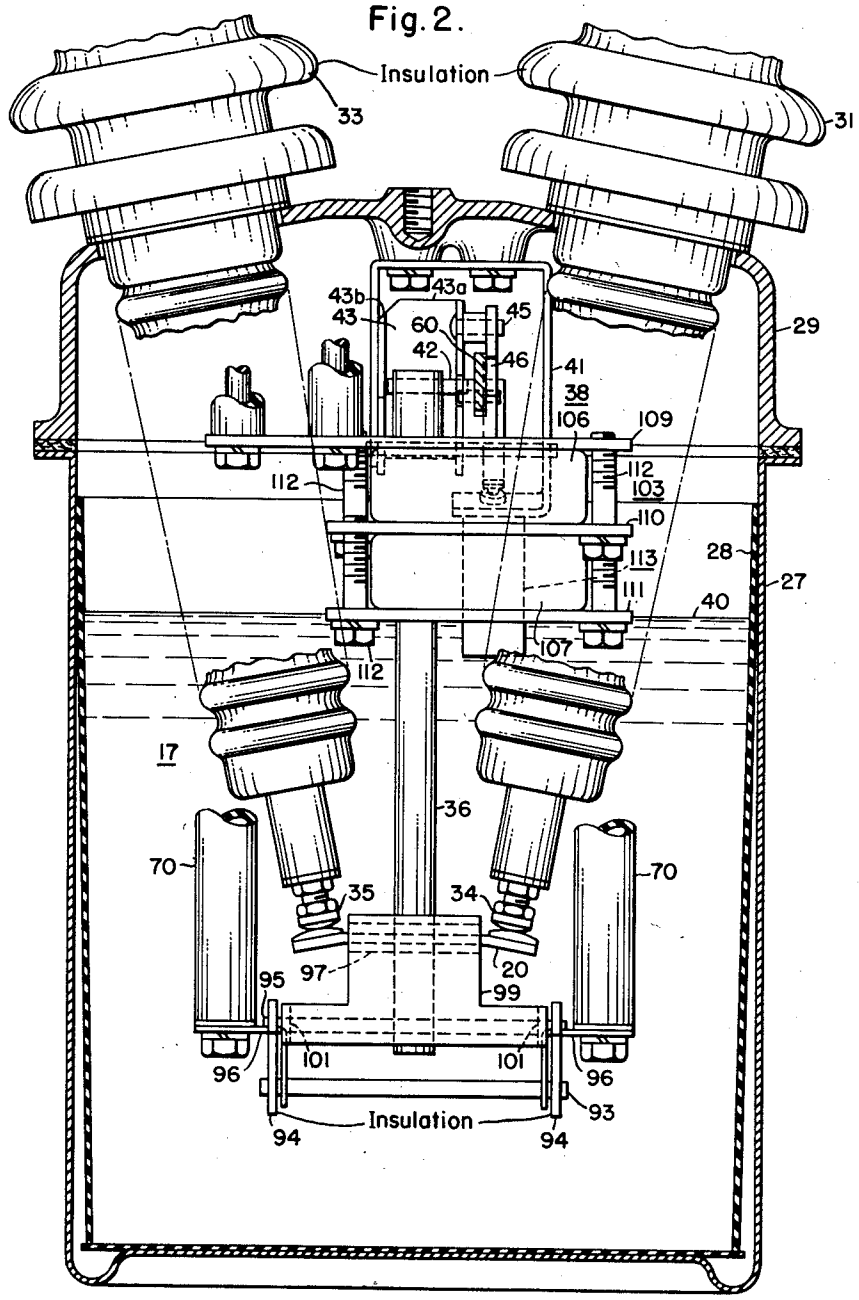
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Feb. 8, 1955 A. W. EDWARDS ET AL 2,701,828

ELECTRICALLY OPERATED SWITCH AND SECTIONALIZER

Filed Sept. 29, 1950 3 Sheets-Sheet 2

Fig. 2.



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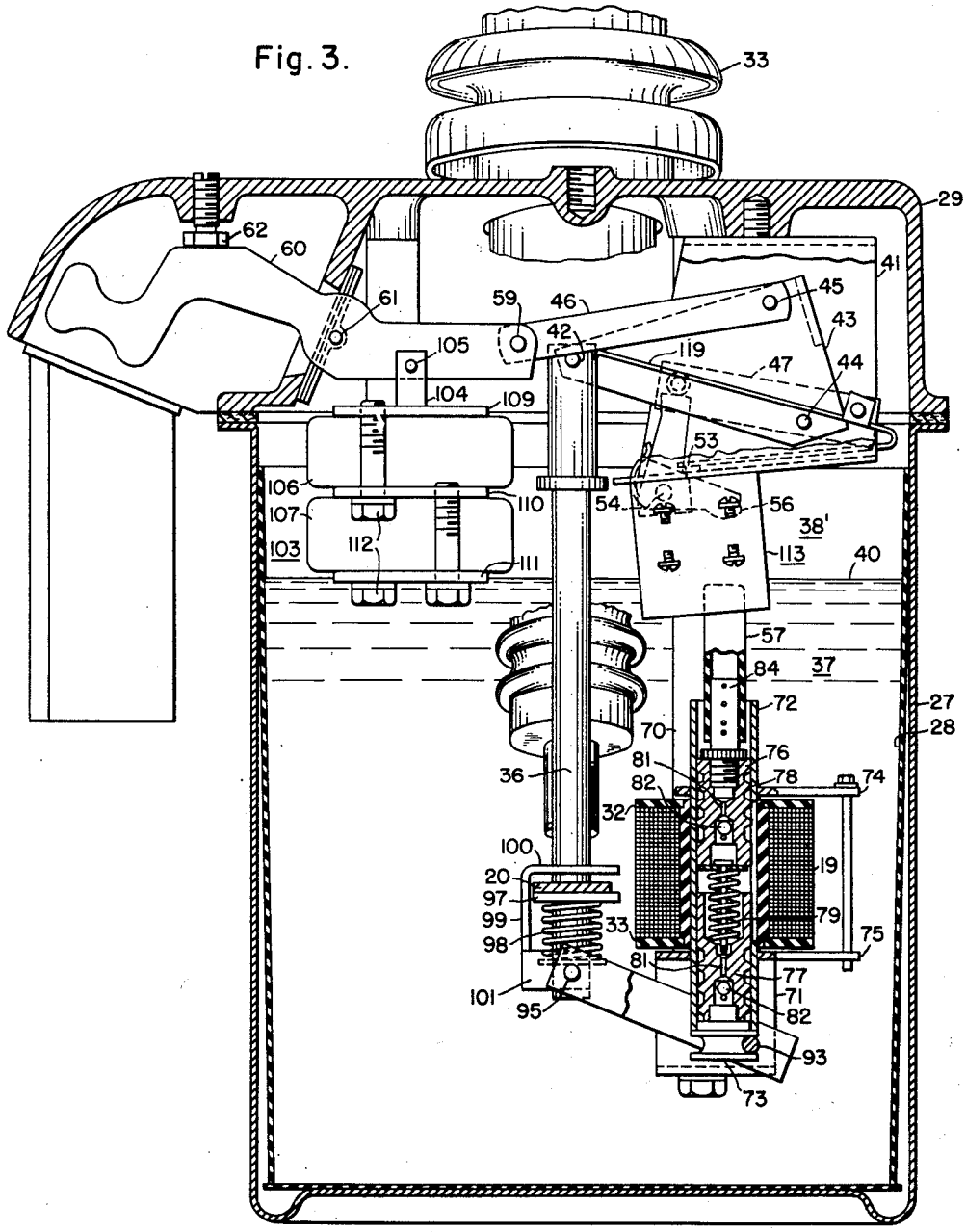
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Feb. 8, 1955 A. W. EDWARDS ET AL 2,701,828

ELECTRICALLY OPERATED SWITCH AND SECTIONALIZER

Filed Sept. 29, 1950 3 Sheets-Sheet 3

Fig. 3.



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United States Patent Office 2,701,828 Patented Feb. 8, 1955

2,701,828

ELECTRICALLY OPERATED SWITCH AND SECTIONALIZER

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Application September 29, 1950, Serial No. 187,566

15 Claims. (Cl. 200—89)

This invention relates generally to electric switching equipment, and more particularly to switches and sectionalizer switches of the electrically operated type.

In many switching applications, such as, for example the switching of capacitors in response to voltage variations of a system, it is desirable to have an inexpensive switch structure which may be electrically operated in response to said variations. It is also desirable to provide a switch structure having a relatively low contact-closing bias in order to limit the size of the mechanism, yet this low contact-closing bias may limit the current carrying capacity of the switch because of the magnetic forces tending to open the contacts under short circuit conditions.

Accordingly, it is one object of our invention to provide a simple and inexpensive electroresponsive oil switch.

Another object of our invention is to provide in a sectionalizing switch for electrically operating the switch to different operating positions.

It is also an object of our invention to provide in an electroresponsive switch device for utilizing electric operating means to actuate the switch device to either an open or a closed operating position.

Yet another object of our invention is to provide in a switch device for increasing the contact pressure with increased current through the switch.

Another important object of our invention is to provide in a switch device for utilizing the magnetic field about a current conducting contact member for increasing the contact pressure on the contact member.

We also propose to provide in a switch device for utilizing a novel magnetic switch operating mechanism wherein an armature is actuated in one direction to close the switch by energizing one operating winding, and in the opposite direction to open the switch by energizing another operating winding.

With the foregoing and other objects in view, our invention consists in the systems, combinations, structures, parts, and methods of design and operation, hereinafter described and claimed, and illustrated in the accompanying drawings, wherein

Figure 1 is a simplified vertical cross-sectional view of a switch device illustrative of our invention,

Fig. 2 is a vertical cross-sectional view taken at substantially right angles to the section of Fig. 1, and

Fig. 3 is a vertical cross-sectional view corresponding to the view of Fig. 1, through a sectionalizer switch device illustrating another embodiment of the invention.

Referring to Figs. 1 and 2 it will be seen that our invention may be embodied in a switch generally of the type disclosed in copending applications Serial Nos. 106,886 and 106,887 of James M. Wallace and Andrew W. Edwards, and James M. Wallace and Alvin W. Ogg, respectively, both of which are assigned to the assignee of the present invention, and wherein a switch **17** is enclosed within a metal tank **27**, which is provided with an insulating liner **28**, and which is surmounted by a top casting **29**. An incoming line enters through a bushing **31** which terminates inside the tank. The circuit then continues, through a terminal contact **34** which constitutes one of the stationary contacts of the sectionalizer. Ordinarily, the sectionalizer has two bushings, each with its lead passing through the bushing, and each bushing terminates, at its bottom, in one of the stationary contacts of the sectionalizers, but since Fig. 1 shows an approximate central section through the sectionalizer, the second stationary contact and bushing are not visible in Fig. 1, but they are

indicated in Fig. 2 at **35** and **33**, respectively. The contacts **34** and **35** may be connected by a movable contact **20**, shown, in Fig. 2, as a contact-bar or bridge which presses up against the underside of the stationary contacts **34** and **35**, in the closed position of the switch, and which is lowered by gravity (after being accelerated by a spring **98**), to operate the sectionalizer, upon the release of a pull rod **36**, which is shown in the form of an upwardly extending insulating tube and may be provided with an operating mechanism **38**.

The switch **17** can theoretically operate either in air, or in an insulating oil, or other insulating fluid. It is sometimes desirable to have the contacts **34—20—35** also operating in oil. We have consequently illustrated our apparatus, by way of example, as having the contacts **34—20—35** immersed in oil **40** which is contained in the tank **27**.

The operating mechanism **38** is mounted in a frame **41** which is bolted to the underside of the top casting **29**. This operating mechanism **38** may be regarded as starting with the movable contact member **20**, and including the upwardly extending insulating pull rod **36**, the bottom end of which is connected to said movable contact member. Pivotally connected, at **42**, to the top of the pull rod **36**, is one of the two terminal pivot points of a rocker member or lever **43**, which is shown, in its preferred form, as a triangular plate, of a generally channel section, with an end base portion **43***a* and a shortened rear leg portion **43***b*. The lever **43** may be disposed with its base line nearly horizontal, with two terminal pivot points **42** and **44** disposed near the ends of said base line, and having an upwardly extending apex portion which carries an intermediate rocker point **45**, which is pivotally connected to a first end of a normally nearly horizontal link **46**, which will be subsequently described. The second terminal pivot point **44** of the rocker member **43** is supported on the frame **41**.

The link **46**, which is pivoted at one end **45** to the top of the triangular rocker member **43**, has a second end which is pivoted, at **59**, to the inner end of an operating handle **60**. An intermediate point of the operating handle **60** is secured to a stationary pivotal support **61**, which is carried within the top casting **29**. The outer end of the operating handle **60** normally presses up against a stop screw **62** which is carried by the underside of the top plate of the top casting **29**.

The lower end of the pull rod **36** may be aligned by means of insulating guide links **94** which are pivotally supported at one end by a pin **93** secured by means of brackets **96** secured to the lower ends of tubular insulators **70** which depend from the top casting **29**. The other ends of the links may be connected to the lower end of the pull rod **36** by a pin **95**.

In order to provide for increasing the pressure between the contact member **20** and the contacts **34** and **35**, an actuating member **97** comprising, for example, a bar of iron, steel, or other magnetic material, may be slidably disposed on the pull rod **36** beneath the contact member **20**, which is also slidably disposed on the pull rod and biased upwardly by a spring **98**. An L-shaped guide **99** having an upper leg **100** with an opening to receive the pull rod, and ears **101** adjacent the lower ends of the vertical leg with openings to receive the pin **95**, may be utilized to align the bridge contact member **20** and prevent it from turning on the pull rod **36**. By making at least the upper leg **100** of a magnetic material, the attractive force between the actuating member **97** and the upper leg **100**, resulting from the flow of current through the contact member **20**, may be utilized to bias the contact member upwardly with a force proportional to the current, and in addition to the normal biasing force of the spring **98**.

To provide for electrically operating the switch **17** so as to use it, for example, for controlling the connection of voltage regulating capacitors to a power system in response to changes in the voltage of the system, electroresponsive operating means **103** may be provided. The electroresponsive means **103** may, for example, comprise an electromagnet having an armature **104** pivotally connected to the lever **60** by a pin **105**, and upper and lower operating windings **106** and **107**. These windings may be

disposed between plates 109, 110 and 111 of magnetic material, which plates may be maintained in spaced relation by bolts 112 which magnetically link the plates. The armature 104 is so disposed that when the upper winding 106 is energized, the armature will be pulled upwardly by magnetic flux in the gap between the upper plate 109 and the armature. It will be pulled downwardly when the lower winding 107 is energized, by flux in the air gap between the lower plate 11 and the armature. This operates the lever 60 to open and close the switch. A cut-off switch 113, having a bridging contact 113*a* biased upwardly by a spring 108, and lower and upper contact members 113*c* and 113*b* may be connected, as shown, in circuit relation with the windings 106 and 107 by conductors 114—115, 116—117 and 118 to effect deenergization of the windings 106 and 107 in response to movement of the switch 17 to the open and closed positions, respectively. A hairpin spring lever 119 pivotally mounted on the pin 44 and actuated by the lever 46 may be disposed to actuate the bridging contact 113*a* down against the upward action of the spring 108.

In the normal or closed position of the linkage, as shown in Fig. 1, the link 46 is in toggle lock with respect to the operating handle 60. In other words, the pivotal point 59 of this toggle-linkage is some 3/32 of an inch below the line joining the two terminal pivots 61 and 45 of this toggle, so that weight or other opening bias of the movable contact member 20 tends to rock the rocker member 43 in a counterclockwise direction about its second terminal pivot-point 44, so that said rocker member presses the link 46 toward the operating handle 60 in such direction that most of the thrust is taken by the pivotal support 61 of the operating handle, but a small part of said thrust is transmitted to the abutment 62 for said operating handle, in the normal closed position of the mechanism. The weight or other biasing-force of the movable contact member 20 is borne by the pivot 44, which is supported on the frame 41.

In operation, current through the bridge contact 20 produces a magnetic flux which links the actuating member 97 and the upper leg 100 of the guide 99. These mutual flux linkages draw these members together. Since the guide member is secured to the pull rod 36, the slidable member 97 is urged upwardly and bears more firmly against the lower side of the contact member. This biasing force increases with current and thus is valuable in assisting to overcome any tendency of the switch to open under short circuit conditions.

An electrical tripping-operation may be initiated by energizing the upper winding 106 through conductors 114, 115, contact members 113*a* and 113*c*, and conductor 118. Armature 104 moves upwardly, raising lever 60. This releases the toggle arrangement of levers 60 and 46, permitting lever 43 to rotate counterclockwise about pin 44 to open the switch. Spring lever 119 thereupon releases switch 113 to permit contact member 113*a* to separate from contact members 113*c* and engage upper contact members 113*b*. This deenergizes winding 106 and sets up an energizing circuit for the lower winding 107.

The switch 17 may be closed electrically by completing the energizing circuit for the operating winding 107 through conductors 116 and 118. The armature 104 is thereupon pulled downwardly. Lever 60 is moved clockwise and actuates lever 46 to effect clockwise rotation of lever 43 about pin 44. The pull rod 36 is raised, and the bridging contact 20 is drawn into engagement with stationary contacts 34 and 35. The toggle relation of levers 60 and 46 is restored, thus holding the switch 17 in the closed position. Lever 119 actuates switch 113 to the position shown, thus deenergizing winding 107 and setting up the energizing circuit for the winding 106.

If the contact 20 is opened by a manual opening-movement of the operating handle 60, the first beginning of said movement elevates the inner pivot-point 59 of the operating handle and breaks the toggle at this place, as in the electrical operation, after which the weight of the contact 20 causes the operating handle to continue to move into its fully open position. Manual reclosing is effected by restoring the handle 60 to the position shown, thus restoring the toggle relation.

Referring to Fig. 3 it will be seen that our invention may be embodied in a switch 17 of the type disclosed in the aforementioned copending applications Serial Nos. 106,886, and 106,887, in which the particular operating-mechanism 38' which is shown in the accompanying drawings is described in detail. In brief, it will perhaps suffice to say that this operating-mechanism comprises a bellcrank trigger 53 and an operating handle 60. The trigger 53 has a downwardly extending abutment-portion 56 which is adapted to be tripped when an upward movement of a trip-pin 57 of a counter 37 raises said abutment point 56 of the trigger, and a lever 47 having a pin 44 for pivotally supporting the lever 43 is thereupon released by the trigger, whereupon the linkage of the operating-mechanism permits the pull rod 36 and the movable contact member 20 to drop freely in the opening operation of the mechanism.

The counter 37 is suspended from the top of the top casting 29, by means of a plurality of depending insulating supports or tubes 70, which support the base frame 71 of the counter. The counter proper 37 may, as shown, comprise a vertically disposed tube 72, which is preferably made of brass or other non-magnetizable metal. The lower end of the tube is tightly closed by a plug 73, while the top of the tube 72 is open. A series current coil 19 surrounds a portion of the tube 72, intermediate between its upper and lower ends. Immediately above and below the coil 19 are two magnetizable plates 74 and 75, respectively, both of which are perforated so as to surround the tube 72. The plates 74 and 75 serve as the two pole pieces of an electromagnetic circuit, the excitation of which is provided by the coil 19.

Inside of the tube 72 are two normally spaced magnetizable cores or armatures 76 and 77, which are slidably movable, with a close fit of say perhaps 3 mils radial clearance, within said tube. The upper armature 76 extends partly above and partly below the level of the upper plate 74, while the lower armature 77 extends partly above and partly below the lower plate 75. Each of the armatures 76 and 77 thus extends partly within and partly without the space between the two plates 74 and 75.

At least one of the armatures, such as the upper armature 76, and preferably both of the armatures 76 and 77, are provided with a plurality of annular magnetizable ribs 78, which are vertically spaced from each other by a spacing which is preferably approximately the same distance as the closable distance between the two armatures 76 and 77, or other disposition which will magnetically lock the respective armatures against unwanted vertical displacement or slippage. A compression spring 79 is disposed between these two armatures, so that, when the coil 19 is sufficiently energized, the two armatures are brought together, storing up energy in the interposed compression spring 79, as will be more fully described hereafter.

Each of these armatures 76 and 77 is provided with a central bore 81, and the lower end of each of these bores is closable by means of a ball valve 82, so that the fluid which is entrapped within the closed lower end of the tube 72 resists any rapid downward movement of either armature, because of the closure of these ball valves 82, while said valves permit the free upward movement of either armature. The entrapped fluid could be any gas or liquid having the required viscosity in comparison with the mechanical clearances which are provided. The idea is to permit the respective armatures to move freely upwardly, in a step-by-step motion, as will be subsequently described, while permitting said armatures to drift back downwardly again, by fluid-leakage, at a very slow rate.

At the top of the upper armature 76 is affixed an upstanding pin 84, which extends upwardly to a point above the open top end of the tube 72. This pin 84 is surrounded by a tubular tip or trip pin 57, which is capable of serving as an adjustable vertical extension of the pin 84. This vertical adjustment is effected in any one of a plurality of vertically spaced positions corresponding to the spacing between the armatures 76 and 77, by means of a cotter-pin, so that adjustment may be made for any desired number of "counts," such as 1, 2, 3 or 4, within the range of the counting mechanism 37.

In the operation of the counting mechanism 37, when the coil 19 is first energized, with a current corresponding to the setting of the counter, the two armatures 76 and 77 are drawn together, so as to close the airgap which separates the inner ends of said armatures. The upper armature 76 cannot move downwardly, in order to bring the two armatures together, because of the presence of its fluid flow valve 82, and hence the lower armature 77 must move upwardly. The attractive force between the two armatures is greater than the attractive force between

the lower plate 75 and the corresponding rib 78 of the lower armature 77, which was at first on the same level as said lower plate 75. When the lower armature completes its upward movement, compressing the spring 79, its next rib 78 comes into a magnetic interlock with the lower plate 75, thus holding said lower armature from drifting or settling downward, due to gravity and the slow leakage of the fluid filling of the tube 72, this holding-action being maintained as long as the coil 19 remains effectively energized.

When there is a fault on a distribution line, within the protective reach of an automatic reclosing type of circuit breaker (not shown), the recloser quickly opens, and quickly again recloses, but during the moment (12 cycles or more, in a 60-cycle line) when said recloser was open, the sectionalizer coil 19 is deenergized, and the compression spring 79 between the two armatures 76 and 77 expands and pushes the two armatures apart again to their normal separation-distance. During this action, however, the lower armature 77 cannot move downwardly, because of its fluid flow valve 82, and hence the upper armature 76 must move upwardly, which it is free to do, so far as fluid action is concerned, because its valve 82 will open during such movement. The magnetic attraction between the upper and lower plates 74 and 75 and the corresponding magnetizable ribs 78 of the upper and lower armatures 76 and 77 is now practically non-existent, because of the deenergization of the coil 19, and hence the upper armature 76 is notched upwardly by a distance corresponding to the amount of compression of the spring 79.

If a fault continues on the distribution system at a point beyond the sectionalizer coil 19, the reclosure of the recloser reenergizes the sectionalizer coil 19 and causes a second compression of the spring 79, in a manner already described. If the fault is still on the system, as has just been assumed, the recloser again opens, and a second upward stepping movement of the trip-pin 57 is obtained. And thus the step-by-step movement of the counter mechanism continues.

When the last upward stepping of the upper armature 76 is obtained, depending upon the vertical positioning of the trip pin or tubular tip 57, this pin 57 comes into contact with the trigger 53 during this last upward movement, and trips out by releasing lever 47 to drop the pivot pin 44 and effect counterclockwise rotation of the lever 43, thus dropping the pull rod and opening the sectionalizer contact 20. It will be noted that this last upward movement of the trip pin 57 occurs during a time when the current in the sectionalizer coil 19 is off. In the operation of the recloser the current remains off, that is, the recloser remains open, for a minimum of 12 cycles (on a 60-cycle line), before the recloser recloses. The opening of the sectionalizer contact 20 requires something like 2 or 3 cycles, so that it is seen that the sectionalizer contact 20 opens during the current-off period, so that the sectionalizer contact 20 does not have to interrupt any substantial current. In opening, the lever 43 strikes reset pin 54 when the pull rod 36 drops, and rotates counterclockwise about it to raise lever 47, and condition the switch for resetting by hand.

The electroresponsive means 103 may be applied to the switch 17 for opening and closing it in a manner similar to that in connection with the switch 17 of Figs. 1 and 2, and the armature 104 actuates the lever 60 in an identical manner, with the switch 113 operating to effect deenergization of the operating windings 106 and 107, respectively. During operation, the actuating member 97 and the guide 99 function as described heretofore in increasing the contact pressure between the bridge contact 20 and the stationary contact members 34 and 35.

While we have illustrated our invention in but a single exemplary form of embodiment, which is now preferred, we wish it to be understood that our invention is susceptible of considerable modification, by way of additions, omissions and the substitution of various equivalents, without departing from the essential spirit of our invention, particularly in its broader aspects. We desire, therefore, that the appended claims shall be accorded the broadest construction consistent with their language.

We claim as our invention:

1. Switch means comprising, separable contact means, actuating means for said contact means, a lever pivotally connected to the actuating means, a pivotal support for said lever, a toggle mechanism including a pair of levers connected together in toggle relation between a pivot on the aforesaid lever intermediate the pivotal support and said actuating means and a fixed pivot on the opposite side of the connection of the lever to the actuating means from the pivotal support operable to move said actuating means, and electroresponsive means connected to the lever of said toggle mechanism having the fixed pivot operable to effect selective operation of said toggle mechanism in opposite senses.

2. A circuit interrupter comprising, fixed contact means, a movable current conducting contact member adapted to engage said fixed contact means, movable support means for said contact member, a toggle mechanism disposed to actuate said movable support means and maintain it in a closed contact position, and magnetic means carried by said support means and disposed for movement related thereto, said magnetic means being positioned adjacent said movable contact member and disposed to be magnetized by current through said contact member to bias the movable contact member toward the fixed contact means.

3. A circuit opening device comprising, fixed contact means, movable contact means including a current conductor, actuating means movable relative to said movable contact means adapted to bias said movable contact means relative to said fixed contact means, toggle means connected to the actuating means to maintain the actuating means in a predetermined operating position, and magnetic means including a magnetic member disposed in fixed relation with the actuating means and a relatively movable magnetic member carried by the actuating means, said magnetic members being so disposed on opposite sides of the current conductor as to bias the movable contact member toward the fixed contact means relative to the actuating means.

4. A switch device comprising, a pair of spaced apart fixed contacts, a movable bridging contact member for said fixed contacts including a conductor disposed to connect said fixed contacts, actuating means resiliently connected to the bridging contact member to actuate it into engagement with and away from said fixed contacts, toggle means connected to the actuating means to maintain it in a position for the bridging contact member to engage the fixed contacts, an actuating member of magnetic material supported by the actuating means and movably disposed on the side of the conductor remote from said fixed contacts, and additional magnetic means disposed on the other side of said conductor in fixed relation with the actuating means.

5. A circuit interrupter comprising, fixed contact means, a movable contact member adapted to be moved into and out of engagement with said fixed contact means, actuating means for said movable contact member, a toggle mechanism including a pair of levers connected in toggle relation between said actuating means and a fixed pivot to actuate said actuating means to different operating positions, electroresponsive means operable to different operating positions connected to one of said levers at one point, and an auxiliary switch actuated by said actuating means for connecting the electroresponsive means in different circuit relations in accordance with the position of the actuating means to actuate said one lever to one or the other of two overcenter positions.

6. A circuit interrupter comprising, separable contact means, an operating mechanism for said contact means, a counter operable in response to pulses of current in the circuit to actuate the operating mechanism to separate said contact means only after a predetermined number of current pulses of a predetermined value, and electromagnetic operating means connected to said operating mechanism operable to actuate said mechanism in opposite senses to effect both separation and engagement of said contact means respectively.

7. A circuit interrupter comprising, separable contact means, an operating mechanism for said contact means comprising a toggle means which has a first undercenter position when said contact means are closed and being movable to another undercenter position when said contact means are opened, said toggle means having two links having two terminal pivot points and a common intermediate pivot point which constitutes the undercenter toggle point, an electromagnetic counter operable only after a predetermined number of current pulses to displace one of said terminal pivot points to move said toggle means from its first undercenter position to its other undercenter position thereby separating said contact means,

lever means operable to displace another of said terminal pivot points to effect separation of said contact means, and electromagnetic operating means connected with said lever means to actuate it in opposite directions to effect separation and engagement of said contact means, respectively.

8. A circuit interrupter comprising, separable contact means, an actuating rod operable to effect separation and engagement of said contact means, an electromagnetic counter operable only after a predetermined number of current pulses to effect operation of the actuating rod to separate said contact means, and electromagnetic operating means operatively connected to the rod to actuate it in opposite senses so as to effect both engagement and separation of said contact means, respectively.

9. A circuit interrupter comprising, separable contact means, an operating mechanism for said contact means including a lever having a normally fixed pivot point and a toggle means having two links with a common pivot point which constitutes an overcenter toggle point, one of said links being connected to said lever at a point spaced from its normally fixed pivot point, electromagnetic operating means connected to the other of said links adapted to actuate it in opposite directions to under and overcenter positions, and an electromagnetic counter operable in response to a predetermined number of current pulses to effect movement of said normally fixed pivot point whereby said lever rotates about the point of connection with said links to separate said contact means independently of operation of said electromagnetic operating means.

10. A circuit interrupter comprising, a pair of fixed contact members, a pull rod, a bridging contact member slidably mounted on the pull rod to engage said fixed contact members, lever means actuating the pull rod to maintain it in an operating position in which the bridging contact engages the fixed contact members, a bar of magnetic material slidably mounted on the pull rod on the side of the bridging contact member remote from the fixed contact members, and guide means for the pull rod including an additional magnetic member mounted on the pull rod in fixed relation therewith on the other side of the bridging contact member.

11. A circuit interrupter comprising, fixed contact means, movable contact means, a pull rod resiliently supporting the movable contact means, an operating mechanism connected to the pull rod to actuate it to move the movable contact means into and out of engagement with the fixed contact means, said operating mechanism including a pair of toggle levers connected between the pull rod and a fixed pivot to maintain the pull rod in a contact engaging position, electromagnetic operating means connected to one of the levers intermediate the ends thereof to operate the operating mechanism to move the movable contact means in opposite directions, and magnetic means supported on and positioned about the movable contact means to bias the movable contact means relative to the pull rod to increase the contact pressure between the fixed and movable contact means in accordance with the value of current through said movable contact means.

12. A circuit interrupter comprising, separable contact means, an operating mechanism for said contact means, electroresponsive means including a pair of operating windings operable to effect operation of said mechanism in opposite directions, and auxiliary switch means actuated by said mechanism to effect selective deenergization of said operating windings of the electroresponsive means in accordance with the operating position of said mechanism.

13. A circuit interrupter comprising, a tank, separable contact means disposed in the tank, actuating means for said contact means including a contact actuating lever and a toggle mechanism having a pair of levers connected in toggle relation between the actuating lever and a fixed pivot, one of said toggle levers having a handle portion projecting from the tank, a single electro-responsive device disposed within the tank operatively connected to said last mentioned lever for actuating it in opposite directions to effect separation and engagement of said contact means, and switch means actuated by the lever for connecting the electroresponsive device in different circuit relation for each such condition of said contact means for operating said contact means to the other condition.

14. A circuit interrupter comprising, separable contacts, an operating mechanism for said separable contacts including a lever having a normally fixed pivot point and a toggle mechanism connected between a point on said lever spaced from said fixed pivot and a fixed support, electromagnetic operating means connected to said toggle mechanism for actuating it in opposite directions, and counting means operable in response to a predetermined number of closely successive current interruptions to effect movement of said normally fixed pivot point to rotate said lever and separate said contacts.

15. A circuit interrupter comprising, fixed and movable contact means, means including a rotatable lever and a toggle mechanism having a pair of levers connected thereto and to a fixed pivot for actuating the movable contact means into and out of engagement with the fixed contact means, and electromagnetic operating means having a single armature connected to one of the levers intermediate the fixed pivot and the point of connection with the other lever to actuate the toggle mechanism and a pair of operating windings disposed about the armature energizable to actuate the armature in opposite senses.

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