Dec. 22, 1931. A. HALLER 1,837,544

CIRCUIT BREAKER OPERATING DEVICE

Filed Oct. 18, 1929

Fig. 1.

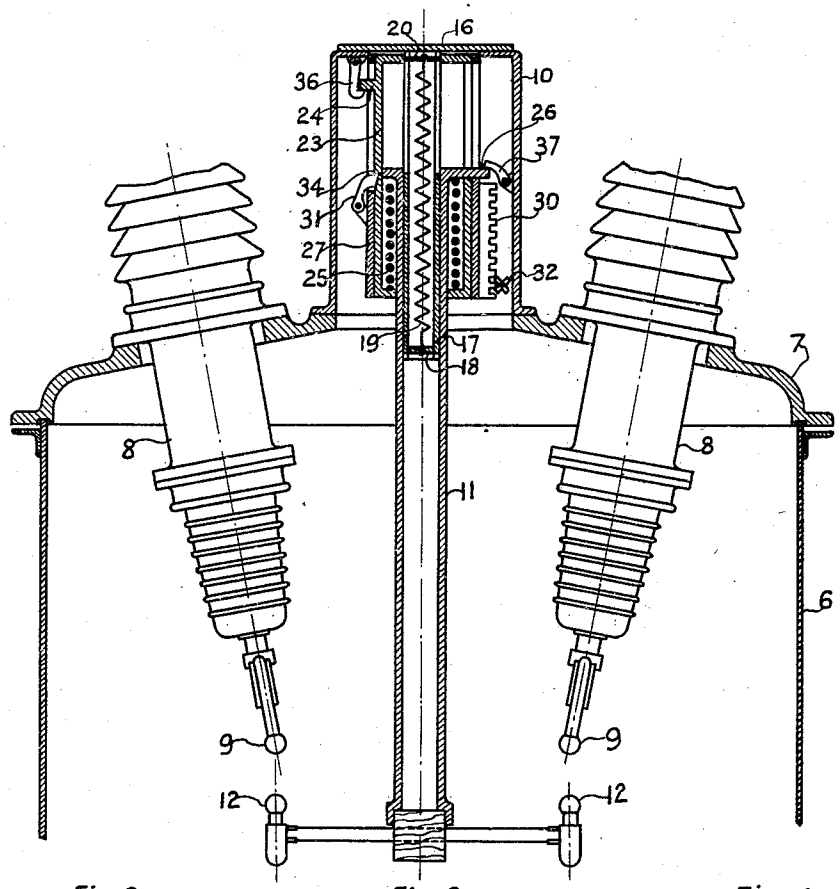


Fig. 2.

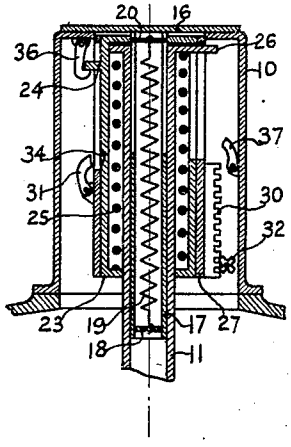


Fig. 3

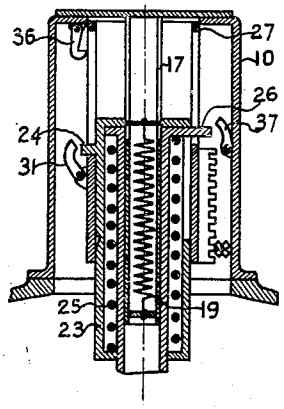
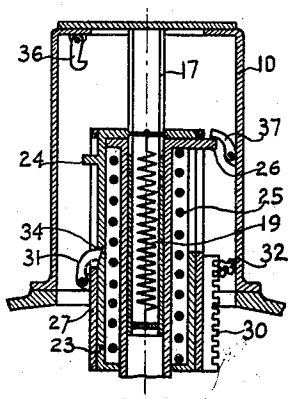


Fig. 4.



Inventor
Arnold Haller
By Alfred H. Dyson
Attorney

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UNITED STATES PATENT OFFICE

ARNOLD HALLER, OF BADEN, SWITZERLAND, ASSIGNOR TO AKTIENGESELLSCHAFT BROWN BOVERI & CIE., OF BADEN, SWITZERLAND, A JOINT-STOCK COMPANY OF SWITZERLAND

CIRCUIT BREAKER OPERATING DEVICE

Application filed October 18, 1929, Serial No. 400,492, and in Germany October 27, 1928.

This invention relates to improvements in power circuit breakers and, particularly, to drives for increasing the opening and closing speed of such circuit breakers in which the contacts are immersed in oil.

The speed at which an oil switch operates is one of the major factors in determining the safe load for a given size of switch or in determining the size of the switch to be used for a given load. An increase of speed in operation of an oil switch permits a decrease in the size of the contacts and aids in preventing the continuance of arcs between the contacts with the attendant formation of gas bubbles and other deleterious results.

It is accordingly among the objects of the present invention to provide a drive for an oil switch which will increase the speed of operation thereby decreasing the length of time during which an arc may exist between the contacts.

Another object of the invention is to provide a drive for oil switches in which a plurality of springs are arranged coaxially about the axis of the operating rod carrying the movable contacts and in which the entire drive is housed within a hood on the switch container.

Objects and advantages, other than those above set forth, will be apparent from the following description and the drawings, in which:

Figure 1 shows a partial cross-section of an oil switch, taken approximately on a central vertical plane, in which the drive is shown in position just before contact is made by the switch, and

Fig. 2 is a vertical cross-section of the drive after contact has been made in the switch.

Fig. 3 is a central vertical cross-section showing the drive after the switch has been disconnected, and

Fig. 4 is a vertical cross-section showing the drive being prepared for a new cycle of operations.

Referring more particularly to the drawings by characters of reference, the reference numeral 6 indicates a tank of the usual type arranged to contain a fluid, such as oil, for insulating and cooling purposes. The tank 6, which is in the form of a cylinder, is covered by a cover plate 7 provided with a plurality of openings, one of which openings is substantially at the center of the cover plate and the other of which are arranged on the circumference of a circle concentric with the central opening. The outer openings are formed to receive insulating bushings 8, of a well known character, to which are connected the fixed contacts 9. The central aperture through the cover plate 7 is arranged to be closed by an open top hood 10 which contains the driving mechanism, to be more specifically described hereinafter, and which also forms an extension of the air space above the oil level. The hood is so fastened on the top plate 7 that the drive may be operated from any point. An operating member in the form of a tube 11 extends downwardly from the driving mechanism and controls movement of the movable contacts 12.

The opening through the top portion of the hood 10 is closed by a cover plate 16 to which is secured a tube 17 having a pin 18 secured within the lower end thereof. A spring 19 is fastened at one end to the pin 18 and is fastened at the other end to a movable pin 20 which passes through and is guided in its movement by slots cut in the tube 17. The pin 20 is secured to the inwardly extending flanges of an inner sleeve 23 which is provided with an extension 24 for a purpose which will appear hereinafter. The operating tube 11 is guided in its movement by tube 17 and is flanged outwardly into contact with the inner sleeve 23 to form a chamber arranged to receive a helical spring 25 which is normally maintained under pressure between the lower inwardly extending flanges of the inner sleeve 23 and the outwardly extending flanges of the tube 11. A portion of the flange of tube 11 is formed to extend through a slot in the inner sleeve 23 and a coinciding slot formed in an outer sleeve 27 which has secured thereto a rack 30 and a latch 31.

The rack 30 is arranged to engage with a pinion 32; operable manually, pneumatically, electrically or hydraulically; which is sup-

ported on a shaft extending beyond the outer limits of the oil switch container for the purpose of moving the several sleeves and tubes forming the switch drive in preparation for connection or disconnection of the contacts. The latch 31 is arranged to engage a notch 34 in the inner sleeve 23 thereby mechanically coupling the sleeves. The latches 36, 37 are secured on the top and side portions of the hood 10, respectively, for the purpose of engaging respectively with the extension 24 of the inner sleeve and the extension 26 on the operating tube 11 to retain the sleeves and springs within the hood in preparation for the desired action.

Figure 1 of the drawings shows the drive in position prior to making contact in the switch. In this position, latch 31 engages notch 34, which maintains outer sleeve 27 and inner sleeve 23 in such position that latch 36 may engage extension 24 to retain both sleeves above the lower end of hood 10. The latch 37 engages the extension 26 on the operating tube 11 thereby maintaining spring 25 under compression while spring 19 is maintained under tension. Contact may now be made between the fixed and movable contacts by releasing the latch 31 from notch 34 and then releasing latch 37 from extension 26. Such action permits compression spring 25 to expand between the lower flanges of inner sleeve 23 and the flanges on the upper end of the operating rod 11. The inner sleeve 23 being still retained within the limits of the hood 10 by latch 36 engaging extension 24, is fixed so that the expansion of spring 25 acts to raise the operating tube 11 in such manner and for such distance that the movable contacts are quickly brought into contact with the fixed contacts 9. The above described position of the drive is shown in Fig. 2.

It will be seen that the entire drive is now retained only by the action of latch 36 on extension 24 of inner sleeve 23 which forms one point of attachment for the tension spring 19. Releasing latch 36 accordingly permits tension spring 18 to contract thereby forcing inner sleeve 23 downwardly.

The downward movement of inner sleeve 23, through the intermediate action of the expanded compression spring 25, causes downward movement of the operating tube 11 so that contacts 12 are separated from contacts 9, the drive being in the position shown in Fig. 3.

The positions of the drive above explained show the connecting and the disconnecting action of the spring drive which is now in its fully released position as shown in Fig. 4. It is accordingly now necessary to place spring 25 under compression and to place spring 19 under tension to prepare the switch for another cycle of operations. Latch 31 is engaged in notch 34 and latch 37 is caused to engage extension 26. Pinion 32 which has rotated idly in the downward movement of the outer sleeve 27 which carries the rack 30, is now rotated in the reverse direction. Such reverse rotation of the pinion 32 causes sleeves 23 and 27 to be moved toward the top of the hood 10 until latch 36 may again engage extension 24. Such action of inner sleeve 23 cooperating with the fixed position of operating tube 11 causes compression of spring 25. The movable pin 20, to which spring 19 is attached, being connected with inner sleeve 23, is moved toward the top of the hood 10 and the spring 19 is again tensioned. The spring drive will then again be in the position shown in Fig. 1 in which it is again ready for reconnection of the switch.

Although but one embodiment of the invention has been illustrated and described, it will be understood that various other embodiments are possible and that various changes may be made therein without departing from the spirit of the invention or the scope of the appended claims.

The invention claimed is:

1. In a drive for oil switches having a member for operating the switch, a tube extending into and guiding the movement of the operating member, a plurality of sleeves coaxially arranged about the operating member, a tension spring within such tube, a compression spring between said sleeve and said operating member, means for tensioning and for compressing said springs, and means for releasing the energy stored in said springs.

2. In a drive for oil switches having a member for operating the switch, a tube extending into and guiding the movement of the operating member, a plurality of sleeves arranged about the operating member, means for mechanically coupling said sleeves, a tension spring within such tube, a compression spring between one of said sleeves and said operating member, means for tensioning and for compressing said springs, and means for releasing the energy stored in said springs.

3. In a drive for oil switches having a member for operating the switch, a hood arranged on the container for the switch, a tube fixed to said hood and extending into the operating member for guiding the same, a plurality of sleeves arranged about the operating member, a spring within said tube, a spring between said sleeve and the operating member, means connected with said hood for retaining said sleeves therein, means for stressing said springs, and means for releasing the energy stored in said springs.

4. In a drive for a switch having a member for operating the switch, a fixed tube guiding the movement of the operating member, a plurality of springs coacting to cause reciprocating motion of the operating member, one of said springs acting under com-

pression and another of said springs acting under tension, and means for stressing said springs.

5. In a drive for a switch having a member for operating the switch, a fixed tube guiding the movement of the operating member, a plurality of springs coacting to cause reciprocating motion of the operating member, one of said springs acting under compression and another of said springs acting under tension, a sleeve arranged about the operating member and forming a chamber therewith, said compression spring being retained within the chamber, and means for stressing said springs.

6. In a drive for a switch having a member for operating the switch, a fixed tube guiding the movement of the operating member, a plurality of springs coacting to cause reciprocating motion of the operating member, one of said springs acting under compression and another of said springs acting under tension, said tension spring being retained within said tube and secured thereto at one end, a sleeve arranged about the operating member and engaging therewith, one end of said spring being secured to said sleeve, and means for stressing said springs.

7. In a device for operating circuit breakers having a movable contact carrying member, a fixed tube extending into and guiding the movement of the contact member, a plurality of sleeves arranged about said tube, a compression spring within said sleeves, a tension spring within said tube, said springs being capable of moving the contact member in opposite directions, and means for stressing said springs.

In testimony whereof I have hereunto subscribed my name this 4th day of October, A. D. 1929.

ARNOLD HALLER.