Oct. 26, 1954 C. SCHINDLER 2,692,925

CIRCUIT INTERRUPTER

Filed Aug. 28, 1951 4 Sheets-Sheet 1

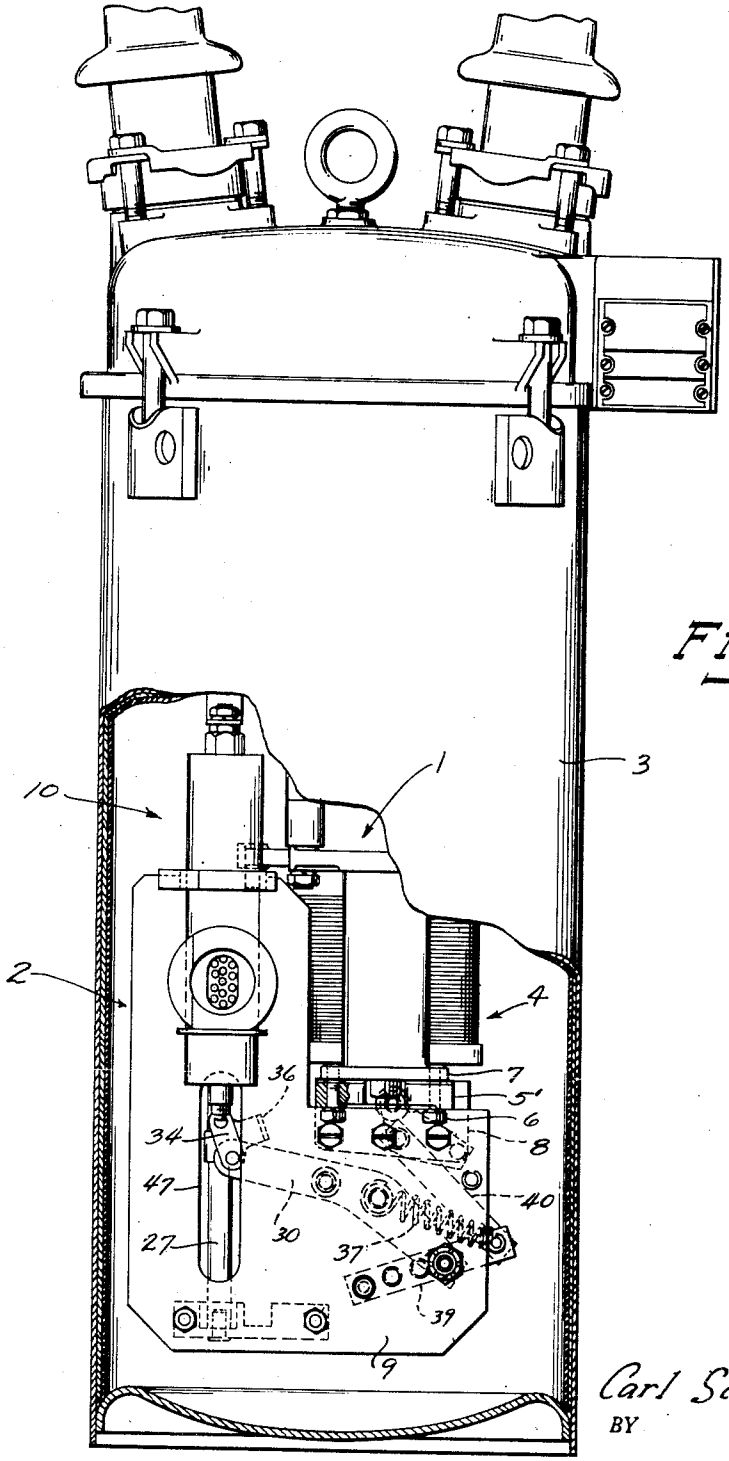


Fig. 1

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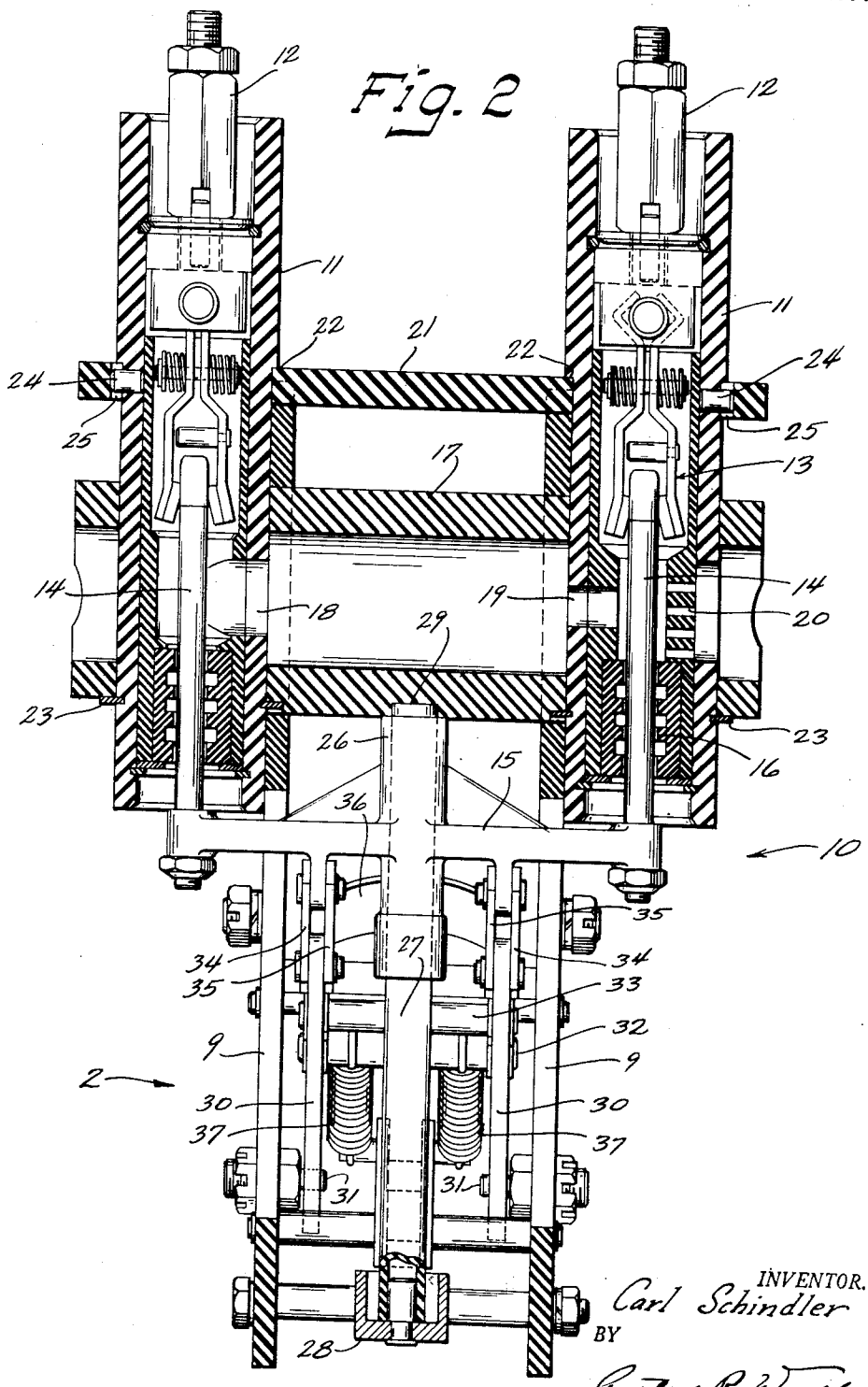
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Fig. 2



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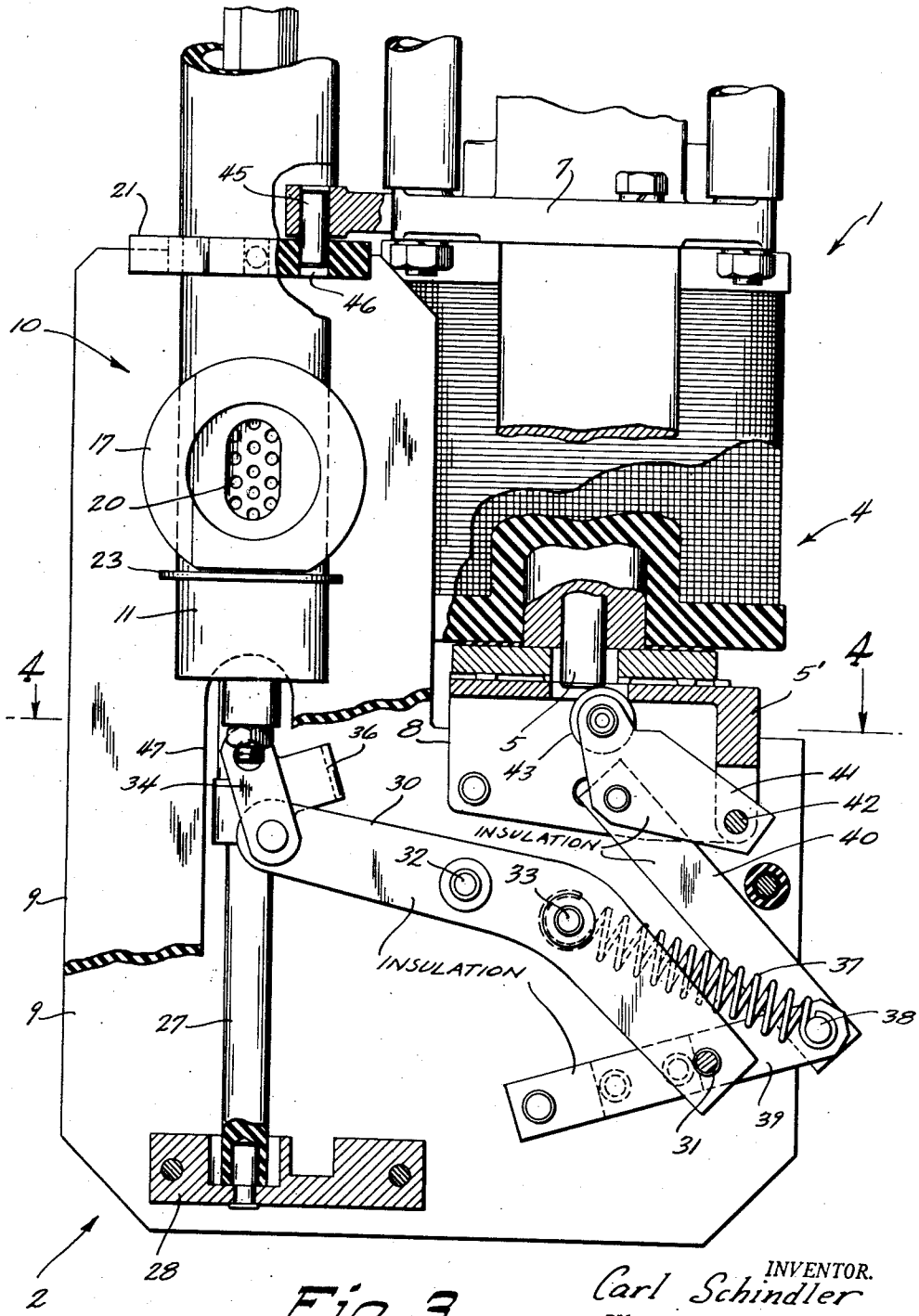


Fig. 3

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Fig. 4

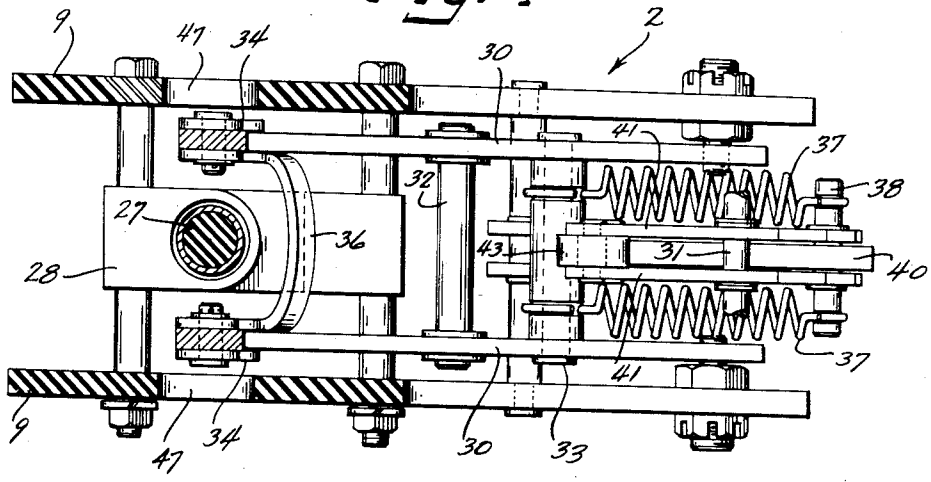
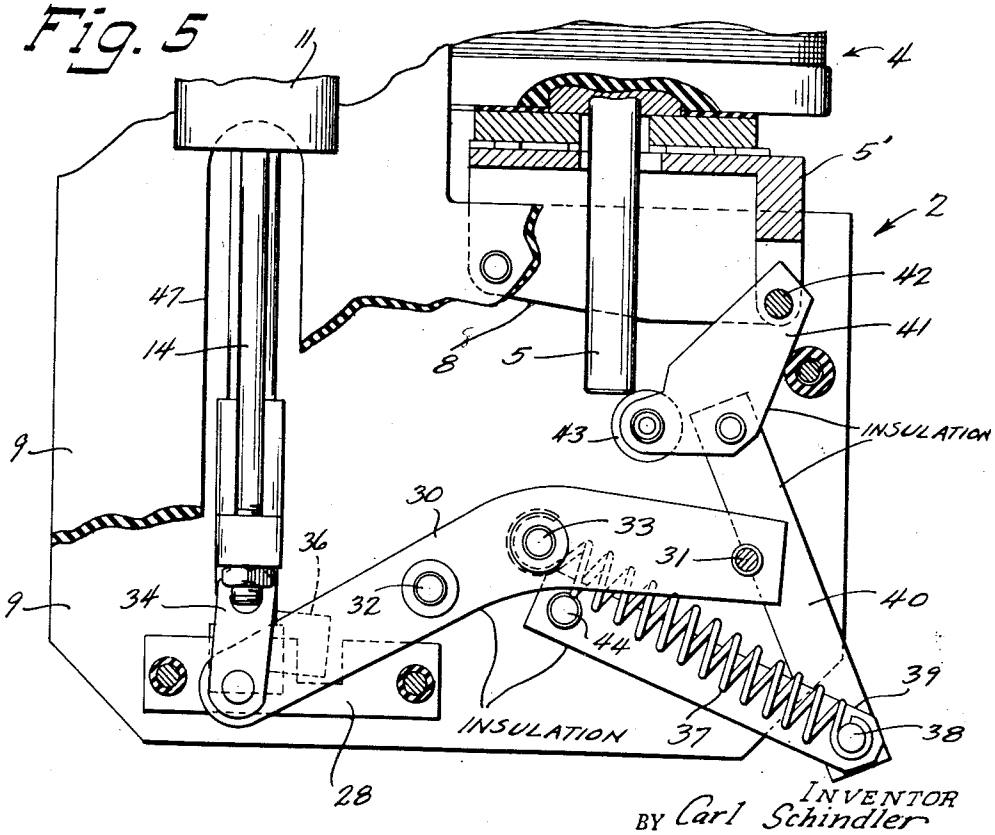


Fig. 5



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UNITED STATES PATENT OFFICE

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CIRCUIT INTERRUPTER

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Application August 28, 1951, Serial No. 243,953

5 Claims. (Cl. 200—87)

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This invention relates to circuit interrupters and is an improvement over the circuit interrupters shown in the following patents which are assigned to the same assignee as the present application, viz. the patent to Van Ryan and Schindler, 2,560,529, of July 10, 1951, for Automatic Reclosing Circuit Breaker, and the patent to Van Ryan and Schindler, 2,560,831, of July 17, 1951, for Circuit Interrupter.

In circuit interrupters as shown by the above noted patents and others of this general type, it is difficult to secure a very long path in the event an arc should strike from the contacts to metal parts of the body portion. If the distance from the lower end of the body portion to the contacts is increased, the total height of the circuit interrupter will become inordinately great and a longer enclosing tank as well as a considerable increase in the cost of manufacture will result. Further than this, it has been found difficult to detach the contacts and operating mechanism from the body portion without disturbing parts of the body portion such as the electromagnetic motor means.

This invention is designed to overcome the above noted defects, and objects of this invention are to provide a circuit interrupter which can safely interrupt circuits of higher voltages thus providing a circuit interrupter of a higher rating without unduly increasing the sizes, particularly the length of the circuit breaker while at the same time providing greater insulating values by increasing the length of the arc path to metal parts of the body portion.

Further objects are to provide a circuit interrupter in which the contacts and operating mechanism therefore constitute a unitary operating mechanism and switch assembly, in which a pair of insulating walls act not only as insulating barriers but also act as structural members, and in which the unitary operating mechanism and switch assembly can be removed or replaced as a unit without disturbing any portion of the body part of the circuit interrupter, particularly without disturbing the electromagnetic motor means.

An embodiment of the invention is shown in the accompanying drawings, in which:

Figure 1 is a side view of a circuit interrupter with parts broken away and parts in section.

Figure 2 is a detail fragmentary view partly in section showing the contacts and the operating mechanism in circuit closed position.

Figure 3 is a side elevation partly in section of the lower portion of the structure shown in Figure 1 with the parts in circuit closed position.

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Figure 4 is a sectional view on the line 4—4 of Figure 3.

Figure 5 is a view corresponding to the lower part of Figure 3, showing the parts in circuit open position.

Referring to the drawings, it will be seen that the device comprises a body portion indicated generally by the reference character 1, and an operating mechanism and switch assembly indicated generally by the reference character 2, and supported from the body portion in a manner hereinafter described.

The circuit interrupter is housed within a tank 3 which is preferably filled with oil as disclosed in the prior patents hereinabove referred to.

The body portion may comprise a structure substantially similar to that shown in either of the above two patents and includes an electromagnetic motor means indicated generally by the reference character 4 which includes a plunger 5 operated by the electromagnetic motor means. This structure is more fully set forth in the above noted prior patents.

The operating mechanism and switch assembly indicated generally by the reference character 2 is a unitary structure and comprises a head portion 5' removably bolted or otherwise secured as indicated at 6 to the lower portion 7 of the electromagnetic motor means 4, see Figure 1. It is to be noted from reference to Figure 1, that the securing means 6 may consist of bolts or screws which pass through the head 5' of the operating mechanism and switch assembly and are screwed into the lower head 7 of the electromagnetic motor means 4.

This enables the repairman or inspector to remove the unitary structure consisting of the operating mechanism and switch assembly without disturbing any portion of the electromagnetic motor means 4 or any other part of the body portion 1.

The head 5' of the operating mechanism and switch assembly has side flanges 8 to which insulating side walls 9 are attached. These side walls 9 are relatively heavy insulating members and serve not only as insulating baffles but also as structural members and support the switch mechanism, indicated generally by the reference character 10 as will be described hereinafter.

The switch mechanism comprises a pair of insulating tubular members 11 which carry terminals 12. The terminals support stationary contact members consisting of a pair of inwardly pressed spring fingers 13 as shown in Figure 2. The movable contacts are indicated at 14—14 and consist of metal rods which are removably

attached to a metallic crosshead 15. Preferably the lower portion of the tubular insulating members 11 are provided with inwardly projecting annular baffles 16 through which the rods 14—14 freely pass. The members 11 are connected and supported by a transverse tubular member 17 of insulating material.

One of the members 11 has a relatively large opening 18 communicating with the interior of the tube 17 and the other member 11 has a relatively smaller opening 19 communicating with the other end of the tube 17. The last mentioned member 11 has a plurality of discharge apertures 20.

If desired the members 11 may be made of composite structure as shown in Figure 2.

The general arrangement of the above described portion of the switch structure is substantially the same as shown in the co-pending application of Anthony Van Ryan and William R. Harry, Serial No. 205,842, filed January 13, 1951, for Circuit Interrupter and assigned to the same assignee as the present application.

It is to be noted that when the movable contacts are moved downwardly that pressure is generated within the left hand tubular member 11, see Figure 2, and oil is projected violently across the arc formed in the other tubular member 11 located on the right hand side of Figure 2 and passes outwardly through the discharge openings 20. The switch mechanism is connected in series with the energizing coil of the electromagnetic motor means.

It is to be noted that the insulating tubular members 11 extend through a top plate 21 of insulating material. This top plate is interlocked with the insulating supporting side plates 9 heretofore described. Preferably the members 11 are provided with shouldered portions 22, see Figure 2, which rest on the top plate 21 and split washers 23 engage grooves formed in the lower portion of the members 11 and bear against the under side of the tubes 17 as shown in Figure 2, thus locking the members 11 in place. In order to prevent relative rotation of the members 11 with respect to the tubes 17, each of the members is provided with a key pin 24. These key pins fit within corresponding slots 25 formed in the heavy insulating plate 21, see Figure 2, and thus prevent rotation of the members 11.

The crosshead 15 is provided with an elongated integral sleeve 26 which is slidably guided by a vertical insulating guide rod 27. The guide rod is anchored at its lower end by a metallic supporting member 28 and at its upper end by a hole 29 formed in the under side of the tube 17, as shown in Figure 2.

The operating mechanism for moving the crosshead up and down to thereby open and close the switch consists of a pair of main levers 30 formed of insulating material and pivoted on inwardly projecting pins 31 carried by the walls 9, see Figures 2, 3, and 5. These levers are rigidly joined by means of transversely extending members 32 and 33, and consequently operate as a single member having two arms. The lever 30 therefore, will be hereinafter referred to merely as a single lever having two arms. The arms of the lever 30 are connected to the crosshead by means of a pair of links 34 and 35. The inner links 35 are formed integrally and are joined by means of a U-shaped member 36.

It will be noted from the construction described hereinabove that the crosshead 15 is prevented from turning or rocking on the vertical supporting rod 27 since the links 35 will prevent such motion as they are attached both to the arm of the lever 30 and to the crosshead 15 as shown in Figure 2, and are integrally joined together.

The operating mechanism includes all of the structure which is interposed between the plunger 5 of the electromagnetic motor means 4 and the movable contact assembly consisting of the crosshead 15 and the rods 14 and includes the lever 30 and an operating or driving spring 37. The spring 37 is really a double spring as is apparent from the examination of Figure 2 and has opposite pairs of ends, connected to the transverse pin 33 of lever 30 and to a pin 38. The pin 38 is carried by an insulating guide lever 39 which is connected by means of an insulating link 40 with a lever 41 formed of insulating material. The lever 41 is pivoted as indicated at 42 on the head 5' of the unitary switch and operating mechanism assembly and is provided with a roller 43 at its outer end directly in line with the plunger 5 of the electromagnetic means.

The object of this mechanism is substantially the same as that disclosed in the above noted patent to Van Ryan et al., Serial No. 2,560,831.

When the plunger 5 moves down upon energization of the electromagnetic motor means by an overload current, it causes the axis of the spring 37 to cross the pivot point 31 of the main lever 30 and thus moves the main lever downwardly with a very quick motion. The open position of the circuit interrupter is shown in Figure 5. It is to be noted, however, that the line of pull or axis of the spring 37 never crosses over the pivot point 44 of the guide lever 39 and consequently there is always an upward thrust on the plunger 5 through the medium of the link 40 and lever 41 hereinabove mentioned. This upward thrust is a biasing force which restores the plunger 5 to its initial position shown in Figure 3, when the circuit is interrupted. As the plunger moves upwardly to the position, shown in Figure 3, the axis of the spring 37 crosses the pivot point 31 of the lever 30 and causes the lever to rise thereby closing the switch.

It is to be noted particularly that the combined operating mechanism and switch assembly can be removed as a unit without disturbing any portion of the electromagnetic motor means or any other portion of the body part 1 of the circuit interrupter. If desired a pin 45, see Figure 3, may be carried by the upper head 7 of the electromagnetic motor means 4 and may project into an opening 46 formed in the heavy upper plate 21. Obviously when the combined operating mechanism and switch assembly are detached from the body portion 1 of the circuit interrupter, the entire assembly may be moved downwardly away from the body portion. The pin 45 is rigidly carried by the head 7 of the electromagnetic motor means and freely slides from the aperture 46.

It will be seen that a novel circuit interrupter has been provided by this invention which is capable of handling a very large overload without damage and which is designed to be used in a high voltage circuit.

It is to be noted that the contact rods 14 are located outside of the insulating side plates 9 and that the crosshead 15 extends through slots 47 formed in such side plates. It has been found that this circuit interrupter can be used in high tension lines with a certainty that an arc will

not extend from the contacts to the nearest portion of the metal parts.

It is to be noted further that the relatively wide spacing between the contact mechanism and the metallic portions of the body part of the circuit interrupter is not secured by extending the total length or height of the circuit interrupter. Instead, the switch mechanism is mounted laterally of the body portion of the circuit interrupter and is supported by the relatively heavy insulating side walls which act not only as insulating baffles but also as structural supporting members.

Although this invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

1. A circuit interrupter comprising a housing having a cover, a main body portion, electromagnetic motor means responsive to overload and constituting a part of the body portion and including a driving member, said body portion being supported from said cover; and an operating mechanism and switch assembly forming a unitary structure detachably supported from said body portion and said unitary structure being wholly removable as a unit without disassembling said body portion and including a pair of spaced vertical walls of insulating material constituting structural supporting members, operating mechanism supported from said vertical walls and actuated by energy derived from said electromagnetic motor means and delivered through said driving member, and switch means supported from said vertical walls and operated by said operating mechanism, said vertical walls extending laterally outwardly from said body portion and spacing said switch means from said body portion.

2. A circuit interrupter comprising a housing having a cover, a main body portion, electromagnetic motor means responsive to overload and constituting a part of the body portion and including a driving member, said body portion being supported from said cover; and an operating mechanism and switch assembly forming a unitary structure supported from said body portion and including a pair of spaced vertical walls of insulating material constituting structural supporting members, operating mechanism supported by said vertical walls and positioned between said vertical walls and located adjacent one end of said motor means and including insulating lever means projecting laterally outwardly away from said motor means and operated by energy derived from said electromagnetic motor means and delivered through said driving member, and switch means located laterally of said motor means and carried by said vertical walls and operated by said lever means, said operating mechanism and switch assembly being wholly removable as a unit from said body portion without disassembling any part of said body portion.

3. A circuit interrupter comprising a housing having a cover, a main body portion, electromagnetic motor means responsive to overload and constituting a part of the body portion and including a driving member, said body portion being supported from said cover; and an operating mechanism and switch assembly forming a unitary structure supported solely from said body

portion and including a pair of spaced vertical walls of insulating material constituting structural supporting members, operating mechanism supported by said vertical walls and positioned between said vertical walls and located adjacent one end of said motor means and including insulating lever means projecting laterally outwardly away from and beyond said motor means and operated by energy derived from said electromagnetic motor means and delivered through said driving member, switch means located laterally of said motor means and carried by said vertical walls, and link means operatively connecting said lever means and said switch means, said operating mechanism and switch assembly being wholly removable as a unit from said body portion without disassembling any part of said body portion.

4. A circuit interrupter comprising a main body portion, electromagnetic motor means responsive to overload and constituting a part of said body portion and including a driving member; and an operating mechanism and switch assembly forming a unitary structure supported from said body portion and including a pair of spaced vertical walls of insulating material constituting structural supporting means and insulating barriers, operating mechanism supported between said vertical walls and actuated from said driving member, switch means including stationary contacts located outside of said vertical walls and supported by said vertical walls and movable contacts operated from said operating mechanism, said movable contacts including a pair of rods connected by a crosshead, said rods being located outside of said vertical walls and said crosshead extending through slots formed in said vertical walls, and an insulating guiding rod arranged to guide said crosshead.

5. A circuit interrupter comprising a main body portion, electromagnetic means responsive to overload and constituting a part of said body portion and including a driving member, a pair of spaced vertical walls of insulating material constituting structural supporting means and insulating barriers, operating mechanism supported between said vertical walls and actuated from said driving member and including a switch operating lever having a pair of rigidly connected arms, switch means supported from said vertical walls and including a pair of stationary contacts located outside of said vertical walls and a pair of movable contacts connected by a crosshead, a single guide rod of insulating material arranged to guide said crosshead, and a pair of links operatively connected to said crosshead and to the arms of said lever, said links being joined by an integrally formed U-shaped member, to thereby prevent rotation of the crosshead about said guide rod.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,024,896	Hill	Apr. 30, 1912
2,050,864	Strang	Aug. 11, 1936
2,448,695	Van Ryan	Sept. 7, 1948
2,449,867	Wallace	Sept. 21, 1948
2,521,194	Van Ryan	Sept. 5, 1950
2,560,529	Van Ryan et al.	July 10, 1951
2,575,738	Wallace et al.	Nov. 20, 1951