

Jan. 19, 1954

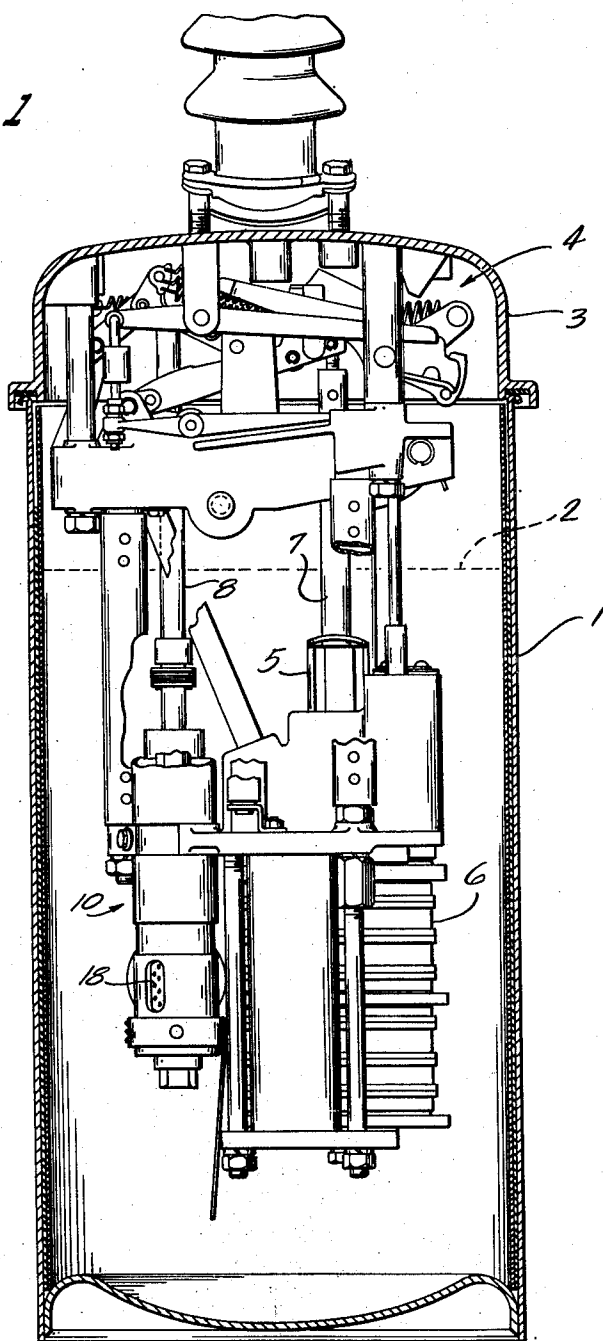
A. VAN RYAN
CIRCUIT INTERRUPTER

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4 Sheets-Sheet 1

Fig. 1



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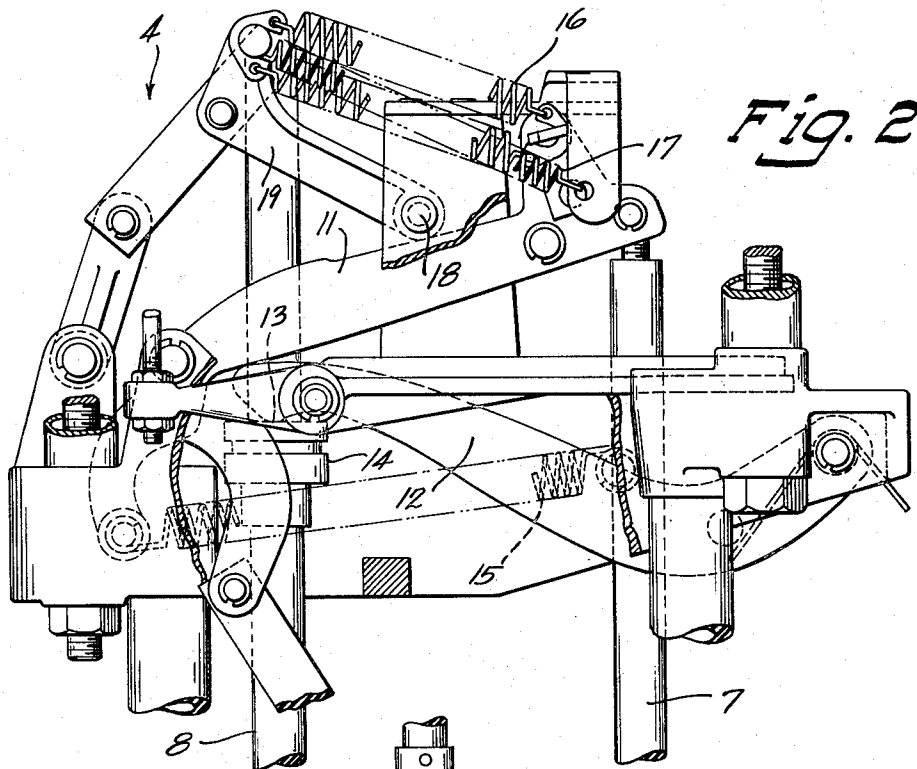
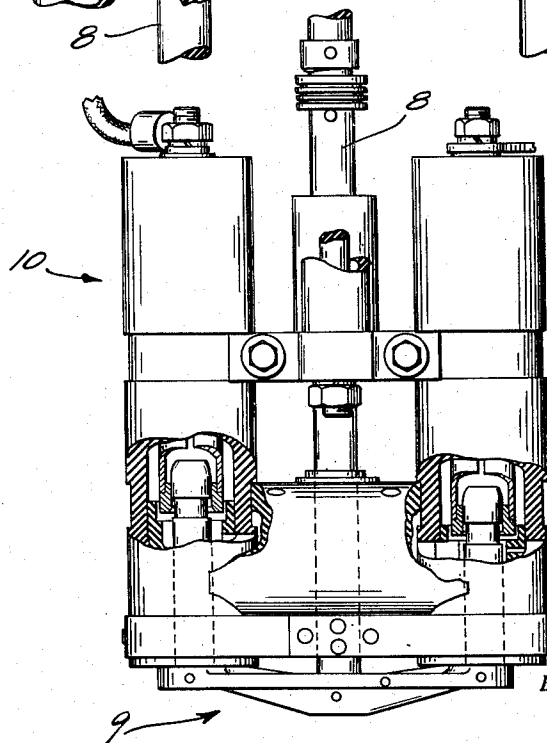
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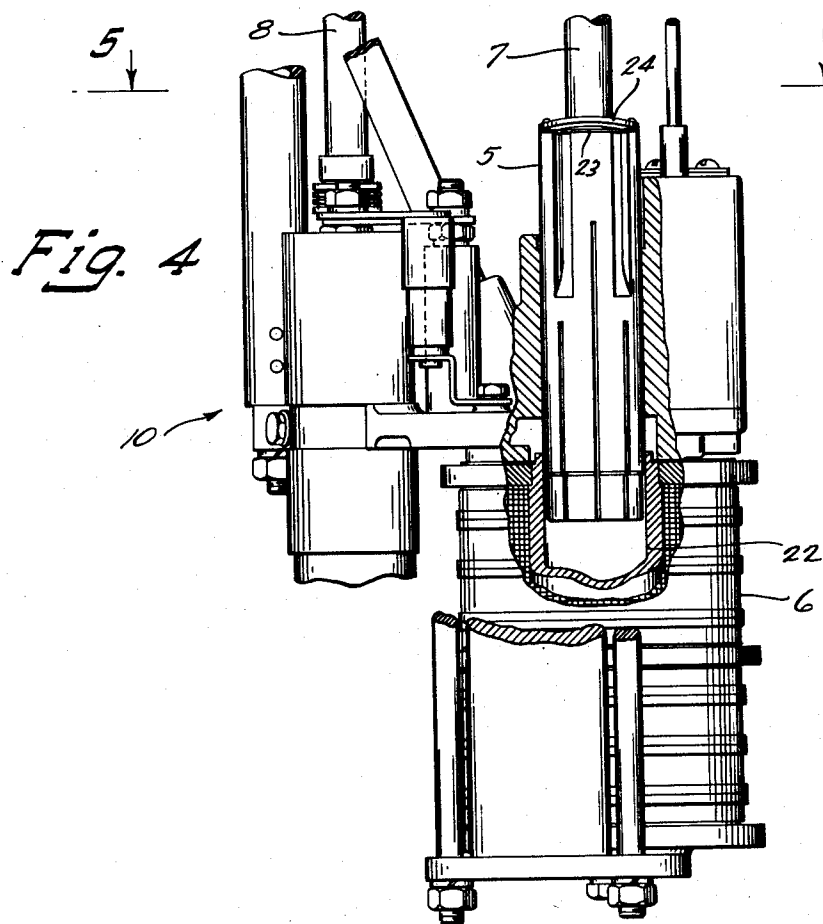
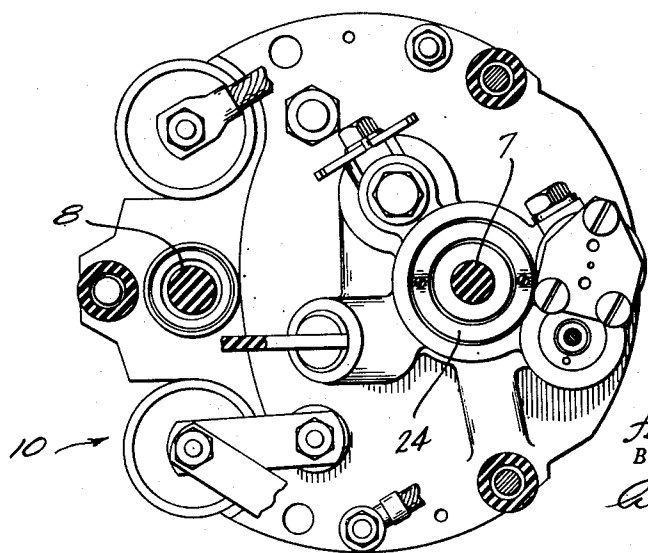
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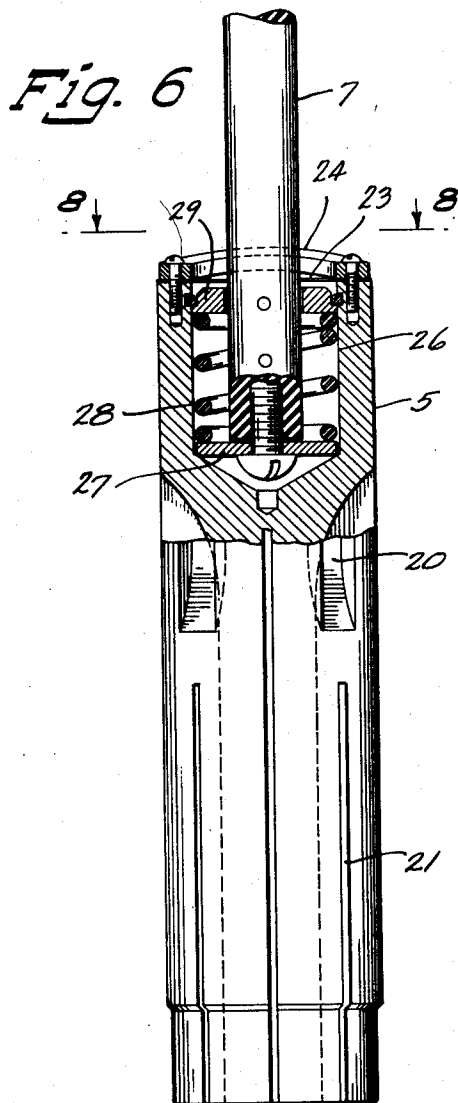
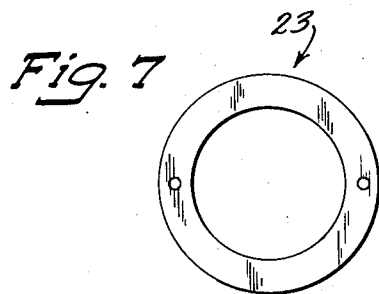
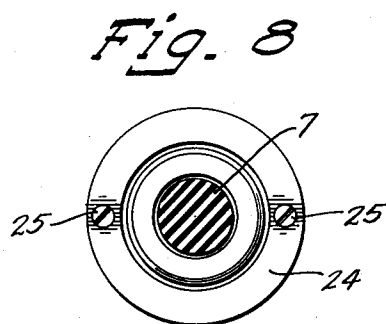
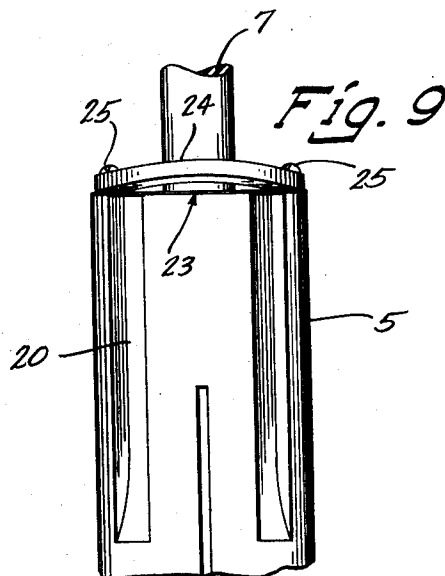
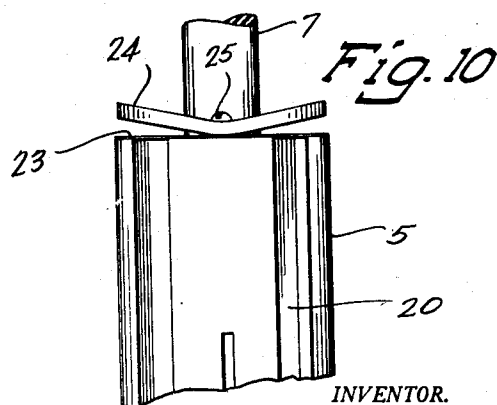
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UNITED STATES PATENT OFFICE

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CIRCUIT INTERRUPTER

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Application January 17, 1951, Serial No. 206,360

4 Claims. (Cl. 200—97)

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This invention relates to circuit interrupters. Circuit interrupters, particularly of the repeating type, are frequently subjected to the phenomenon of "telegraphing" which consists of a series of rapid openings and closings of the switch means. This is undesirable and does not allow the circuit interrupter to function in the manner in which it was intended, namely, to open the circuit and allow an interval of time before the circuit is again closed.

This invention is designed to overcome the above noted defects and objects of this invention are to provide a circuit interrupter in which means are provided which prevent "telegraphing" or rapid undesirable opening and closing of the circuit interrupter without a complete cycle of operations of the circuit interrupter.

Further objects are to provide a circuit interrupter having the characteristics enumerated above in which very simple means have been provided which may be applied directly to the magnetic plunger of the circuit interrupter in a simple and highly effective manner and with a minimum of change so that circuit interrupters may retain all of their usual characteristics and may, in addition, have means for preventing "telegraphing."

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

Figure 1 is a vertical sectional view through the circuit interrupter with parts broken away and parts in section.

Figure 2 is a fragmentary enlarged elevation of the operating mechanism with parts broken away.

Figure 3 is a fragmentary view partly broken away and partly in section of the contact assembly.

Figure 4 is a fragmentary view partly in section and partly broken away showing the magnetic plunger and solenoid and some of the associated parts.

Figure 5 is a sectional view on the line 5—5 of Figure 4.

Figure 6 is a view partly in section of the magnetic plunger.

Figure 7 is a plan view of the retaining ring for the valve of the magnetic plunger.

Figure 8 is a sectional view on the line 8—8 of Figure 6.

Figure 9 is a fragmentary side elevation of the magnetic plunger looking at it in the same direction as in Figure 6.

Figure 10 is a view corresponding to Figure 9 taken at right angles to Figure 9.

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Referring to the drawings, it will be seen that the circuit interrupter is mounted within a tank 1 which may be lined with insulation if so desired. This tank is partly filled with oil, for example to the oil level as indicated at 2 in Figure 1. The upper portion of the tank is provided with a cover or top 3 within which is located the operating mechanism indicated generally by the reference character 4. This operating mechanism is driven or operated by means of a magnetic plunger 5 which is adapted to be drawn downwardly into a solenoid 6. It is connected with the operating mechanism as will be described in more detail by means of the magnetic plunger rod 7. Through the operating mechanism 3 the magnetic plunger 5 reciprocates the contact rod 8 which in turn opens and closes the switch mechanism.

The switch mechanism consists of a movable contact assembly indicated generally by the reference character 9 and attached to the contact rod 8 and a stationary contact assembly indicated generally by the reference character 10, with which the movable contact assembly cooperates. The details of this contact assembly may be exactly the same as that disclosed in the copending application of William R. Harry, Serial No. 141,336, filed January 30, 1950, for Circuit Interrupters, assigned to the same assignee as the present application.

It is apparent that when the contact rod 8 descends the switch is opened. The depression of the contact rod 8 is obtained through the operating mechanism indicated generally by the reference character 4.

The operating mechanism includes a main operating lever 11 which coacts with a contact rod lever 12. In reality, these levers are made double as set forth in the above noted application, but are of rigid construction. The outer end of the contact lever 12 straddles the contact rod 8 as may be seen from Figure 2 and is provided with bearing portions 13 which are arranged to engage the upper face of a collar 14 rigid with the contact rod 8. It is to be noted that a series of springs are provided as set forth in greater detail in the above noted copending application. It may be briefly stated that these springs are preferably formed in pairs but they may be referred to as a single spring since their function is the same as that of a single spring in each instance. For example, the spring 15 serves primarily to balance the weight of the magnetic plunger 5 and its plunger rod 7, and the spring 16 serves to substantially balance the weight of

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the movable contact assembly 9 and the contact rod 8. The spring 17 is a quick motion spring and it will be seen that when the spring 17 passes the fixed pivot point 18 of the lever 19 that a quick downward thrust is imparted to the contact rod 8. This structure is set forth in greater detail in the above noted copending application.

It is to be noted that the magnetic plunger 5 which is shown in greater detail in Figures 6 to 10 is provided with a plurality of relatively large slots 20 which extend part-way downward of such plunger and with relatively narrower slots 21. The plunger slides within a cylinder located within the magnet solenoid 6 as shown in Figure 4. Oil is trapped beneath the plunger 5 and as the plunger passes downwardly, the oil is discharged from the cylinder 22 relatively freely for one or more operations as described in the above noted application and by means of structure identical with that described and shown in the above noted application. When the plunger rises, oil must replace that displaced from the cylinder 22. The construction is such that when the plunger is down a material distance, the slots 20 communicate with the cylinder 22 and allow relatively free discharge of oil upwardly around the plunger.

A valve 23, see Figures 6, 9 and 10, is positioned at the upper end of the magnetic plunger and consists of an annular disk of spring metal which tends to remain flat as shown in Figures 6, 9 and 10. However, this disk may be sprung upwardly or warped upwardly at opposite sides to allow free discharge of oil. On upward motion of the plunger, the disk 23 flattens and closes the slots 20 and retards the upward motion of the plunger. A distorted guiding ring or retaining ring 24 is secured to the upper end of the plunger 5 as by means of screws 25 located at diametrically opposed points. The intermediate portions of the retaining ring or washer 24 are bowed upwardly as shown very clearly in Figures 6, 9 and 10 to allow upward motion of the corresponding portions of the disk or valve 23. It is to be noted that the disk or valve 23 is apertured and allows the free passage therethrough of the plunger rod 7. Further, it is to be noted that the plunger rod had a dashpot action with reference to the plunger 5. This is secured by providing a cylinder 25 in the plunger 5 within which a piston 27 loosely fits. This piston is secured to the lower end of the rod 8 and a spring 28 is provided and bears downwardly against the piston and urges the piston downwardly to the position shown in Figure 6. The upper end of the spring bears against a washer 29, secured to the inner side of the cylinder 25. A considerable amount of clearance has been shown in Figure 6 for the sake of clarity but, in reality, the parts fit fairly closely so as to provide an adequate dashpot action upon very heavy overloads. For example, when the plunger 5 is suddenly pulled downwardly on a heavy overload, the dashpot action comes into play and some of the energy of the plunger is temporarily stored in the spring 28. All of this matter is described in the above noted copending application. The action of the dashpot is not interfered with in any manner by the valve or disk 23, as the valve or disk 23 merely has to close the upper end of the slots 20 and has no effect on the dashpot.

It is apparent that when an overload occurs, that the valve 23 will allow free upward discharge of oil through the slots or passages 20. However, when the plunger 5 starts to move upwardly, the valve 23 will immediately close and will delay

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upward motion of the plunger. This delay is independent of any other delay which is provided by the construction of the circuit interrupter as set forth in detail in the copending application. It insures a delay at the magnetic plunger itself and prevents "telegraphing" under all conditions irrespective of the length of the arc at the separated contacts.

Further it will be seen that no material change is required for existing types of circuit interrupters as set forth in the above noted copending application in order to apply this improvement. All that is necessary is to provide the valve and its guiding or retaining washer as set forth in detail hereinabove. This change immediately transforms the circuit interrupter into one which will prevent "telegraphing" under all possible conditions.

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 separable contacts, a magnetic plunger for separating said contacts, an energizing solenoid for said plunger, an oil cylinder into which said plunger is arranged to be drawn when said solenoid is energized on overload, said plunger having externally located slots forming oil flow means, said slots being directly closed on one side by the wall of said cylinder, and an outwardly opening valve for controlling said oil flow means by directly closing said slots on one direction of travel of said plunger.

2. A circuit interrupter comprising separable contacts, a magnetic plunger for separating said contacts, an energizing solenoid for said plunger, an oil cylinder into which said plunger is arranged to be drawn when said solenoid is energized on overload, said plunger having external oil slots extending lengthwise along its side, said slots being directly closed on one side by the wall of said cylinder, and an annular valve positioned on the outer end of said plunger for directly closing said external slots on outward motion of said plunger.

3. A circuit interrupter comprising separable contacts, a magnetic plunger for separating said contacts, an energizing solenoid for said plunger, an oil cylinder into which said plunger is arranged to be drawn when said solenoid is energized on overload, said plunger having oil slots extending lengthwise along its side, a flexible annular valve positioned on the outer end of said plunger for closing said slots on outward motion of said plunger, and a ring having spaced portions secured to said plunger for clamping said valve to said plunger and having outwardly bowed intermediate portions for allowing outward bowing of intermediate portions of said valve.

4. A circuit interrupter comprising separable contacts, a magnetic plunger for separating said contacts, an energizing solenoid for said plunger, an oil cylinder into which said plunger is arranged to be drawn when said solenoid is energized on overload, said plunger having oil slots extending lengthwise along its side, a flexible annular valve positioned on the outer end of said plunger for closing said slots on outward motion of said plunger, a ring having spaced portions secured to said plunger for clamping said valve to said plunger and having outwardly bowed in-

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intermediate portions for allowing outward bowing of intermediate portions of said valve, and fastening means extending through the said spaced portions of said ring and through said annular valve and into said plunger.

ANTHONY VAN RYAN.

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