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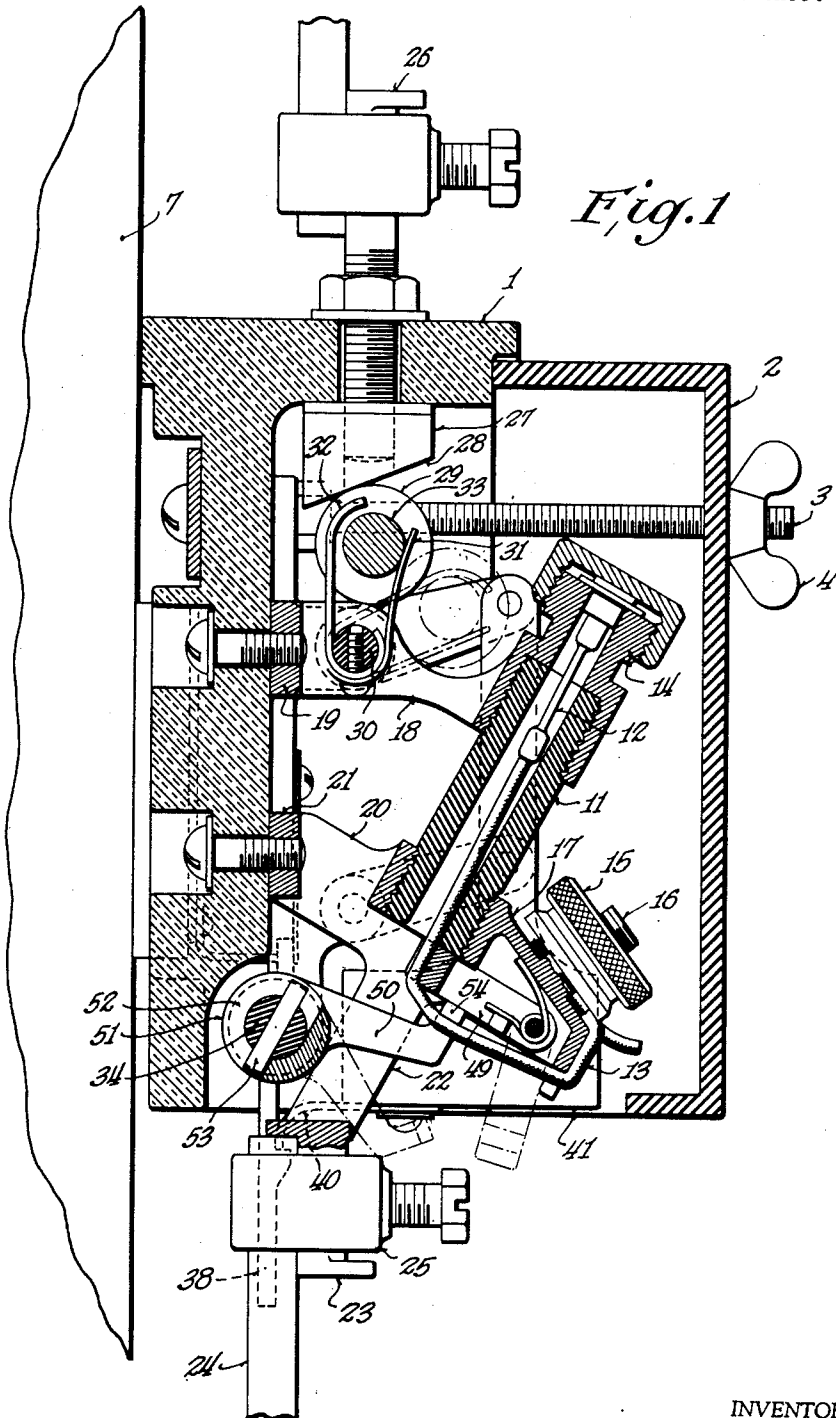
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2,298,972

CUT-OUT

Filed Jan. 27, 1941

4 Sheets-Sheet 1



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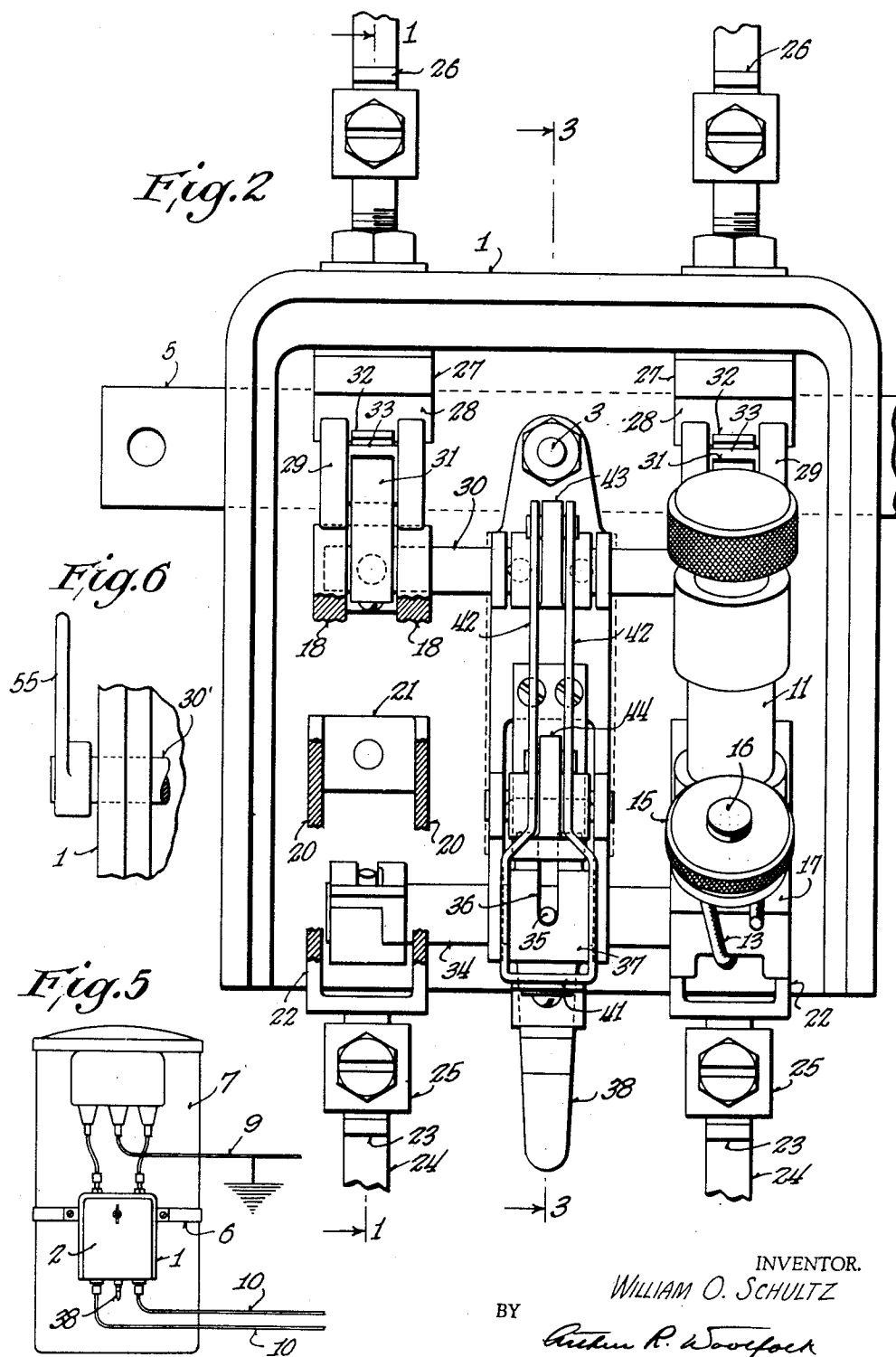
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4 Sheets-Sheet 2



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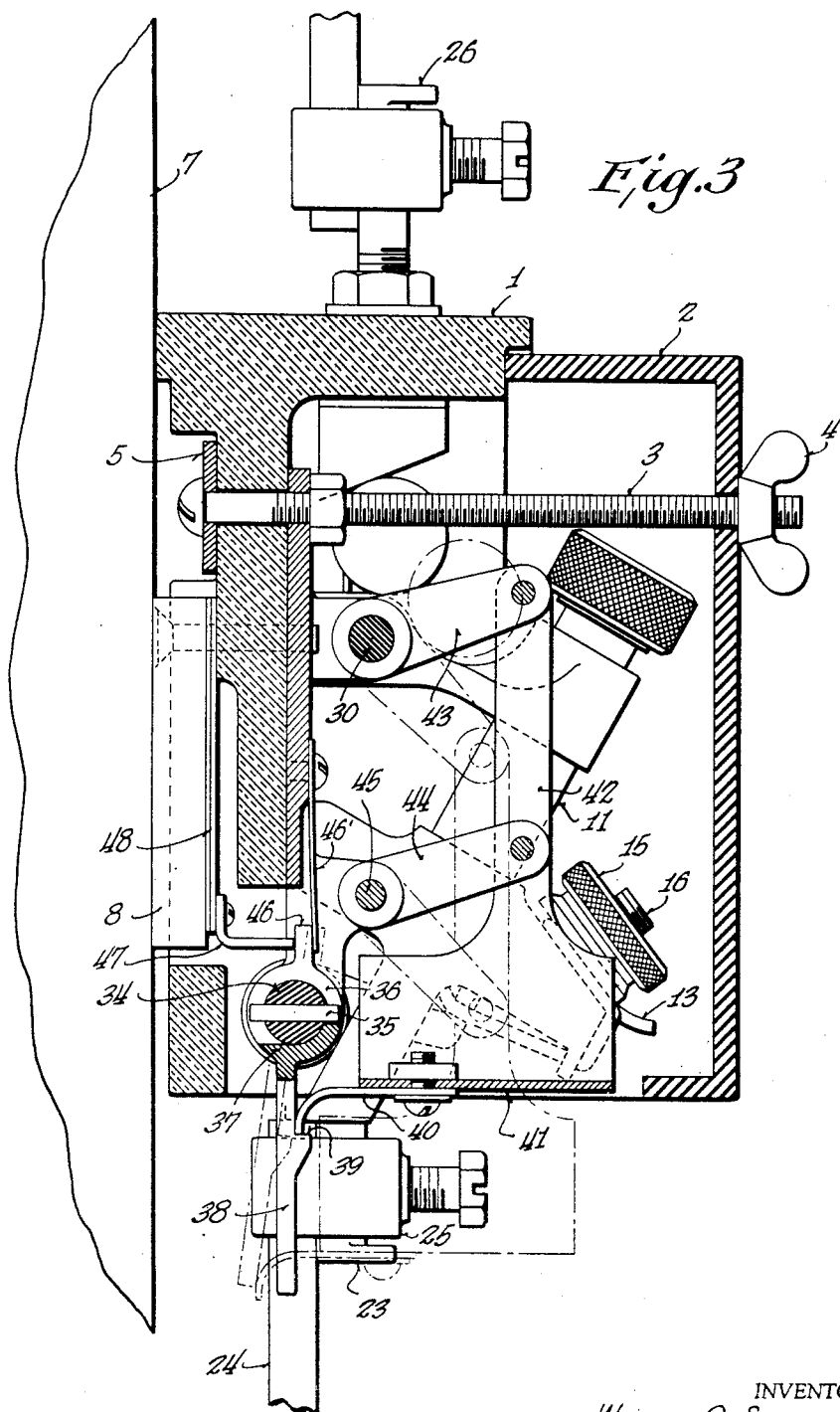
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4 Sheets-Sheet 3



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Fig. 4

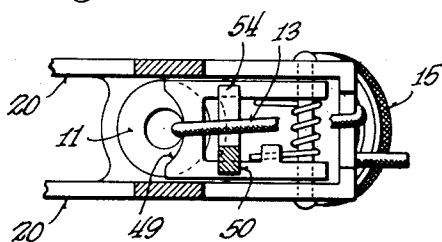


Fig. 8

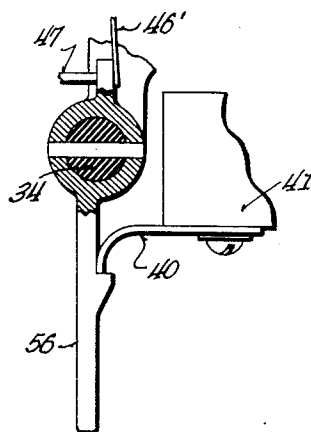
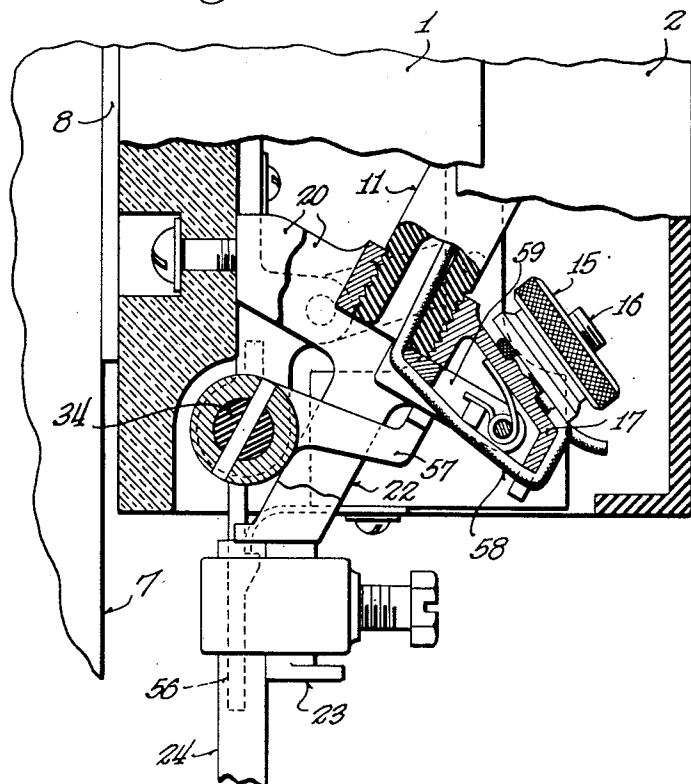


Fig. 7



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UNITED STATES PATENT OFFICE

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CUTOUT

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17 Claims. (Cl. 200-116)

This invention relates to cut-outs and is particularly directed to multiple circuit secondary cut-outs.

Objects of this invention are to provide a cut-out construction which may be either a single or multiple cut-out which may be used with a transformer or other electrical device and which is so made that the device constitutes a combined fuse and switch.

Further objects are to provide a cut-out in which a combined fuse and switch is employed and so arranged that the fuse device will release a normally closed switch on light or heavy overloads upon rupture of a fuse link, which will release the switch when the transformer or other device with which it is associated has a temperature rise exceeding a predetermined value, and which is so constructed that the switch may be manually released.

In greater detail, further objects are to provide a fuse and switch construction which may be secured to an electrical instrumentality, such, for example, as a transformer, and may respond to overloads of such value as will not rupture the fuse links as well as overloads which will rupture the fuse links. This is accomplished by providing thermally responsive means which is responsive to the temperature rise of the transformer or other device so that when the temperature exceeds a predetermined value, the device will operate to open the switch.

Further objects are to provide a construction in which the fuse tubes remain in fixed position after the device has operated, in which a switch is arranged in series with each fuse, and in which the switches are opened upon rupture of the fuse link of any fuse device, and in which means are provided for indicating that the device has operated, the device being so constructed that it may be readily reset and refused after having operated.

Embodiments of the invention are shown in the accompanying drawings, in which:

Figure 1 is a vertical sectional view through the device, such view corresponding approximately to a section on the line 1-1 of Figure 2.

Figure 2 is a view of the device with the cover removed and with parts broken away and in section.

Figure 3 is a vertical sectional view approximately on the line 3-3 of Figure 2.

Figure 4 is a bottom view of the parts adjacent one of the fuse devices.

Figure 5 is a side elevation showing the device in place on a transformer.

Figure 6 is a fragmentary view of a modified form of the invention.

Figure 7 is a fragmentary view showing a further modified form of the invention.

Figure 8 is a detail of the construction shown in Figure 7.

Referring to the drawings, particularly Figures 1, 2, 3 and 5, it will be seen that the device comprises a body portion or casing 1 of insulating material to which a cover 2 is removably held by any suitable means, as by means of the elongated screw 3 and wing nut 4. The device is provided with an attaching portion 5 to which a strap 6 may be secured and may extend around the casing 7 of a transformer or other electrical instrumentality to thereby hold the device clamped against the transformer casing. The device is provided with a heat receiving and transmitting metal portion or metal block 8, as shown most clearly in Figure 3, and this metal block or heat transmitting member is held in direct contact with the casing 7 of the transformer.

Though the invention may be used for many different purposes, it has been shown as applied to the secondary circuit of a transformer, as is shown most clearly in Figure 5. In this figure, it will be seen that the grounded neutral is indicated by the reference character 9 and the two secondary line wires are indicated by the reference characters 10.

Two fuse tubes indicated at 11 in Figures 1, 2 and 3 are located within the device and are rigidly mounted and do not move upon blowing of the fuse link.

The fuse link may comprise a fusible section 12 and a flexible leader 13. This fuse link extends from the upper contact 14 of the fuse device through the open lower end and is secured by means of a thumb nut or other attaching member 15 which may be threaded on a screw 16 to thereby clamp the flexible leader of the fuse link to the lower terminal portion indicated generally by the reference character 17. The upper terminal portion 14 is integral with a pair of spaced arms 18 which are joined by means of a rear transverse web 19. This web is secured to the casing or body portion 1 in any suitable manner, as by means of screws as shown. The lower terminal 17 is provided with a pair of integral spaced arms 20 joined by a rear web 21 secured to the casing 1 in any suitable manner, for example by screws as illustrated. In this manner it will be seen that the upper and lower terminals 14 and 17 are rigid and that the fuse tube 11 does not move upon

operation of the device but is at all times held in fixed position.

The arms 20 of the lower terminal 17 extend downwardly as indicated at 22 and are integral with an outer lower terminal 23 to which a conductor 24 is attached in any suitable manner, as by means of the clamp 25.

The upper contact 14 is not directly connected to the outer upper terminal 26. The upper outer terminal 26 is electrically connected to an upper stationary contact member 27 which has a slanting lower face 28 opposite the arms 18, as shown in Figures 1 and 2, and a switching member in the form of a double roller construction 29 normally electrically connects the upper stationary contact 27 with the upper terminal 14.

The arms 18 are so made that when the roller construction 29 is moved in a clockwise direction as viewed in Figure 1, it will roll downwardly to the dot and dash line position shown in Figure 1 out of contact with the upper contact 27. The construction for both of the two fuse devices is identically the same. The means for moving the roller construction 29 comprises an insulating shaft 30 which carries spring arms 31 and 32 between which the reduced shaft portion 33 of the roller construction 29 is received.

It is obvious that when the parts are in the position shown in Figures 1 and 2, that the rollers 29 are held in contact with the upper contact 27 and thus electrically connect such upper contact through the arm 18 to the upper terminal 14 of the fuse device. Obviously when the shaft rocks in a clockwise direction, the rollers are moved to their dot and dash position shown in Figure 1 and thus disconnect the upper stationary contacts 27 from the respective upper terminals of the corresponding fuse devices.

It will be seen from the construction thus far outlined, that a fuse device and a switch are normally connected in series in each circuit and the construction is so arranged, as will be pointed out hereinbelow, that when an overload occurs or when the device is manually tripped, the switch is moved to open position for each fuse device.

Upon overloads, either light or heavy, of sufficient value to rupture the fuse link, the construction is so arranged that this rupturing of the fuse link in either fuse device automatically opens both switches.

As will appear hereinafter, means are provided for opening the switch upon rise of temperature of the transformer or other electrical instrumentality with which the device is associated, which rise in temperature is caused by an overload which is of a smaller value than that required to rupture the fuse links. Even under these conditions the construction is such that the switches will open and thereby protect the electrical instrumentality against overloads of sufficiently small value that the fuse links will not respond thereto. An additional feature, as will appear hereinafter, is provided for the manual tripping of the device. The manual tripping also causes the switches to automatically open. Also, as will appear hereinafter, when the switches are open in any of the different ways hereinabove enumerated, indicating means are displayed to indicate such condition.

Referring to Figures 1, 2 and 3, it will be seen that a second or lower insulating shaft 34 is provided. The lower shaft 34 is provided with a centrally arranged transverse pin 35 which fits within a slot 36 formed in the hub portion 37 of a lever 38, see Figures 2 and 3.

This lever 38 constitutes both a trip member and a catch. The catch portion is furnished by means of a shouldered portion 39 which normally fits beneath an outwardly projecting arm 40 rigid with the transverse lower portion 41 of the indicating member which is normally in the position shown in Figures 2 and 3. The indicating member 41 is integral with a pair of links 42 which extend upwardly and which join the upper lever 43 rigid with the upper shaft 30 to the floating lever 44 which is pivotally mounted by means of the pin 45.

Thus it is apparent that when the lower shaft 34 is rotated in a clockwise direction, the trip member 38 will be moved to withdraw its shouldered portion 39 from beneath the lip 40 to thereby allow the indicating member 41 to descend through the bottom open portion of the device to the dot and dash line position shown in Figure 3. This same action causes the switch members 29 to simultaneously open and thus interrupt the circuit through both of the fuse devices. It is obvious that either a single fuse device or any number of fuse devices can be employed.

The hub 37 of the trip member is provided with an upper lip 46 which is engaged by a leaf spring 46', see Figure 3, and urged in a counterclockwise direction. This lip 46 is also engaged by a movable projecting portion 47 carried by a bi-metallic strip 48.

This bi-metallic strip 48 has its upper end secured to the heat transmitting metal block 8 and normally lies flat against such block so that when the transformer or other instrumentality heats up beyond a predetermined value, the bi-metallic strip 38 warps to project the member 47 to the right as viewed in Figure 3 and thereby trip the catch 38, causing both switches to simultaneously open. This is caused due to the fact that the indicating means 41 and its link mechanism 42 descend under the influence of gravity or by spring means if desired to the dot and dash position shown in Figure 3, and thus rotate the upper shaft 30, thereby opening both switches simultaneously.

It is apparent that the heat generated within the transformer is transmitted through the oil, if the transformer is oil immersed, to the casing 7 and thence to the block 8 and then to the bi-metallic strip 48. It is also to be noted from reference to Figure 3 that the construction of the housing or body portion 1 is such that the bi-metallic strip is located within a cavity between the block 8 and the casing or body portion 1 so as to provide a shielded compartment for this bi-metallic strip. Obviously the device could be attached directly to other electrical instrumentalities so that the block 8 would heat from direct conduction from any desired part of any of the electrical instrumentalities.

In addition to these two means of opening the switches, that is to say, in addition to the manual means and the thermal means for opening the switches, means are provided for opening the switches upon rupture of either fuse link in either of the fuse tubes. The construction is the same for both fuse tubes. It comprises fuse link extracting means 49, see Figure 1, spring urged as shown in Figures 1 and 4 towards counterclockwise rotation, as viewed in Figure 1. The fuse link is looped over this fuse link extracting means and normally retains such means against motion.

A lever 50 is provided for each fuse device and

has its hub 51 loosely mounted on the lower shaft 34 and provided with a slotted portion 52. A pin 53 is rigidly carried by the shaft and has its ends located within the slotted portion 52 of the hub 51. The lever 50 has a projecting portion which bears against the lower face of the fuse link extracting member 49. In the first form of the invention now being described and as shown most clearly in Figures 1 and 4, the lever 50 is provided with a projecting transverse finger 54 beneath which the fuse link is normally positioned.

It is apparent from an inspection of Figure 1, that when the fuse link of either fuse device is ruptured, either on heavy or light overloads, the fuse link extracting member 49 moves in a counterclockwise direction and thus depresses the corresponding lever 50 thereby rotating the lower shaft 34 and causing the trip 38 to release. The construction is such, as is apparent from an inspection of Figure 1, that either lever 50 can rotate upon rupture of the corresponding fuse link without causing rotation of the other lever as such other lever is provided with the slotted portion 52 which receives the corresponding pin 53 carried by the shaft 34.

It is thus clear that the device has the three principles of operation, namely, the opening of the switches by manual release, the opening of the switches by overload resulting in rupture of either or both fuse links, and the opening of the switches upon abnormal rise in temperature of the transformer or other electrical instrumentality. After the device is refused, it is apparent that the switches may be closed by merely pushing upwardly on the indicating means 41 to thereby cause the indicating means to move upwardly into the housing out of indicating position. This, through the linkage mechanism, closes the switches and the device is then ready for further operation.

It is also obvious that in the event the device has operated because of abnormal rise in temperature of the transformer, that when the transformer has cooled below a predetermined point, the device may be reset by merely pushing upwardly on the indicating means 41.

A modified form of construction is shown in Figure 6 which represents a fragment of the left-hand upper portion of Figure 2. In this form of the invention the shaft 30' corresponds to the shaft 30 of Figure 2 and this shaft is extended outwardly beyond the casing or body portion 1 and is provided with a manipulating lever 55. The device in this form of the invention may be reset by operating the lever 55 instead of pushing upwardly on the indicating means 41 of Figure 2.

The device may take other forms. For example as shown in Figures 7 and 8, the trip member 56 may be rigidly secured to the lower shaft 34 and also the arms 57 may be rigidly secured to such lower shaft 34, the arms 57 corresponding to the arms 50 of Figure 1. This construction is possible because in this form of the invention the leader of the fuse link 58 does not pass over a projecting finger on either of the arms 57, but instead merely passes over the spring pressed fuse link extracting means 59 as shown in Figure 7. Thus the trip member 56 and the levers 57 will all move simultaneously upon motion being imparted to either lever 57 or to the trip member 56.

In every form of the invention the device will operate upon overload of sufficient value to rup-

ture either or both of the fuse links or on heavy overloads. The fuse link extracting means will move the corresponding levers and thus release the trip means and cause the switches to move to open circuit position, thus electrically separating the fuse devices from the live portion of the line. Also the device in either form of the invention may be manually tripped as previously described so that it will operate as a switch to simultaneously open both circuits. Also the device will operate on overloads which are insufficient to rupture either of the fuse links but sufficient to cause an abnormal rise of temperature of the transformer or other electrical instrumentality with which the device is associated.

It will be seen that a very simple type of device has been provided which will control a single circuit or any desired number of circuits as it is obvious that it requires a mere duplication of parts to adapt it for two or more circuits, two circuits having been shown.

It will be seen further that the device provides for the complete electrical separation of the fuse device from the live portion of the circuit upon overload or upon manual release, and thus both a combined fuse device and switch device are provided.

It will be seen further that the device may be readily refused and reset.

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. The combination of a transformer having a casing and a fuse device held to said casing, said fuse device including a stationary fuse and a switch connected in series and forming a portion of a circuit including said transformer, latching means for holding said switch in closed position, thermal latch releasing means controlled by the temperature of the casing, fuse controlled latch releasing means, and manual latch releasing means, each of said latch releasing means being operable irrespective of the operation of the remaining latch releasing means.

2. A fuse device for use with an electrical instrumentality comprising a normally fixed fuse tube, a fuse link within said fuse tube, a normally closed switch movable to open position independently of said fuse tube, switch operating means for causing said switch to open when said switch operating means is operated, means controlled by the temperature of said electrical instrumentality for controlling said switch operating means, and means controlled by said fuse link for controlling said switch operating means.

3. A fuse device for use with an electrical instrumentality comprising a normally fixed fuse tube, a fuse link within said fuse tube, a normally closed switch movable to open position independently of said fuse tube, switch operating means for causing said switch to open when said switch operating means is operated, means controlled by the temperature of said electrical instrumentality for controlling said switch operating means, manual means for controlling said switch operating means, and means controlled by said fuse link for controlling said switch operating means.

4. A protective device for an electrical instrumentality, said protective device comprising a housing adapted to be secured to the electrical

instrumentality and having means for conducting heat from the electrical instrumentality, an electric switch forming a portion of said device and located within said housing, an indicator normally located within said housing and movable outwardly therefrom when said electric switch is opened, said electric switch being normally connected in circuit with said electrical instrumentality, and thermally responsive means for causing said electric switch to open upon a rise of temperature of said instrumentality beyond a predetermined point, whereby said instrumentality is protected against excessive rise in temperature and said indicator is projected outwardly of said housing when said temperature arrives at a predetermined point.

5. A protective device for a transformer provided with a casing comprising a housing adapted to be secured to said casing and having thermally conducting means adapted to contact with said casing, said device including a normally closed switch biased towards open position and connected in an electric circuit with said transformer, a housing for said switch, an indicator normally located within said housing and mechanically movable outwardly therefrom when said switch moves to open position, and a thermally responsive member adapted to be heated by the said thermally conducting portion for releasing said switch for movement to open position when the temperature of said transformer exceeds a predetermined value.

6. A protective device for a transformer provided with a casing, said device comprising a housing adapted to be secured to said casing and having thermally conducting means adapted to contact with said casing, said device including a normally closed switch biased towards open position and a fuse connected in series with said switch, said switch and fuse being connected in an electric circuit with said transformer, a housing for said electric switch, an indicator normally located within said housing and mechanically movable outwardly therefrom when said switch moves to open position, and a thermally responsive member adapted to be heated by said thermally conducting portion for releasing said switch for movement to open position when the temperature of said casing exceeds a predetermined value.

7. A multiple circuit protective device comprising a plurality of fixed fuses, a switch in series with each fuse, means independently operable upon the rupture of any fuse for simultaneously opening all switches, and manual means located at a point remote from said first mentioned means for causing all switches to simultaneously open independently of the rupture of any of said fuses.

8. A multiple circuit protective device comprising a plurality of fixed expulsion fuse tubes having open ends, fuse links in each of said fuse tubes extending outwardly through the open ends thereof, a normally closed switch connected in series with each of said fuse links, and means controlled by the outwardly extending portions of said fuse links for simultaneously opening all switches upon the rupture of any of said fuse links.

9. A multiple circuit protective device comprising a plurality of fixed expulsion fuse tubes, a fuse link in each fuse tube, a normally closed switch connected in series with each of said fuse links, switch operating means for simultaneously opening all of said switches, and fuse

link extracting means for each of said fuse tubes for extracting any remaining portion of the corresponding fuse link from the corresponding fuse tube upon rupture of such fuse link, said switch operating means being operated to open all of said switches upon motion of any of said fuse link extracting means.

10. A multiple circuit protective device comprising a plurality of fuse tubes, a fuse link in each fuse tube, a normally closed switch in series with each fuse link and biased towards open position, an outwardly biased fuse link extracting means controlled by the fuse link of each fuse tube for withdrawing any remaining portion of the fuse link from the corresponding fuse tube upon rupture of the fuse link, and latch means operable by any fuse link extracting means for simultaneously releasing all of said switches.

11. A multiple circuit protective device comprising a plurality of fuse tubes, a fuse link in each fuse tube, a normally closed switch in series with each fuse link and biased towards open position, an outwardly biased fuse link extracting means controlled by the fuse link of each fuse tube for withdrawing any remaining portion of the fuse link from the corresponding fuse tube upon rupture of the fuse link, and a single latch means independently operable by any fuse link extracting means for simultaneously releasing all of said switches.

12. A multiple circuit protective device comprising a plurality of fixed fuse tubes, a fuse link in each fuse tube, a normally closed switch in series with each fuse link, said switches being biased towards open position, latch means for normally holding said switches in closed position, a latch releasing means for each fuse tube normally restrained against motion by the fuse link of the corresponding fuse tube, and a common supporting shaft for all of said latch releasing means, said latch releasing means each being movable independently of the motion of other pivotally mounted latch releasing means.

13. A multiple circuit protective device comprising a plurality of fixed fuse tubes, a fuse link in each fuse tube, a normally closed switch in series with each fuse link, said switches being biased towards open position, latch means for normally holding said switches in closed position, fuse link extracting means for each fuse tube for withdrawing any remaining portion of the fuse link from the corresponding fuse tube upon rupture of the fuse link, and latch releasing means having portions adjacent each fuse tube arranged for simultaneous motion, said latch releasing means being actuated by a fuse link extracting means upon rupture of any fuse link.

14. A multiple circuit protective device comprising a plurality of fuse tubes, a fuse link in each fuse tube, a normally closed switch in series with each fuse link, a rock shaft permanently operatively coupled to each switch for simultaneously opening said switches upon rotation of said rock shaft, and means independently controlled by each fuse link for causing said rock shaft to rotate to simultaneously open said switches upon rupture of either fuse link.

15. A multiple circuit protective device comprising a plurality of fuse tubes, a fuse link in each fuse tube, a normally closed switch in series with each fuse link, a rock shaft operatively coupled to each switch for simultaneously opening said switches upon rotation of said rock shaft, means independently controlled by each fuse link for causing said rock shaft to rotate to simul-

taneously open said switches upon rupture of any fuse link, and indicating means operatively connected to said rock shaft and movable to indicating position upon switch opening motion of said rock shaft.

16. A multiple circuit protective device comprising a plurality of fuse tubes, a fuse link in each fuse tube, a switch connected in series with each fuse link and normally occupying a closed position, a housing enclosing said fuse tubes and said switches, a rock shaft operatively connected to said switches for simultaneously opening said switches and biased towards switch opening motion, indicating means normally housed within said housing and operated from said rock shaft to project outwardly from said housing upon rotation of said rock shaft to switch open position, latch means normally restraining said rock shaft against motion, and latch releasing means operable upon rupture of any fuse link.

17. A multiple circuit protective device for

attachment to a transformer provided with a casing, said device comprising a housing having a heat conducting member adapted to contact with a casing of a transformer, a relatively fixed fuse tube located within said housing, a fuse link within said fuse tube, a normally closed switch in series with said fuse link, a rock shaft for moving said switch towards open position, said rock shaft being biased towards switch opening motion, an indicator operatively connected to said rock shaft and projected outwardly of said housing when said rock shaft moves to switch open position, a latch for normally restraining said rock shaft against motion, thermally responsive means operatively associated with said heat conducting portion for releasing said latch, manual means for releasing said latch, and means controlled by said fuse link for releasing said latch.

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