July 17, 1928. 1,677,335

B. E. GETCHELL

AUTOMATIC ELECTRIC SWITCH

Filed April 10, 1926 3 Sheets-Sheet 1

Fig. 1.

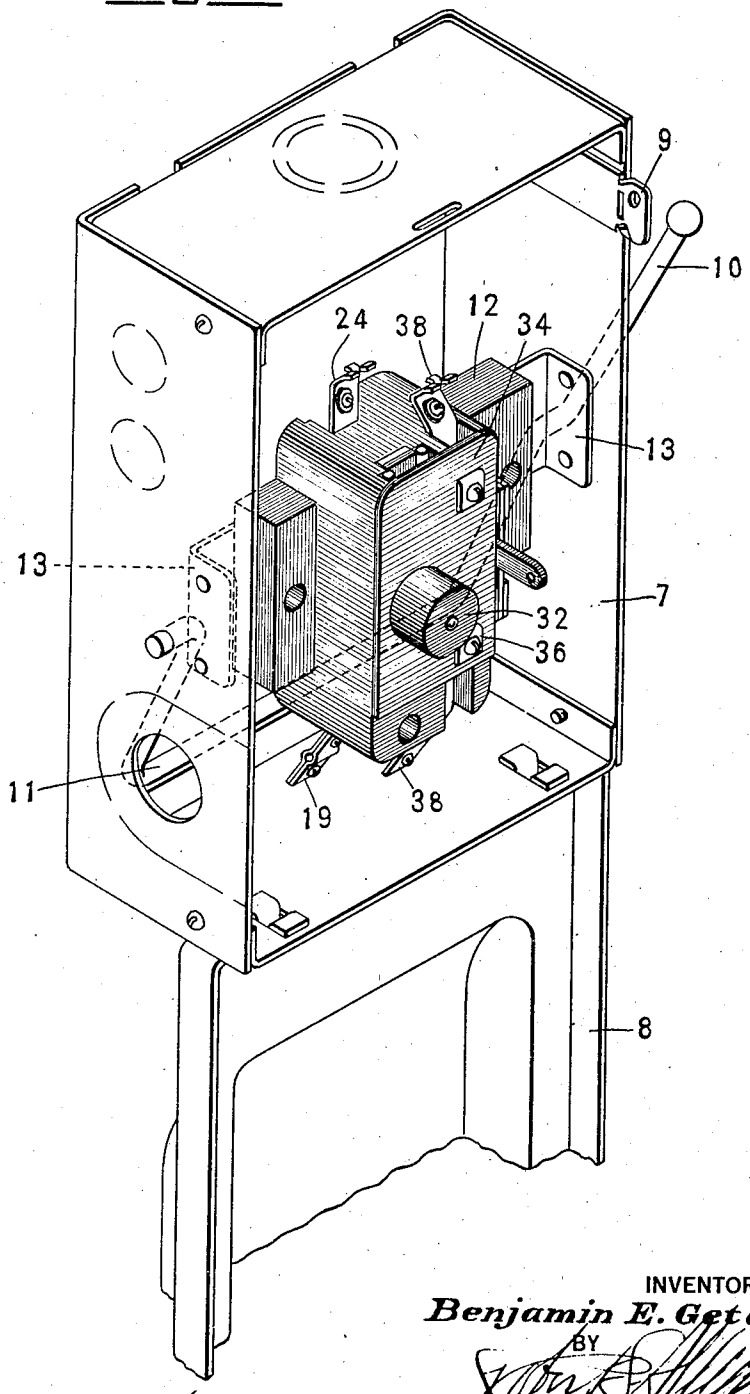

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Fig. 2.

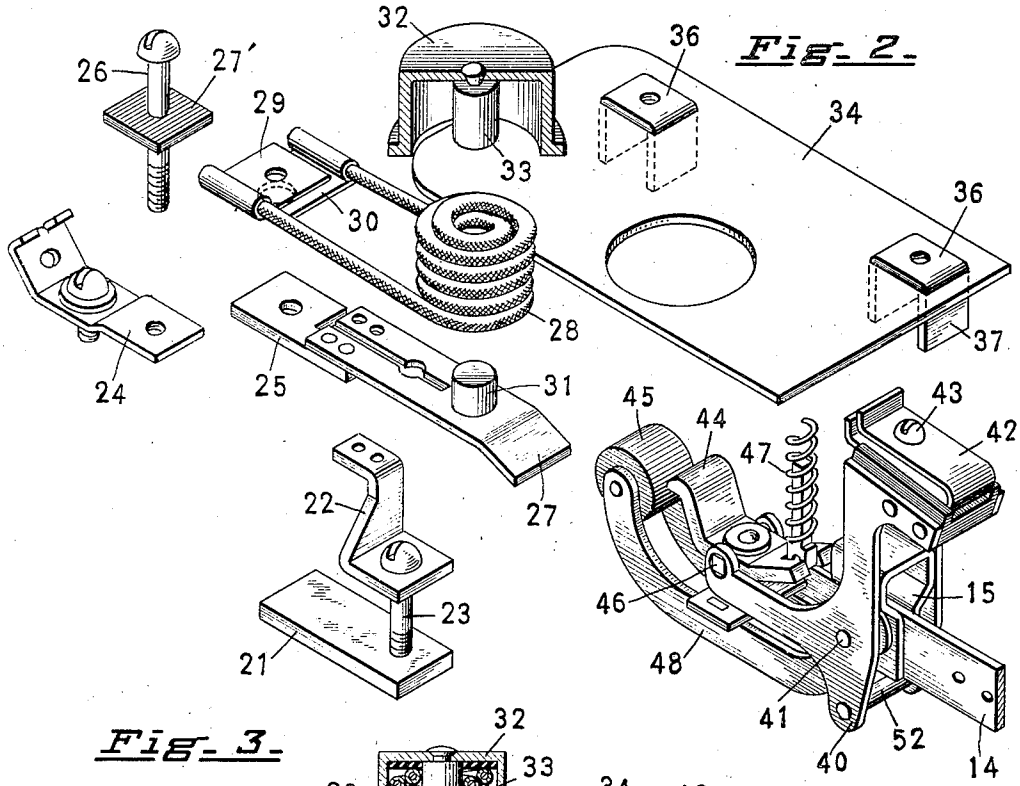


Fig. 3.

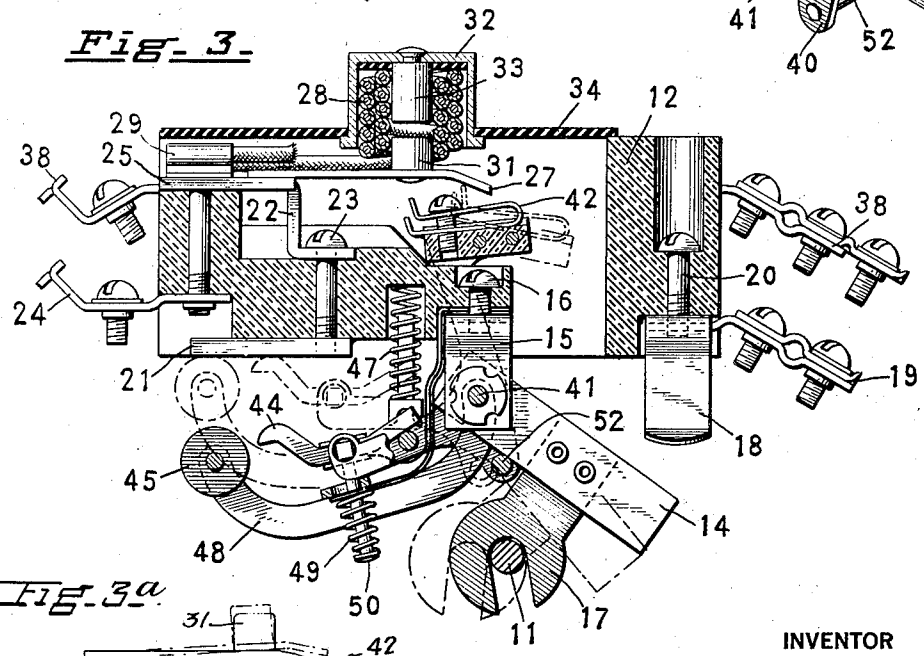
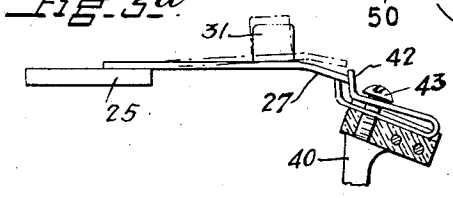


Fig. 3a



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3 Sheets-Sheet 3

Fig. 4.

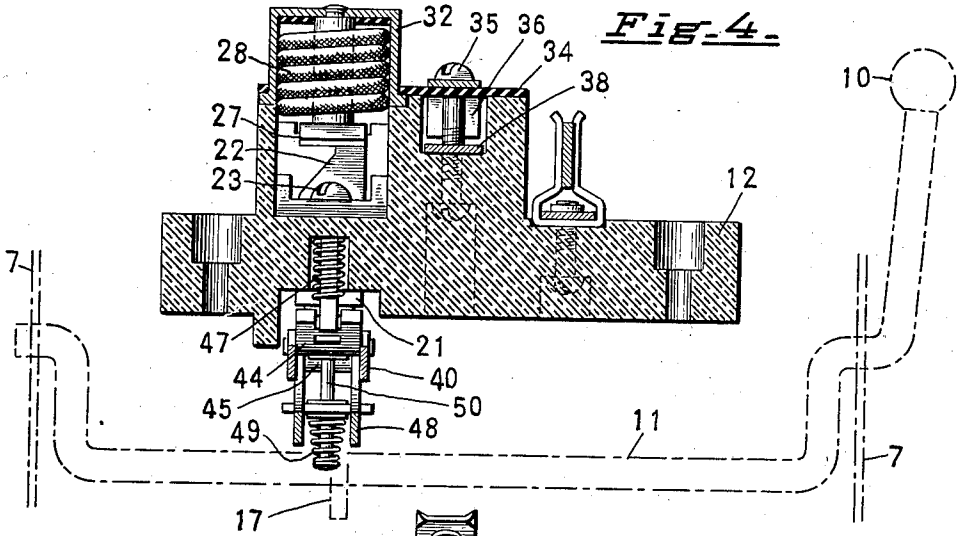
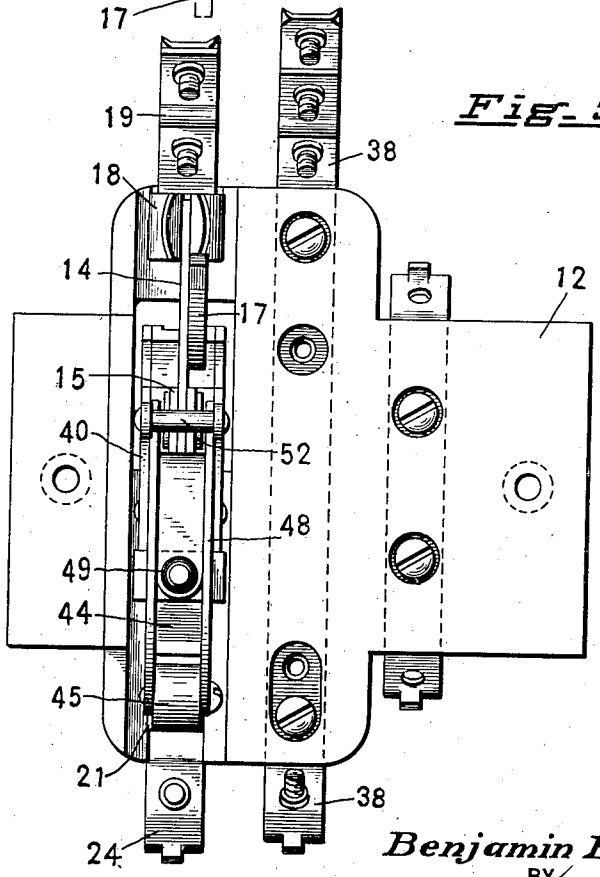


Fig. 5.



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Patented July 17, 1928. 1,677,335

UNITED STATES PATENT OFFICE.

BENJAMIN E. GETCHELL, OF PLAINVILLE, CONNECTICUT, ASSIGNOR TO THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, OF PLAINVILLE, CONNECTICUT, A CORPORATION OF CONNECTICUT.

AUTOMATIC ELECTRIC SWITCH.

Application filed April 10, 1926. Serial No. 101,025.

My invention relates particularly to what are ordinarily termed entrance switches.

One object is to provide a simple and reliable construction by which the circuit may normally be opened and closed by hand and which will automatically open the circuit in case of an overload.

Another object is to provide a construction of this character which will have sufficient time lag to make the switch practical so that the surge of the initial closing of the circuit will not automatically open the switch but the switch will automatically open the circuit in case of a sudden excessive overload or of a continued overload of less magnitude.

Another object is to provide and enclosed or safety type switch adapted to fully protect the circuit but which will not require the use of ordinary fuses which have to be replaced.

Another object is to provide a switch of this character having a main circuit breaking element and an automatic auxiliary switch element, the latter being operable on overload conditions independently of the main element and in spite of any ordinary attempt to hold the circuit closed.

Another object is to provide a construction of this character which can be assembled and adjusted at the factory or by an authorized representative but which cannot be readily tampered with by the customer.

In carrying out the invention, I provide a switch having a manually operable member by which the circuit may be opened or closed when desired, and an auxiliary switch which is normally inactive but which will automatically operate to open the circuit in case of either a temporary excessive load or a prolonged ordinary overload. This auxiliary switch consists of a movable switch member normally held in the closed circuit position by means of a latch which is adapted to be released either thermostatically or/and magnetically according to the character of the overload.

Fig. 1 is a perspective view of a construction embodying the improvements of my invention, the switch being shown in a box or receptacle having a cover which is shown open and partially broken away.

Fig. 2 is a perspective view showing various elements of the switch mechanism separated.

Fig. 3 is a longitudinal sectional view of the switch showing the parts in the open circuit position in full lines and showing in dot-and-dash lines the position of the parts when the automatic switch elements are about to be set or latched into normal operating position.

Fig. 3ª is a side view showing the thermostatic element and latch for the switch in the closed circuit or on position.

Fig. 4 is a transverse sectional view of the switch.

Fig. 5 is a rear view of the switch parts.

The box 7 is provided with a cover 8 and may have a catch 9 of any suitable character. The switch is provided with an external operating handle 10 with an internal crank 11 pivoted in the box.

The current-carrying parts of the switch are carried by an insulating base 12 which is mounted on brackets 13 in the box at a sufficient distance above the bottom of the box to allow for clearance of the moving parts and to provide space for the conductors. The main blade 14 of the switch is hinged to the post 15 which is secured to the base by the screw 16. This blade 14 has an insulating connector 17 slotted to receive the operating crank 11. The stationary jaws 18 and circuit terminals 19 are secured in place by a screw 20.

The stationary contact plate 21 and the bracket 22 are secured to the base by a screw 23. Circuit terminal 24 and the block 25 are secured to the base by a screw 26. A bimetallic thermostatic element 27 is bifurcated at one end to form two arms which are secured, respectively, to the block 25 and to the bracket 22. Coil 28 is preferably made of wire substantially equal in carrying capacity to the other parts of the switch construction therefore it offers practically no resistance to the normal current. The coil 28 has terminal plates 29 and 30 so that the coil is connected in series with the normal circuit. An insulating plate 27′ is interposed between plates 29 and 30. A core 31 is mounted on the thermostatic element 27 within one end of the coil 28. To house the coil and to increase the effect of the magnet, I prefer to provide a magnet sheath

32 and core 33. The sheath surrounds the coil and the core extends inside to a point close to the surface of the core 31. The sheath 32 may be held in place conveniently by a cover plate 34 and screws 35. The elements 36 serve as seats for the screws 35 and have flanges 37 which extend into a slot 38 in the insulating body to position the cover.

Switch frame 40 is pivoted at 41 co-axially with the blade 14 and carries a catch 42 which is of spring metal and normally engages the tip of the spring thermostatic member 27. The catch may be adjusted by a screw 43. Switch frame 40 carries two contacts 44 and 45 adapted to engage the plate 21 when the switch is in the running position. Contact 44 is pivoted at 46 in the frame 40 and is under pressure of the spring 47. The contact roller 45 is carried by an arm 48 which is hinged on the pin 41. A spring 49 and pin 50 connects the contacts 44 and the contact arm 48 tending to draw them toward each other.

When the switch is closed, the normal circuit may be traced as follows—terminal 19, jaws 18, blade 14, hinge jaw 15, pivot pin 41, frame 40, contacts 44 and 45, contact plate 21, screw 23, bracket 22, thermostatic member 27, coil terminal 30, coil 28, coil terminal 29, screw 26, and terminal 24. Obviously the switch may be opened by hand by simply operating the handle 10 and the crank 11 so as to swing the switch blade 14 to an open circuit position.

The switch will be operated automatically in case of a sudden excessive overload by the electro-magnet which would draw up the thermostatic member 27, release the catch 42 and permit the spring 47 to tilt the frame 40 and thus separate the contacts 44 and 45 and the plate 41 to open the circuit.

The same action will occur in case of a continued overload of a lesser value but which is sufficient to heat the thermostatic element 27 and cause it to be warped so as to disengage it from the catch 42. This thermostatic element, however, is so designed that it will stand the ordinary overload surge such as commonly occurs when a circuit is closed. Such a lag is quite necessary in a switch of this character so as to prevent the circuit from being opened by temporary surging which would not be likely to injure parts in the circuit. The thermostatic element, however, does require time to operate it and the electromagnetic device is provided to supplement the opening action in case of a sudden excessive load which would otherwise destroy the circuit or parts in it.

The core 31 is shown and described as a preferred form but obviously the core might be omitted entirely in case the thermostatic strip includes a strip of steel or iron which will be magnetically affected by the main body 33 of the core.

When it is desired to close the circuit after it has been automatically opened, the main blade 14 is thrown into open circuit position as shown in Fig. 3 by means of the external operating member and the back of the blade 14 then engages the pin 52 which is carried by the frame 40. The continued opening movement of the blade 14 forces the frame 40 clockwise, as viewed in Fig. 3, thus compressing the spring 47 and bringing the contact 44 against the plate 21. This closing movement also compresses the spring 49, forces the contact arm 48 and its roller 45 to the closed circuit position. As the contacts 44 and 45 are pressed against the plate 21, the catch 42 engages the member 27 and holds the parts of the auxiliary switch in the closed circuit position. The main switch may then be closed by means of the external handle.

It should be understood that any number of these switch units may be employed and connected in any suitable manner in the circuit or circuits to be controlled.

It will be particularly noted that this construction provides for operating the switch under three distinct conditions:— First, the normal manual opening and closing movement of the main switch. Second, the thermostatic means for opening the auxiliary switch on ordinary overload conditions, and third, the magnetic coil means for opening the auxiliary switch in case of short circuit or excessive overload conditions.

Switches of this class are usually enclosed in a box or casing which is locked or sealed against the customer's access but such access is not necessary in this construction for the reason that the external handle provides means for normal operation of the main switch and also for closing the auxiliary switch after it has opened automatically.

The automatic thermostatic release and the magnetic release cannot be controlled by the operator when the box is closed, nor can the auxiliary switch be closed and latched except by intentional full switch opening movement of the external operating handle.

Should the auxiliary switch be closed and latched while the short circuit or excessive over-load condition still exists, it will be automatically released and opened as soon as the main switch blade touches its contact jaw.

Obviously both the central station and its customer are fully protected by this construction.

I claim:

1. The combination with a quick break

switch of a thermally bendable element for latching said switch in closed position and a magnetically operable release device having a coil in an electrical circuit with said element and having an armature directly associated with said element and cooperating therewith to release said switch on excessive overload in the circuit.

2. The combination of a quick break switch, a bendable bi-metallic latch normally holding the switch parts in a closed circuit position and an electromagnet coil in series with the thermostatic latch for automatically bending said latch to release the switch on an excessive overload.

3. The combination with a quick break switch of a bimetallic thermally operable latch, a magnetically operable release directly cooperating therewith and a manually operable switch member adapted also to move the quick break switch to latched position.

4. The combination with a quick break switch of a thermally bendable latch, a magnetically operable release for operating said latch, and a hand operable switch blade in series with said latch and with said magnetically operated release.

5. The combination in a switch of a movable switch member, a spring for automatically moving said switch member, a bendable latch for holding said switch member in closed circuit position and electromagnetic and thermal means in series and cooperating therewith for bending said latch gradually or instantaneously depending upon the overloads.

6. A spring-pressed switch element, a bendable member for latching said switch element in closed circuit position, thermal means for bending said member to release the said switch element and electro magnetically operated means in series with said thermal means for bending said member to release the said switch element.

7. A spring-pressed switch element, a bendable latch for holding said switch element in closed circuit position, thermal means for bending said latch, electro magnetically operated means for bending said latch and manually operable means for relatching said switch element, said thermal means being operable independently of the resistance of said electromagnetically operated means.

8. The combination of a thermally bendable latch, a magnet core mounted on said latch, an electro-magnetic coil cooperating with said core to bend said latch and a switch member controlled by said latch.

9. The combination of a bimetallic thermostatic latch having a magnet core mounted thereon, an electro-magnetic coil cooperating with said core, a switch member controlled by said latch and manually operable means for re-latching said switch member.

10. The combination of a manually operable main switch, an auxiliary switch coacting therewith, a thermally bendable member for latching said auxiliary switch, and an electro-magnetic member directly associated with said member for operating said member to release said auxiliary switch.

11. A quick break switch construction including a spring operated movable switch member, a thermally bendable latch for holding said switch member in closed position and for releasing said member under predetermined overload conditions and an electro-magnet having a coil in series with said latch and adapted to bend said latch to release said switch member on excessive overload in the circuit regardless of the thermal condition of said latch.

12. A quick break switch construction including a movable switch member, a bimetallic latch for holding said switch member in closed position under normal circuit conditions and for releasing said switch member on ordinary overload conditions and an electro-magnet having a coil in series with said latch and having a direct operable connection with said latch to bend said latch and release said switch member on excessive overload conditions.

13. A quick break switch construction including a movable switch member, a thermally bendable latch for holding said switch member in closed position and an electro-magnet positioned immediately adjacent said latch and having a coil in series with said latch and adapted to bend said latch to release said switch member on excessive overload conditions in the circuit regardless of the thermostatic action of said latch.

14. A quick break switch construction including a spring pressed switch member, a thermally operable latch in the electrical circuit for holding said member in closed position under normal circuit conditions and for unlatching said member under ordinary overload conditions and an electro-magnet directly associated with said latch for bending said latch to unlatch said member in the event of a sudden excessive surge in the circuit.

15. An enclosed switch construction including a movable switch member, a bendable latch for holding said member in closed position, thermally operable means for bending said latch to release said switch member, electro-magnetically operable means for bending said latch to release said switch member and an externally operable member serving as the only means for resetting said latch.

16. An automatic switch construction including a spring pressed movable switch member, a latch for holding said member in

closed position, thermal means in the electrical circuit for slowly bending said latch to release said switch and electro-magnetic means for instantly bending said latch to release said switch in response to a sudden excessive surge in the circuit.

17. An automatic switch construction including a movable switch member, a thermally bendable latch for holding said member in closed circuit position under normal circuit conditions and for releasing said switch member on ordinary overload conditions, an armature carried by said latch and an electro-magnet cooperating with said armature to bend said latch to release said switch under excessive overload conditions.

18. An automatic switch construction including a movable switch member, a bimetallic thermally bendable latch in the electrical circuit for normally holding said member in closed circuit position and having a free end and an electro-magnet adapted to bend the free end of said latch to release said switch member in the event of a short circuit or sudden excessive overload in the circuit.

19. A switch construction including a main switch, an auxiliary switch cooperating therewith, an adjustable catch for said auxiliary switch, a bendable latch cooperating with said catch to hold said auxiliary switch in closed position, means for thermally bending said latch to release said auxiliary switch and means for electro-magnetically bending said latch to release said auxiliary switch.

20. A switch construction including a manually operated main switch, an automatically operated auxiliary switch cooperating therewith, a thermally bendable latch for holding said auxiliary switch in closed position under normal circuit conditions and for releasing said auxiliary switch on predetermined overload conditions and an electro-magnet adapted to bend said latch to release said auxiliary switch on excessive overload.

21. An enclosed switch construction including a box, a switch within the box and an external operating handle for said switch, the said switch including a movable contact member, a thermally bendable latch for holding said contact member in closed position under normal circuit conditions and to release said contact member on predetermined circuit conditions and an electro-magnet adapted to bend said latch to release said contact member in response to a sudden excessive overloading of the circuit controlled by said contact member.

22. An enclosed switch construction including a box, a switch within the box and an external operating handle for said switch, the said switch including a movable contact member, a thermally bendable latch for holding said contact member in closed position under normal circuit conditions and to release said contact member on predetermined circuit conditions and an electro-magnet adapted to bend said latch to release said contact member in response to a sudden excessive overloading of the circuit controlled by said contact member, said external handle having operable connection with said contact member to move said contact member to closed and latched position by the normal switch-opening movement of said handle.

23. The combination of a quick break switch and a manually operable switch in series therewith, latching means for normally holding the quick break switch in closed circuit position, thermostatic means for operating said latching means to release the same on a predetermined overload, magnetically operated means for releasing said latching means on a predetermined greater overload and means for closing the quick break switch and resetting said latching means by the operation of the manually operable switch when the circuit through the latter is open.

24. In a switch construction the combination of a pivoted frame, a spring pressed contact member hinged to said frame, a secondary pivoted contact member, a resilient connection between said contact members providing limited relative movement between the same, a latch member coacting with said frame to hold said frame and its contact members in closed circuit position, thermostatically operable means for disengaging said latch member on a predetermined overload, and an electromagnetic means for moving said latch member on a predetermined greater overload.

25. In a switch construction the combination of a pivoted frame, a spring pressed contact member hinged to said frame, a secondary pivoted contact member, a resilient connection between said contact members providing limited relative movement between the same, a latch member coacting with said frame to hold said frame and its contact members in closed circuit position, thermostatically operable means for disengaging said latch member on a predetermined overload, electromagnetic means for releasing said latch member on a predetermined greater overload, a manually operable switch member movable independently of said frame and means of connection between said manually operable switch member and said frame for closing the circuit through said contact members.

26. In an electric switch, a manually operable switch blade, a spring pressed frame, a contact member carried by said frame, an auxiliary contact arm resiliently connected to said frame, a common pivot for said

switch blade, said frame and said arm, a latch member for holding said frame, said arm and said contact member in closed circuit position and electromagnetically operable means for releasing said latch member.

27. In an electric switch, the combination of a pivoted frame having two arms, a contact member hinged to one arm, a spring coacting with said contact member to move said contact member and said frame, an auxiliary arm pivoted with respect to said frame, a spring and pin connecting said auxiliary arm and said contact member, a latch coacting with the other arm of said frame and means for releasing said latch on an overload in the circuit.

28. In an electric switch an insulating body, a switch member pivotally mounted thereon, a spring for moving said switch member to open circuit position, a bimetallic thermostatic latch member supported by said body and having one end engaging said switch member to hold the same in closed circuit position, the other end of said thermostatic latch member being bifurcated, an electromagnet coil having two terminals, one of which is directly connected electrically with one part of said thermostatic latch member, a circuit terminal, and a stationary contact electrically connected to the other terminal of said coil.

29. The combination in a quick break switch of a spring pressed switch member, a movable bi-metallic thermostatic latch therefor, and an electromagnet coil in series with said thermal means, said latch being releasable from closed position by either the thermostatic means or the magnetic means.

30. The combination in a quick break switch of a spring pressed switch member, a bi-metallic thermostatic spring latch for holding said switch member in closed position and an electromagnet in series with said switch and with said latch, said latch being operable both thermally and magnetically.

31. A switch comprising a main switch member, an auxiliary switch member, a catch for the auxiliary switch member, a movable abutment for holding said catch and said auxiliary member, means for electro-magnetically moving said abutment and means for thermostatically operating said abutment.

32. A spring-pressed switch element, means for latching said switch element in closed circuit position, thermostatically operated means for releasing said latching means, electro-magnetically operated means for releasing said latching means, and a manually operable switch member in series with the said switch element and operable independently thereof.

33. The combination of an automatically operable switch member, a thermostatic element for latching said member, an electromagnetic means for releasing said latching element, a manually operable switch member and means of connection between said switch members whereby said automatically operable switch member may be reset by a circuit opening movement of the manually operable switch member.

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