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CIRCUIT MAKER AND BREAKER

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FIG. 1

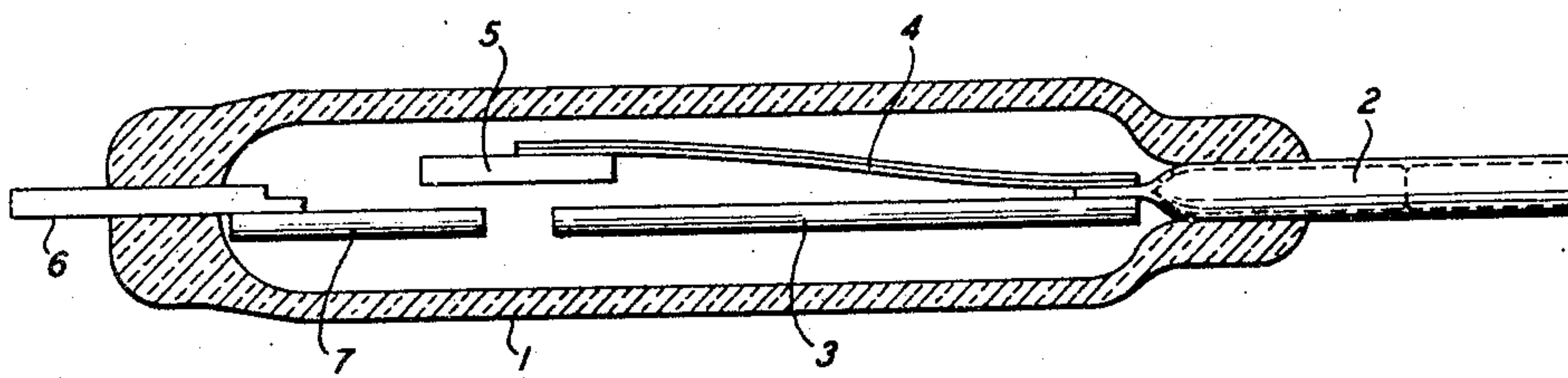


FIG. 2

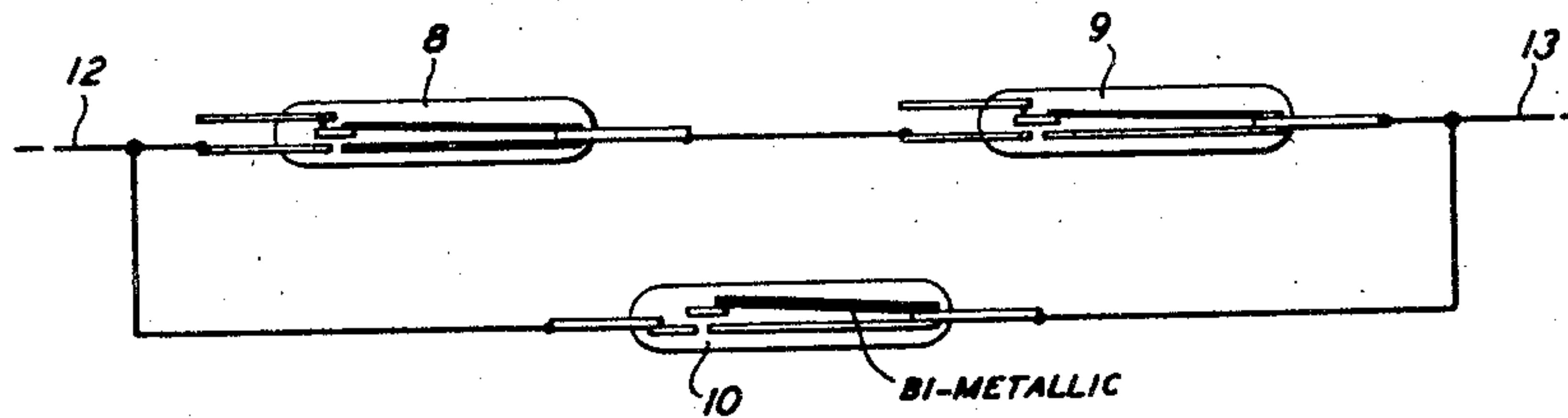
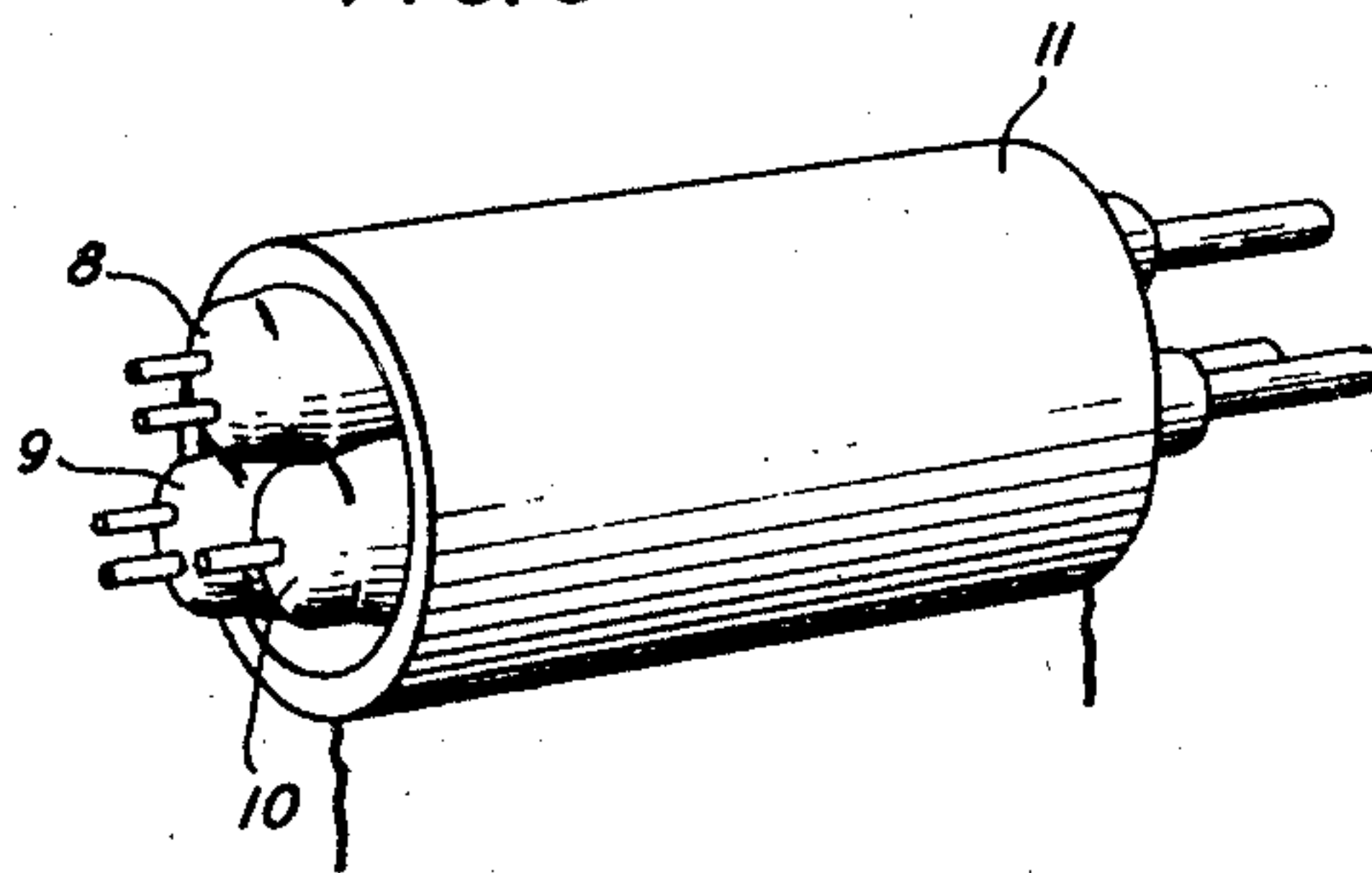


FIG. 3



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CIRCUIT MAKER AND BREAKER

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This invention relates to circuit makers and breakers and particularly to glass sealed relay contact devices.

The object of the invention is to provide means for averting dangerous overloads of such glass sealed contact devices. The invention consists in the use of an auxiliary contact device so constructed that it responds to overheating in contiguous devices of the same general nature to shunt the circuits of such contiguous devices and to thus take part of the current flowing there-through to reduce the heating effect.

In one embodiment of the invention a glass sealed contact device is employed to close a circuit in which under normal conditions a heavy current is maintained only for a short interval. Under such normal conditions the said contact device is capable of handling without injury the resulting current flow.

However, under extraordinary conditions this glass sealed device may be required to hold the circuit closed on a heavy current for an unduly long period in which case there is danger of overheating which might rise to such a point that the seals would be injured. In order to avoid such an ill effect another glass sealed device is mounted in close proximity thereto and subjected to the same magnetic influence as the first. This second or auxiliary device differs from the first, however, in that its armature is arranged to respond to the said magnetic influence only when it has become heated to a certain degree. Thus the spring by which the armature is usually mounted is, in the case of the auxiliary device, constructed of a bimetallic element which upon heating will move the armature into another position where it will respond to the said magnetic influence. Thereupon the thermoresponsive device will operate and share the load so that the heating of the first device will be reduced.

A feature of the invention is the combination of two or more contact elements connected in parallel at least one of which will not respond to the normal common magnetic influence until it is raised above normal temperature.

Another feature of the invention is a thermoresponsive glass sealed contact element in which the normal armature spring is replaced by a bimetallic element which is constructed and arranged to move the said armature into a position where it will respond to normal magnetic influence.

Another feature of the invention is the use of glass sealed contact devices filled with hydrogen

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to provide a high rate of heat conduction whereby the rapidity of the response of a thermoresponsive element is sufficient to bring a safety element into operation before any damage can have been caused.

The drawing consists of a single sheet having three figures as follows:

Fig. 1 is a sectional view much enlarged of a contact unit in which the armature is carried by a bimetallic spring;

Fig. 2 is a schematic circuit diagram showing how two ordinary contact units and one special contact unit in accordance with Fig. 1 are connected; and

Fig. 3 is a perspective drawing indicating how two or more contact units may be nested within a single coil so that all of these contact units are subjected to the same magnetic influence.

The contact unit of Fig. 1 consists of a plastic envelope 1 which may be glass. Sealed into one end is tube 2 used during the manufacturing process for tubulation purposes and sealed thereafter. To the end of this tube within the envelope 1 there is attached a magnetic element 3 and a bimetallic spring 4 carrying the armature 5. It should be noted that these various elements are attached to each other by welding and fusing processes. At the other end of the envelope a rod 6 is sealed into the plastic and carries a magnetic element 7. When this unit is placed within a coil and thereby subjected to magnetic influence the air-gaps between the element 7 and armature 5 and the armature 5 and element 3 will be closed by the movement of the armature 5 when the magnetic influence has risen to a sufficient point for this purpose.

This device is similar to other devices of the same nature with the exception that the bimetallic element 4 is new. Through the use of this bimetallic element the armature 5 may be held away from the air-gap between the elements 3 and 7 with a force sufficient to prevent the operation of the device under the magnetic influence which will cause its companion devices to operate. If two ordinary contact devices such as indicated by the elements 8 and 9 are included within the influence of the coil 11 along with the special device 10 then under ordinary conditions a circuit may be closed from the conductor 12 to the conductor 13 through the ordinary elements 8 and 9 in series. If this circuit is maintained for an undue length of time and at a greater than usual current strength either one or both of the devices 8 and 9 may become overheated and being in contiguous relation to

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the special device 10 will cause this device also to become heated with the result that the bimetallic element 4 will move the armature 5 nearer to the gap between the elements 3 and 7 so that it too will now respond to the magnetic influence of the coil 11. When this happens the device 10 will close a circuit from the conductor 12 to the conductor 13 thus sharing the current heretofore flowing only through the devices 8 and 9.

It may also be noted that as an aid in this sort of operation that after the device of Fig. 1 has been constructed it may be filled through the tube 2 with hydrogen so that the conduction of heat from the overheated elements of the devices 8 and 9 and into the bimetallic element 4 is rapid. When this action takes place and the device 10 operates to share the load, the dangerous condition is alleviated and the heating effect is reduced. As long, however, as the magnetic influence of the coil 11 is used, the device 10 will remain operated but will release immediately that the current flow through conductors 12 and 13 is stopped. Thereafter if the coil 11 is again operated only the devices 8 and 9 will respond unless again the heating of these devices is communicated to the bimetallic element of device 10 to cause a recurrence of the operation described.

Again, it should be noted that this combination leads to certain desirable results in dependability. Normally the control of the current over conductors 12 and 13 is by the devices 8 and 9 in series. Since there will inevitably be erosion of the contact surfaces, the probability of failure of the device as a whole is extremely remote due to the fact that as the device 10 normally does not operate and its contacts therefore suffer no erosion, it is able to function properly on the rare occasions on which it is brought into use. While the probability of the device being disabled by sticking contacts is greatly reduced by the connection of the two devices 8 and 9 in series, the long life perfect functioning of the device 10 due to this factor of rarity is an insurance of dependable action of the complete device.

It has been discovered that where two contact devices both under the same magnetic influence are connected in series the probability of failure through sticking (welding or mechanical interlocking of roughened surfaces) is very greatly reduced since there is a tendency for that one of the two whose contacts have become unduly roughened by erosion to delay the parting of its contacts, so that the burden of breaking the circuit is thrown on the other. Therefore with two sets of contacts in series, there is an alternating shifting of the duty of breaking the circuit, one contact acting in this capacity while the other repairs previous damage through the mechanical

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hammering of its contacts during their operation. The addition of the special contact device 10, therefore, besides preventing damage through overload heating also provides a pair of particularly clean contacts and therefore gives long life and great dependability to the unit as a whole.

What is claimed is:

1. The combination of a plurality of contact closing devices mounted contiguously and subjected to a common magnetic influence, one of said devices being normally unresponsive to said magnetic influence, said one of said devices having a thermoresponsive element for rendering it responsive to said magnetic influence.

2. The combination of a plurality of contact closing devices mounted contiguously and subjected to a common magnetic influence, said devices being connected in parallel, one of said devices being normally unresponsive to said magnetic influence, said one of said devices having an element responsive to rise in temperature of said contiguously associated devices to render it equally responsive to said magnetic influence, whereby overload through said associated devices is relieved by the operation of said thermoresponsive device.

3. The combination of a plurality of glass sealed contact closing devices mounted contiguously and subjected to a common magnetic influence, each said device being filled with hydrogen to provide a high rate of heat conduction, one of said devices being normally unresponsive to said common magnetic influence, said one device being equipped with a thermoresponsive element for rendering it responsive to said magnetic influence, whereby overheating of said other contiguously placed devices will cause said thermoresponsive device to operate.

4. The combination of a plurality of contact closing devices mounted contiguously and subjected to a common magnetic influence, one of said devices being normally unresponsive to said magnetic influence, said one of said devices having a thermoresponsive element responsive to heat generated by said other contiguous devices for rendering it responsive to said magnetic influence.

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