June 5, 1934. C. BOWERS 1,961,578

ELECTRIC CIRCUIT CONTROL DEVICE

Original Filed Feb. 12, 1931 2 Sheets-Sheet 1

Fig. 1.

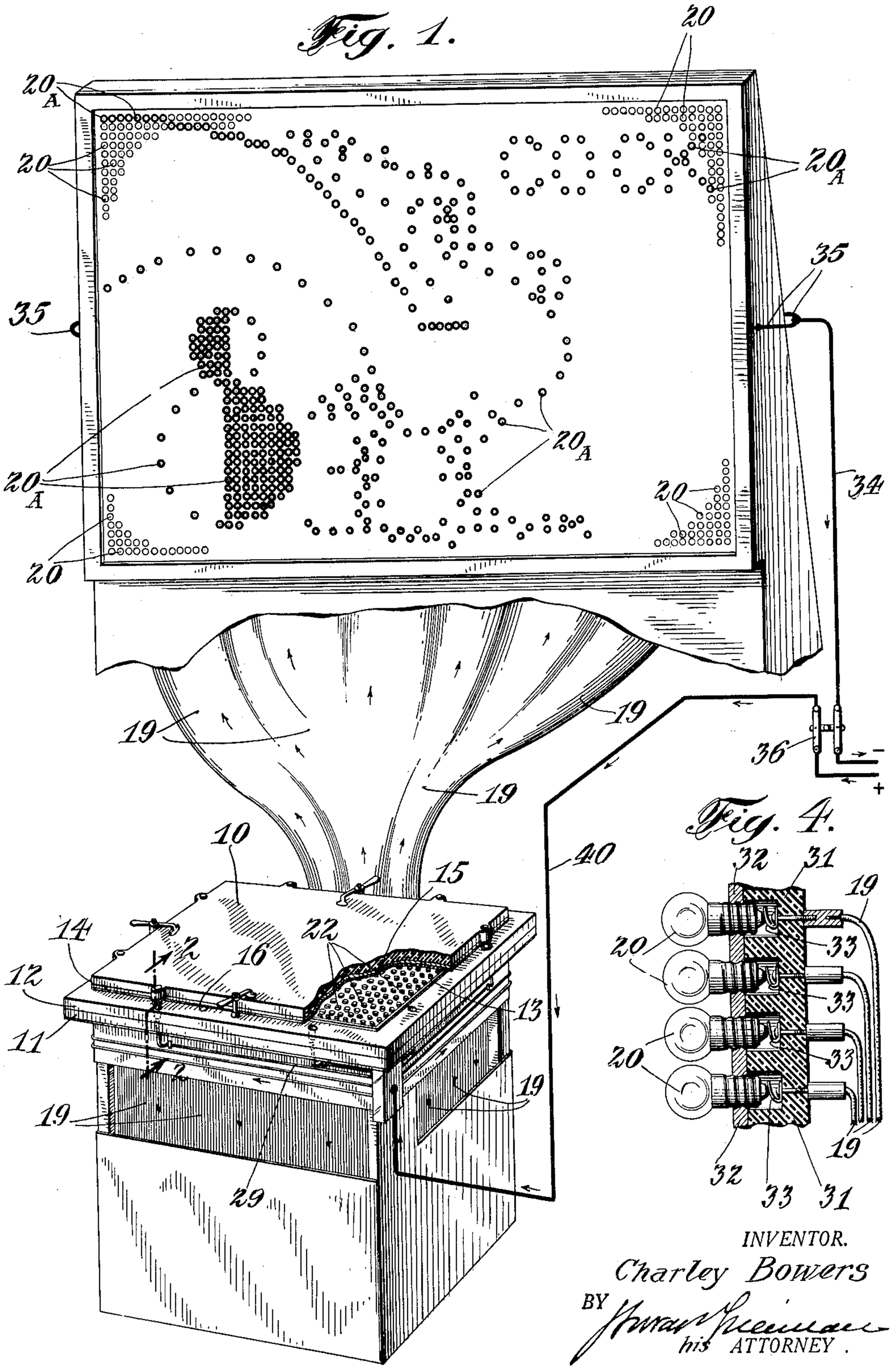

Fig. 4.

INVENTOR.

Charley Bowers

BY Howard Greenman

his ATTORNEY.

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Fig. 2.

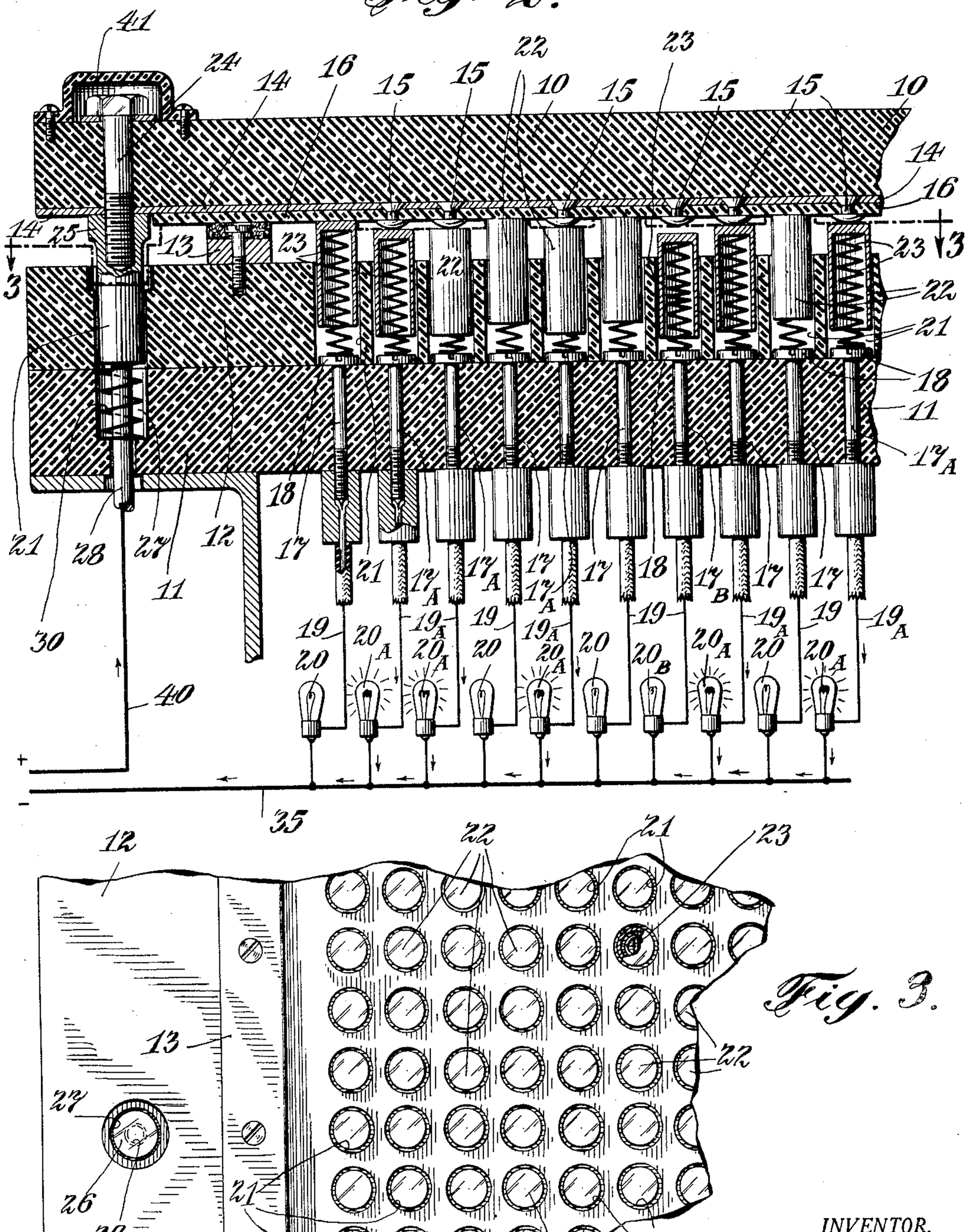

Fig. 3.

INVENTOR.
Charley Bowers
BY Spurgeon Freeman
His ATTORNEY.

Patented June 5, 1934 1,961,578

UNITED STATES PATENT OFFICE

1,961,578

ELECTRIC CIRCUIT CONTROL DEVICE

Charley Bowers, New York, N. Y., assignor of five per cent to William Saal, New York, N. Y.

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Renewed August 31, 1933

3 Claims. (Cl. 200—46)

My invention relates to electric light circuits and refers particularly to means for automatically controlling the circuit of each electric light bulb in devices containing a plurality of such bulbs, although my device is applicable to a single electric light bulb.

Fuses involving the melting of the current-carrying member and interruption of the current when the wire becomes overloaded are well known and while applicable in many cases are incapable of adoption where resilient means are necessary to maintain the current, as the fuses thus employed are of themselves non-resilient.

Resilient contact members are particularly necessary in electric signs which carry a very large number of electric light bulbs, only certain predetermined one of which it is desirable to illuminate and in which it is desirable, or necessary, to change the number and arrangement of the bulbs thus illuminated.

One means of accomplishing this changing effect in electric signs is to have a sheet, or plate, of conductive material with a plurality of space-plotted holes through which a desired number and arrangement of conductive members may be placed, and means whereby these conductive members may be placed in electric connection with electric light bulbs arranged to correspond in number and arrangement with said conductive members, thus producing a light effect similar to the words or designs outlined by the conductive members.

In devices of this character, means must be employed which will make it possible to connect a conductive member extending through each and every one of the mentioned holes; and as these conductive members are frequently studs extending through said holes with a head upon the extended portion, it is evident that the face of the conductive material is uneven because of the extension of the particular inserted studs, while the other holes have no members extending therethrough.

For the above mentioned reasons, the means contacting with the studs must be of a resilient character in order that proper electrical connection may result, and this necessitates a large number of resilient contact members corresponding in number and arrangement with all the holes in the conductive material.

In order to facilitate the effectiveness of the elements of devices of this character and to increase their simplicity of construction and operation, I have devised means whereby the resilient member is of itself a means whereby the current will be interrupted in the event of overheating, or overloading, the current conductors, the member, therefore, acting both as a resilient contact member and as a current control.

In the accompanying drawings, in which similar parts are designated by similar numerals, I show the application of my device in co-operation with a changeable electric sign, but I do not limit myself to such use, as it is evident it is applicable to many other applications in both single and multiple electric light effects.

Figure 1 is a perspective view of one form of the device of my invention, partly broken away for purposes of explanation.

Figure 2 is an enlarged section through the line 2, 2 of Figure 1.

Figure 3 is a section through the line 3, 3 of Figure 2.

Figure 4 is an enlarged partial section through the electric light sign board shown in the upper part of Figure 1.

The particular form of the device of my invention illustrated in the accompanying drawings comprises an upper sheet, or plate, of non-conducting material 10 and a lower sheet, or plate, of non-conducting material 11. A sheet, or plate, of non-conductive material 12 rests upon the upper face of the plate 11. The plates 10 and 12 are spaced from each other by means of non-conducting spacers, as 13 shown in Figure 2.

A sheet of conducting material 14 abuts upon the lower face of the plate 10 and has extending through it a predetermined number and arrangement of studs 15, 15 made of conducting material.

A plate, or sheet, of non-conducting material 16 abuts upon the lower face of the sheet 14, the studs 15, 15 passing through both sheets 14 and 16, each having a head upon the upper face of the sheet 14 and a head upon and shown as extending beyond the lower face of the sheet 16.

The sheets 14 and 16 are space-plotted with holes, through some of which studs 15, 15 are passed, in order to produce a similar effect by means of a plurality of electric light bulbs as explained later.

Extending through openings in the plate 11, corresponding to the holes in the sheet 14 are a plurality of pins 17, 17, 17A, 17A, 17B of conducting material, each having a head 18 resting upon the upper face of the plate 11, the lower end of each pin 17 being connected to an electric wire 19, which in turn is attached to an electric light bulb 20, the plurality of bulbs 20,

20, 20A, 20A, 20B being arranged to agree with the holes in the sheet 14.

The plate 12 has a plurality of holes 21, 21, arranged in alignment with the pin heads 18, 18 and the holes in the plates 14 and 16.

Longitudinally movable within each hole 21 of the plate 12 is a conducting tubular member 22, open at the lower end and closed at the upper end.

Within each tubular member 22 is a coil thrust spring 23 abutting upon the inner face of the upper end of the tubular member and upon a pin head 18. These springs are of such physical and material construction as to be operative under the normal electric current employed, but which, when subjected to an electric overload, as from a short circuit or otherwise, will become unduly heated and softened so as to lose their elasticity and resiliency and become inoperative, the weight of the tubular member 22 being such that in such an event it will fall from its upwardly extended position and will not be capable of abutment upon a stud 15.

The means for conducting the electric current to the respective elements of the device is as follows:

A bolt 24 of conductive material passes through a hole in the plates 10 and 14 and is threaded into the tubular member 25 which is capable of insertion within, and vertically movable within an opening 27 which extends through the plates 11 and 12, the lower portion of the opening 27 in the plate 11 being of smaller diameter than the upper portion thereof. A tubular member 26, capable of vertical movement within the opening 27, has a downwardly extended reduced portion 28 extending outwardly of the plate 11, the member 28 being connected by a wire 40 to a source of electric current (not shown). A coil spring 29 is positioned between the lower face of the member 26 and the bottom face of the recess 27 causing the member 26 to abut upon the member 25. A cap 41 of non-conducting material covers the upper exposed end of the bolt 24. The device carries a plurality of these electric conducting elements.

The electric light board consists of a base 31 of non-conducting material upon which rests a plate 32 of conducting material. Electric light bulbs 20, 20 are threaded through holes in the plate 32, contact being made with the wires 19, 19 by means of springs 33, 33. The plate 32 is connected to the aforementioned source of electric current by means of the wire 34 having branches 35, 35 connected to different points of the plate 32.

A switch 36 may be employed to make and break the circuit as desired.

The operation of the device is as follows, assuming that the plates 10, 14 and 16 have been removed:—

Plates 14 and 16 connected together by means of studs 15, 15 so positioned with respect to each other as to form words or devices desired in electric light effect, are positioned upon the spacers 13, 13, the plate 10 is placed in position, and the bolts 24, 24 are threaded into members 25, 25. The current is then turned on by means of switch 36. The current thus passes from its source of supply through the wire 40, the elements 28, 26, 25 and 14 to the studs 15, 15, thence through the elements 22, 23, 18 and 17 to the wire 19 and thence through the wires 19A, 19A to the bulbs 20A, 20A, the plate 32 and the wires 35 and 34 to the source of electric current, thus illuminating those bulbs positioned in accordance with the positions of the studs 15, 15.

It will be noted that bulbs 20, 20 in Figure 2 are not illuminated as there are no studs 15, 15 in contact with their tubular members 22, 22.

It will be further noted that electric light bulb 20B is not lighted because its spring 23 has been weakened and has lost its resiliency through an electric overload in its circuit and hence its member 22 does not contact with its stud 15.

It is to be noted particularly that the resilient member producing the contact is immediately rendered inoperative through the action of an overload of current which decreases the resiliency of the member producing the contact, the actual contact members breaking the circuit through gravitational force. The current is thus interrupted immediately in the bulb within the overloaded circuit without breaking the circuits of the other bulbs.

A further advantage of my device is that an inoperative resilient member, or spring, may be readily replaced by an operative one.

It will thus be seen that by means of my device an overload of current is confined to the particular circuit in which it occurs, thus protecting the other bulb circuits from being burned out, a protection of the greatest value, especially where a large number of individual bulbs is employed.

I do not limit myself to the particular size, shape, number, arrangement or material of parts as shown and described, as these are given simply as a means for clearly describing the device of my invention.

What I claim is:—

1. In an electric circuit control device, in combination, a fixed contact element forming a contact-making abutment, a slidable circuit-controlling contact element normally in abutting contact-making circuit-closing engagement with said abutment-forming fixed contact element, an electrically insulating guideway for said slidable contact element in its circuit-controlling movements, means whereby there is constantly applied a continuously acting unremittent force tending to move said slidable contact element out of contact-making abutment with said abutment-forming fixed contact element, and an electrically conductive coiled spring coaxial with the path of movement of said slidable contact element, said spring being opposed to and normally capable of overcoming said force applied by said means thereby normally to hold said slidable contact element in contact-making circuit-closing abutment with said fixed contact element, said spring being included in a circuit with said slidable contact element and being of such a predetermined construction as to be weakened to such an extent by a predetermined overload of current thereon that it will then be overcome by said force applied by said means so that the latter will then be effective to move said slidable contact element out of contact-making circuit-closing abutment with said abutment-forming fixed contact element thereby opening said circuit between said contact elements.

2. In an electric circuit control device in combination, a stationary base member provided with an electrically insulating vertical guideway, a stationary electrically insulative supporting member above said base member, a downwardly exposed fixed contact element fixedly carried by said supporting member in vertical alignment

with said guideway of said base member and forming a contact-making abutment, a vertical slidable circuit-controlling contact element slidably guided by said guideway of said base member in vertical alignment with and below said fixed contact element for circuit-controlling cooperation therewith, a fixed electrically conductive member stationarily mounted in vertical coaxial alignment with the path of movement of said slidable contact element, and an electrically conductive coiled spring coaxial with the path of movement of said slidable contact element with one end of said spring having contact-making engagement with said fixed conductive member and with the other end of said spring having contact-making engagement with said slidable contact element and arranged to urge the latter upwardly, said spring normally being capable of overcoming the weight of said slidable contact element so that thereby said slidable contact element is normally urged upwardly by said spring into contact-making circuit-closing abutment with said abutment-forming fixed contact element while said slidable contact element has a constant tendency to drop by its own weight out of contact-making abutment with said fixed contact element said spring being of such a predetermined construction as to be weakened to such an extent by a predetermined overload of current thereon that it will then be overcome by and no longer be able to support the weight of said slidable contact element so that thus the latter will then drop by its own weight out of contact-making circuit-closing abutment with said fixed contact element thereby opening said circuit between said contact elements.

3. In an electric circuit control device, in combination, an electrically insulating stationary base member having therein an upwardly-opening downwardly-extending tubular hole, a stationary electrically insulative upper member detachably and removably mounted upon said base member in fixed position above the latter, a downwardly-exposed fixed contact element fixedly carried by said upper member in vertical alignment with said hole in said base member and forming a contact-making abutment, a fixed electrically conductive member forming an abutment within the inner portion of said hole in said base member, an electrically conductive coiled thrust spring removably contained loosely in said hole with its lower end in unattached contact-making abutment upon said conductive member, and a vertically slidable upwardly-removable circuit-controlling contact element in unattached contact-making abutment upon the upper end of said spring and normally urged upwardly thereby into contact-making circuit-closing abutment with said abutment-forming fixed contact element while having a constant tendency to drop by its own weight out of contact-making abutment with said fixed contact element, said slidable contact element having a downwardly extending tubular skirt fitting loosely over said spring and slidably guided in said hole in said base member with its lower end spaced above said conductive member, so that thereby said slidable contact element and said spring may be removed and replaced merely by detaching and removing said insulative upper member together with said abutment-forming fixed contact element carried thereby, said spring being of such a predetermined construction as to be weakened to such an extent by a predetermined overload of current thereon that it will then be overcome by and no longer be able to support the weight of said slidable contact element so that thus the latter will then drop by its own weight out of contact-making circuit-closing abutment with said fixed contact element and open said circuit between said contact elements.

4. In an electric circuit control device, in combination, an electrically insulating stationary base member having an upwardly-opening downwardly extending tubular hole therein, a stationary electrically insulative upper member detachably and removably mounted upon said base member in fixed position above the latter, a downwardly-exposed fixed contact element fixedly carried by said upper member in vertical alignment with said hole in said base member and forming a contact-making abutment, a fixed electrically conductive member forming an abutment within the inner portion of said hole in said base member, an electrically conductive coiled thrust spring removably contained loosely in said hole with its lower end in unattached contact-making abutment upon said conductive member, and a vertically slidable upwardly-removable circuit-controlling contact element in unattached contact-making abutment upon the upper end of said spring and urged upwardly thereby into contact-making circuit-closing abutment with said abutment-forming fixed contact element, said slidable contact element having a downwardly extending tubular skirt fitting loosely over said spring and slidably guided in said hole in said base member with its lower end spaced above said conductive member, so that thereby said slidable contact element and said spring may be removed and replaced merely by detaching and removing said insulative upper member together with said abutment-forming fixed contact element carried thereby.

5. In an electric circuit control device, in combination, an electrically insulating supporting member having a flat outwardly exposed face and having therein a field of tubular holes extending inwardly from said face, an insulative abutment-forming plate removably mounted in fixed position on said supporting member in opposed parallel relation with its flat face, a plurality comprising a predetermined number and arrangement of fixed abutment-forming contact elements passing through and fixedly carried by said insulative plate in alignment with a corresponding number of said holes, a fixed electrically conductive member forming an abutment within the inner portion of each of said holes, a conductive coiled thrust spring removably contained loosely in each of said holes with its inner end in unattached contact-making abutment against said conductive member, and a slidable outwardly removable contact element in unattached contact-making abutment against the outer end of each of said springs and urged outwardly thereby into abutment with said insulative plate and a corresponding number of which are thus urged into contact-making abutment with the respective said fixed contact elements, each of said slidable contact elements having an inwardly extending tubular skirt fitting loosely around said spring and slidably guided in one of the said holes in said supporting member with its inner end normally spaced outwardly from said conductive member, so that thereby any of said slidable contact elements and any of said springs may be removed and replaced merely by removing said abutment-forming insulative plate together with said abut-

ment-forming fixed contact elements carried thereby.

6. In an electric circuit control device, in combination, an electrically insulating stationary base member having a flat horizontally disposed upper face and having therein a field of tubular holes extending downwardly from said face, a stationary electrically insulative abutment-forming plate removably mounted in fixed position upon said base member above the latter in opposed parallel relation with its flat face, a plurality comprising a predetermined number and arrangement of fixed abutment-forming contact elements passing through and fixedly carried by said insulative plate in vertical alignment with a corresponding number of said holes, a fixed electrically conductive member forming an abutment within the inner portion of each of said holes, a conductive coiled thrust spring removably contained loosely in each of said holes with its lower end in unattached contact-making abutment upon said conductive member, and a vertically-slidable upwardly-removable contact element in unattached contact-making abutment upon the upper end of each of said springs and urged upwardly thereby into abutment with said insulative plate and a corresponding number of which are thus urged into contact-making abutment with the respective said fixed contact elements, each of said slidable contact elements having a downwardly extending tubular skirt fitting loosely over said spring and slidably guided in one of the said holes in said base member with its lower end normally spaced above said conductive member, so that thereby any of said slidable contact elements and any of said springs may be removed and replaced merely by removing said abutment-forming insulative plate together with said abutment-forming fixed contact elements carried thereby, failure of any said spring being visually indicated by the dropping by its own weight of the corresponding slidable contact element.

7. An electric circuit control device including a plate-like unitary separable circuit-controlling member comprising a metal sheet and an electrically insulating sheet in juxtaposed flatwise contact, and a plurality of metal contact studs securing said sheets firmly together and passing through said insulating sheet so as to be exposed at the outer side thereof, said contact studs being arranged according to a desired predetermined design and the exposed end of each of said contact studs constituting an individual circuit-controlling contact element independently of the others.

8. An electric control device including a perforated plate-like unitary separable circuit-controlling member comprising a metal sheet and an electrically insulating sheet in juxtaposed flatwise contact, and a plurality of contact studs disposed within said perforations in accordance with a desired predetermined design and each having a head at each end thereof by which said sheets are firmly secured together, said heads at the outer side of said insulating sheet projecting beyond its outer face with each such projecting head constituting an individual circuit-controlling contact element independently of the others.

CHARLEY BOWERS.