June 26, 1945. W. L. STUBBINS 2,379,197

AUTOMATIC CONTROL DEVICE FOR ELECTRIC CONTACT

Filed April 7, 1944 2 Sheets-Sheet 1

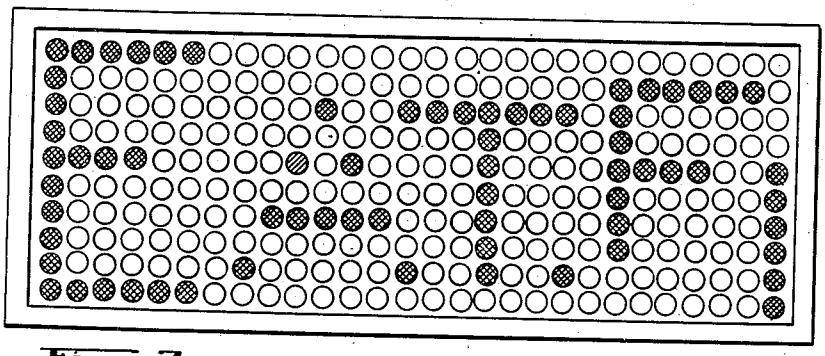


FIG. 7.

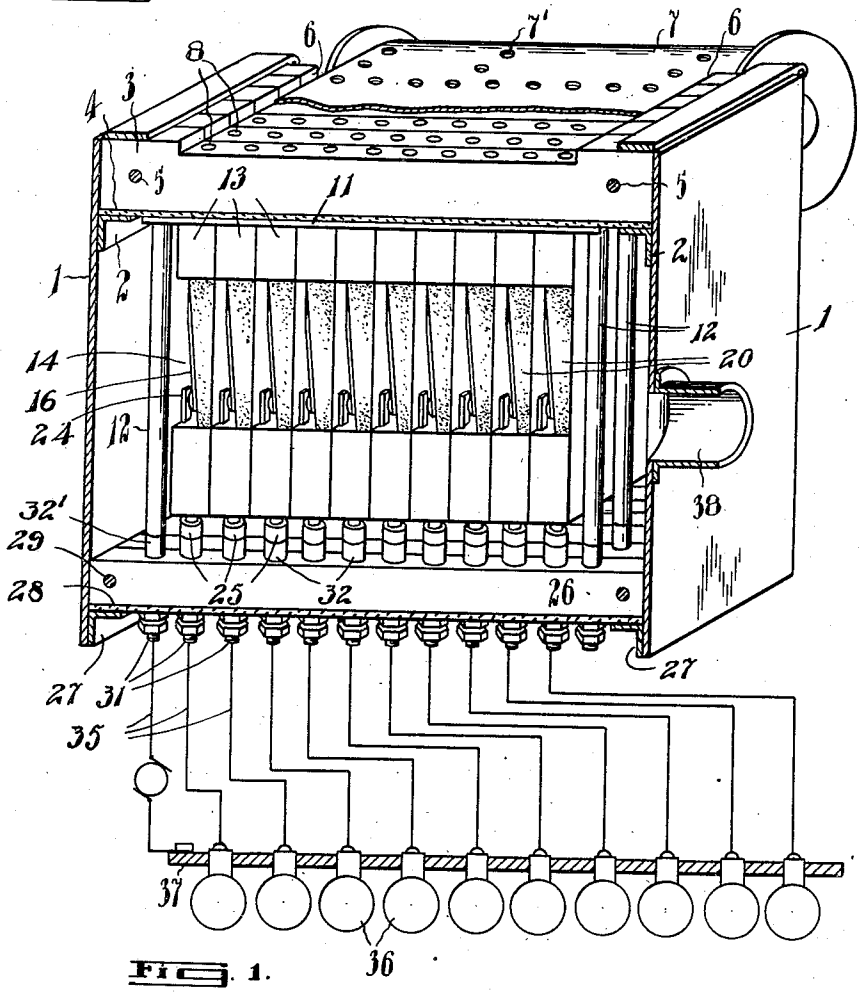


FIG. 1.

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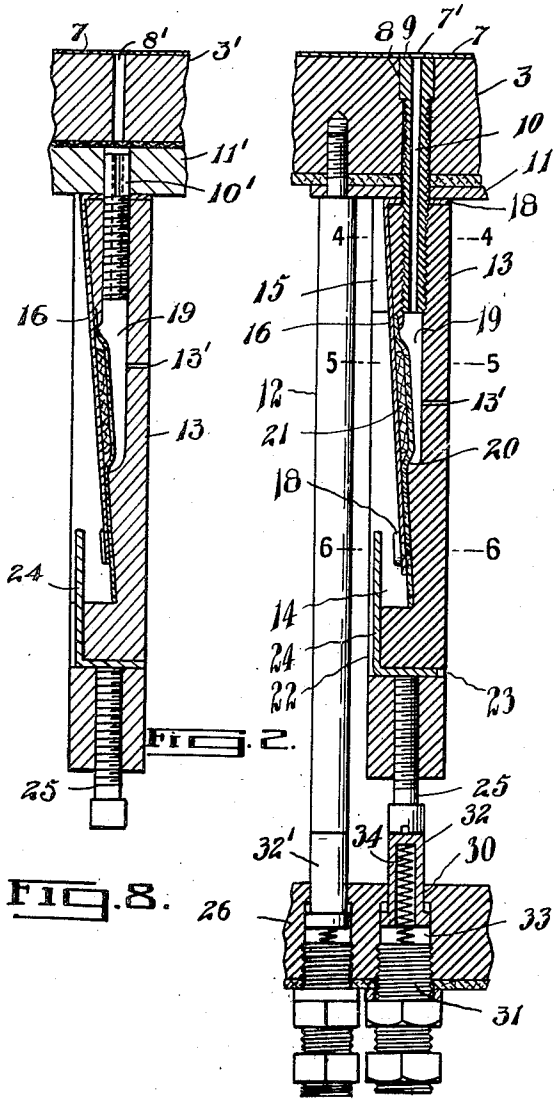


Fig. 2.

Fig. 8.

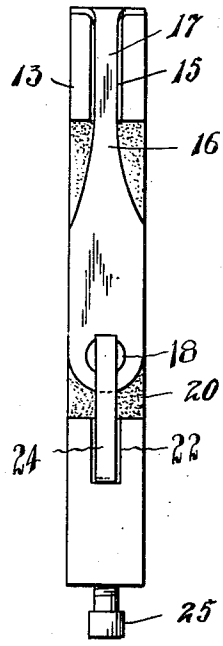


Fig. 3.

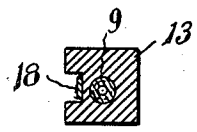


Fig. 4.

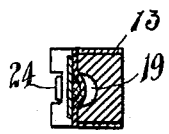


Fig. 5.

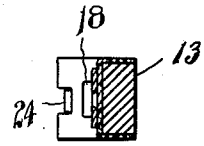


Fig. 6.

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UNITED STATES PATENT OFFICE

2,379,197

AUTOMATIC CONTROL DEVICE FOR ELECTRIC CONTACTS

William L. Stubbins, Toronto, Ontario, Canada

Application April 7, 1944, Serial No. 530,059

8 Claims. (Cl. 200—46)

The principal objects of this invention are to provide a pneumatically actuated control device for intermittently closing the electric circuits to the individual lights of the "flash" or "moving" type of sign which will permit of the building up of the control units of various dimensions to suit display signs of different sizes and different numbers and groupings of lights, and to devise a construction of vacuum chamber which will permit of the assembly of any desirable grouping of individual control units.

The principal feature of the invention consists in the novel construction of individual control units for making and breaking electric circuits to individual lamps or electric contacts wherein each unit is formed of a unitary block or strip of electrical insulating material having a cavity therein closed by a flexible diaphragm which is adapted to engage and operate a flexible spring contact to engage a fixed contact secured in said block, the cavity being connected through a tubular member with one of a plurality of orifices in a bar, a plurality of said bars being arranged to form one side of a vacuum chamber and forming a tracker bar over which a perforated sheet is adapted to travel. Individual spring contact members are mounted in individual bars arranged to close the opposite side of said vacuum chamber to that closed by the tracker member, said spring contacts engaging electrical contact members mounted in the pneumatic unit.

In the accompanying drawings Figure 1 is a part sectional perspective view of a portion of a control mechanism constructed in accordance with the present invention.

Figure 2 is an enlarged longitudinal vertical mid-section taken through one of the individual pneumatic control units and the contact bar therefor and the engaging electrical spring contact.

Figure 3 is an enlarged elevational view of one of the automatic spring contact members separated from its supporting bar and electrical contact.

Figure 4 is a cross sectional view taken on the line 4—4 of Figure 2.

Figure 5 is a cross sectional view taken on the line 5—5 of Figure 2.

Figure 6 is a cross sectional view taken on the line 6—6 of Figure 2.

Figure 7 is a miniature plan of a display sign illustrating the arrangement of individual lights thereon to be controlled by the control mechanism hereinafter described.

Figure 8 is an enlarged longitudinal sectional view of a modified form of pneumatic control unit.

In the operation of the "flash" or "moving" type of electric display many different forms of mechanisms operated pneumatically and controlled by a perforated paper strip or roll have been proposed.

The present invention relates to an improved construction of such control mechanism applicable for general use.

In the construction herein illustrated a cabinet or casing is formed with a pair of side panels 1. These are provided with longitudinally arranged angle flanges 2 spaced from the top. A plurality of bars 3, which may be formed of a plastic, such as "Lucite" or any other suitable electric non-conducting material, are arranged between the side walls 1 above the flanges 2 and rest upon a sheet 4 of leather, rubber or other suitable flexible air-tight material. The bars are formed with flat vertical faces and fit together in snug engaging contact and are clamped by rods 5, and the composite member is clamped by members 3'.

The top edges of the bars 3 are recessed to form the longitudinal edges 6, between which the perforated paper strip 7 mounted on suitable rollers at opposite ends of the casing is adapted to ride.

Each of the bars 3 is formed with a plurality of vertical orifices 8 formed to receive the head end 9 of a tubular screw 10. The bottom of the head of the screw engages the counterbored portion of the orifice.

A metal bar 11 is arranged underneath each of the bars 3 and this bar is secured at the end against the underside of the sheet 4 by rods 12 which have threaded ends extending through the metal bar 11 and the sheet 4 and are threaded into the bars 3.

Threaded onto the lower ends of each of the tubular screws 10 is a bar 13 preferably rectangular in cross section and of the same width as the bar 3. The member 13 is formed with an angular notch recess 14 in one face thereof. The upper portion of the bar is formed with a narrow slot 15.

A thin spring metal member 16 is arranged within the notch 14 and slot 15 and having a narrow portion 17 at the upper end fitting loosely in the slot 15 with a laterally turned head portion 18 abutting the end of the bar 13 which is rigidly held against the metal bar 11 by the tubular screw 10.

The spring member is widened out below the slot 15 and has an electrical contact 18 at its lower end. A recess 19 is formed in the sloping face of the bar 13 and forms a continuation of the

threaded hole into which the screw 10 is secured. A thin leather or other suitable flexible diaphragm cover 20 extends over this recess 19 under the spring member 17, and a strip of hard material 21, such as wood, is cemented into the portion of the diaphragm which is pressed inwardly into the recess 19. Each bar 13 is provided with a bleed hole 13' to effect the return of the diaphragm to its normal position.

The lower portion of the bar 13 below the notched recess 14 is formed with a narrow slot 22 in the face adjacent to the recess which communicates with a transverse hole or slot 23, and an angular metal contact bar 24, having one end extending into the hole 23, extends upwardly opposite to the contact 18 carried by the spring arm, so that upon the spring arm being swung outwardly by the operation of the diaphragm the contact member 18 will engage the member 24 and form an electrical contact therewith. Silver-to-silver contacts may be used.

A screw 25 threaded into the lower end of the bar 13 clamps the member 24 rigidly in position.

A plurality of bars 26 extend across the bottom of the casing and are secured upon angle flanges 27 and rest upon a leather or rubber sheet 28, similar to the sheet 4 which seals the top of the casing, and forms an air seal at the bottom. These bars are of similar width to the width of the bars 13 and are clamped together by the longitudinal rods 29. The bars 12, which are rigidly secured in the upper bars 11 and 3, extend downwardly and terminate level with the head ends of the contact screws 25 and engage contacts mounted in the lower bars 26 and form electrical connections with the bar 11 which forms a common connector to the spring contact members 16.

The bars 26 are formed with orifices 30 which are counterbored from the lower ends and are threaded at the lower extremity to receive the threaded contact posts 31.

Within the orifices 30 are arranged slidable contact members 32 which are formed with flanged lower ends slidably arranged in the counterbore 33 and spaced from the inner ends of the contact posts 31. The members 32 are bored axially from the lower end to a point intermediate of their length and house the compression springs 34 which engage the top surface of the contact posts and urge the members 32 upwardly into spring-engaging contact with the screws 25 on the bottom ends of the members 13, the end contacts 32' engaging the posts 12.

Electric leads 35 are connected to each of the posts 31 and lead to one of the contact terminals of the electric light bulbs 36 which are mounted in a common conductor 37. The conductor 37 and the conductor post 12 connected with the bar 11 are both connected to a suitable source of electric power.

The casing enclosed between the side walls 1 and the bars 3 and 26 may be of any desirable length having any desirable number of contact-supporting bars and orificed bars over which the controlling perforated strip 7 passes, and the ends of this cabinet are suitably sealed so that a vacuum chamber is formed therein.

A tube connection 38 is arranged in a suitable position in one of the side panels 1 and is connected with a suitable form of air pump to create a minus pressure within the casing.

The paper strip 7 extending across the recess portion of the bars 3 closes the orifices 8 leading to the tubular screws 10, but when orifices in the paper strip register with the orifices 8, communication is established between the outside atmosphere and the recesses 19, and atmospheric pressure entering through the tubular screw into the recess 19 presses the diaphragm 20 outwardly so that the wood strip 21 flexes the spring metal contact member 16, forcing it outwardly until the contact 18 engages the contact 24. The spring contact member 16 is in electrical contact with the metal bar 11 connected through the rod 12 to the source of electric energy, and when the contact 18 engages the contact 24 a circuit is closed through the screw 25, contact member 22 and spring 34 to the contact post 31 which is connected to one of the terminals of one of the lamps 36 in a bank or battery of lamps arranged as a display, or to whatever electric circuit is to be energized.

It will be understood that by arranging groupings of perforations 7' in the paper strip 7 any desirable grouping of contacts can be energized to display letters or characters on the face of the sign, as illustrated in Figure 7, and the various letters or characters depicted on the face of the display can be illuminated in such a manner as to stagger or offset the lamps being lighted in a continuous procession of characters caused to travel across the face of the sign by the successive energizing of the lamps as the perforated sheet passes over the tracker bar formed by the perforated bars 3.

From this description it will be appreciated that the operating unit formed by the bar 13 with its pneumatically operating contact member may be assembled in associating with top bars 3 and contact bars 26 in any desirable number, ten of such contact members being shown in the assembly illustrated in Figure 1 and co-operating with ten horizontal rows of lamps illustrated in Figure 7, and any desirable number of groups of these assembled units and bars can be arranged to continue the illumination of the lamps along the length of the sign.

An important feature in connection with the construction of a control apparatus, such as herein described, is that any desirable number of the individual control units may be assembled in rows, and any number of the composite rows can be assembled lengthwise, and by disengaging the means for securing these assembled members in the casing, the entire assembly of pneumatically operated switch members may be removed and any individual switch member may then be removed from the assembly and replaced by simply removing the upper holding screw.

A modified structure is shown in Figure 8 in which each member 13 is provided with a tubular screw member 10' having a slotted upper end which is a push fit in the heavy contact bar 11' and registers with an orifice 8' in the top bar 3'. With such construction the members 13 are held in engagement with the contact by the slotted spring connection assisted by the upward pressure of the bottom spring contact 32 and when the upper structure is removed from the casing any one of the members 13 may be removed by simply pulling them out of their socket connection.

In practice it is not found necessary to extend the sealing members 4 and 28 beyond the supporting flanges, as the bars can be made with very smooth contact side faces so that when the assembly of bars is complete they may be clamped tightly so as to form air-tight joints between the engaging faces.

It is an important feature that both the top

and bottom assembly bars **3** and **26**, and also the individual unit bars **13**, may be made of moulded plastics so that practically no machine work is required in their construction.

The device has been particularly described as applied to electric signs but it will be understood that it may be applied to many forms of devices where a plurality of electrical contacts are desired to be operated intermittently or in unison.

What I claim as my invention is:

1. In an automatic control device for electric contacts, the combination with a movable perforated strip, of a vacuum chamber having a plurality of spaced openings through one wall thereof, individual pneumatic control units secured to said perforated wall and each having a cavity therein connected to one of said wall openings and closed by a flexible diaphragm, said control units each having a flexible contact member operable by said diaphragm and a fixed contact, a plurality of regularly spaced electric contacts secured in a wall of the vacuum chamber and arranged to engage the fixed contacts of said control units.

2. In an automatic control device for electric contacts, the combination with a movable perforated strip, of a casing, a plurality of flat bars parallelly arranged in close engaging contact and forming one wall of said casing, said bars each having a plurality of spaced openings extending therethrough to the interior of the casing adapted to register with said strip perforations, a plurality of individual pneumatic control units secured to each of said bars each having a cavity therein connected with one of the bar openings and closed by a diaphragm, a flexible electric contact mounted on each of said control units adapted to be operated by the diaphragm, a fixed contact mounted on each of said control units, and a plurality of regularly spaced electric contacts secured in the wall of the vacuum chamber opposite to the wall formed by said parallel bars and individually engaging the fixed contact members of said control units and extending through said wall, and electrical devices individually electrically connected with said spaced electric contacts.

3. In an automatic control device for electric contacts, the combination with a movable perforated strip, of a casing, a plurality of flat bars parallelly arranged in close engaging contact and forming one wall of said casing, said bars each having a plurality of spaced openings extending therethrough to the interior of the casing adapted to register with said strip perforations, a plurality of individual pneumatically operated switch members mounted on the inward side of each of said bars and having operating communication with the perforations in said bars, a plurality of flat bars parallelly arranged in close engaging contact and forming a wall of said casing, a plurality of spring-actuated electric contacts mounted in each of said latter bars and forming individual electric contacts for said switch members.

4. In an automatic control device for electric contacts, the combination with a movable perforated strip, of a casing, a plurality of flat bars parallelly arranged in close engaging contact and forming one wall of said casing, said bars each having a plurality of spaced openings extending therethrough to the interior of the casing adapted to register with said strip perforations, a plurality of bars of insulating material arranged with one end abutting the inner face of each of said perforated bars and each having a recess arranged longitudinally therein opening through the end abutting the bar and opening outwardly through one side wall, a tubular member registering with each orifice in said wall bars and extending into the end of the recess of the abutting bar, a flexible diaphragm closing the side opening of each bar recess, a flexible spring contact mounted on each of the abutting bars and extending over the said diaphragm of each, a fixed contact rigidly mounted in the free end of each of said recessed bars and extending adjacent and outside said spring contacts, a screw mounted in the end of each of said recessed bars and securing the fixed contact, and individual electric contact members secured in the wall of said casing adjacent the free ends of said recessed bars and individually engaging the projecting screws holding the fixed contacts.

5. A device as claimed in claim 4 in which each of the recessed bars is formed with a recess in one side, the spring contact of each bar being secured at the end and extending into said side recess outside of the diaphragm closing the recess entering from the end, said bar being slotted to receive and hold the spring contact in alignment, the diaphragm being wrapped around the recessed side and adjacent sides of each bar, said bar being recessed to receive the fixed contact.

6. In an automatic control device for electric contacts, the combination with a movable perforated strip, of a vacuum chamber having a plurality of spaced openings through one wall thereof, individual pneumatic control units secured to said perforated wall and each having a fixed and a movable electric contact, a plurality of electric contacts slidably mounted in a wall of said chamber and adapted to contact said pneumatic control units, an electrical contact post rigidly secured opposite each of said slidable contacts, and coil compression springs inserted between said rigid and slidable contacts.

7. In an automatic control device for electric contacts, the combination with a movable perforated strip, of a casing open at opposite sides and having longitudinal flanges adjacent the edges, a plurality of bars rigidly clamped together and supported by said flanges, said bars having perforations to register with the perforations of said strip, means forming an air seal between said bars and the supporting flanges, individual pneumatic switch units secured to each of said bars and registering with the perforations therein, a plurality of bars clamped together and supported by other of said flanges to enclose said switch units in a vacuum chamber, means forming an air seal between the latter bars and the supporting flanges, and electric contacts mounted in the latter bars and forming electrical connections with said switch members and having terminals on the outer sides of said bars.

8. In an automatic control device for electric signs, the combination with a movable perforated strip, of a casing having two opposite open sides, a plurality of bars of insulating material secured together to form a closure for one side of said casing each having a plurality of perforations, a metal bar arranged on the inner side of each of the aforesaid bars, tubular connections registering with the perforations of said insulating bars, recessed pneumatic switch members having orifices in the ends engaged by said tubular contacts and secured against

said metal bar, flexible switch elements secured between said bars and the ends of said pneumatic switch members, fixed electrical contacts mounted on each of said pneumatic switch elements, screws securing said fixed contacts, posts rigidly securing the ends of said metal bars to the insulating perforated bars, insulating bars secured together and forming a closure for the opposite open side of said casing and spaced from the inward ends of said pneumatic switch members, and flexible electrical contacts mounted on the latter bars and engaging the screws holding the fixed contacts of said pneumatic members.

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