

July 21, 1942.

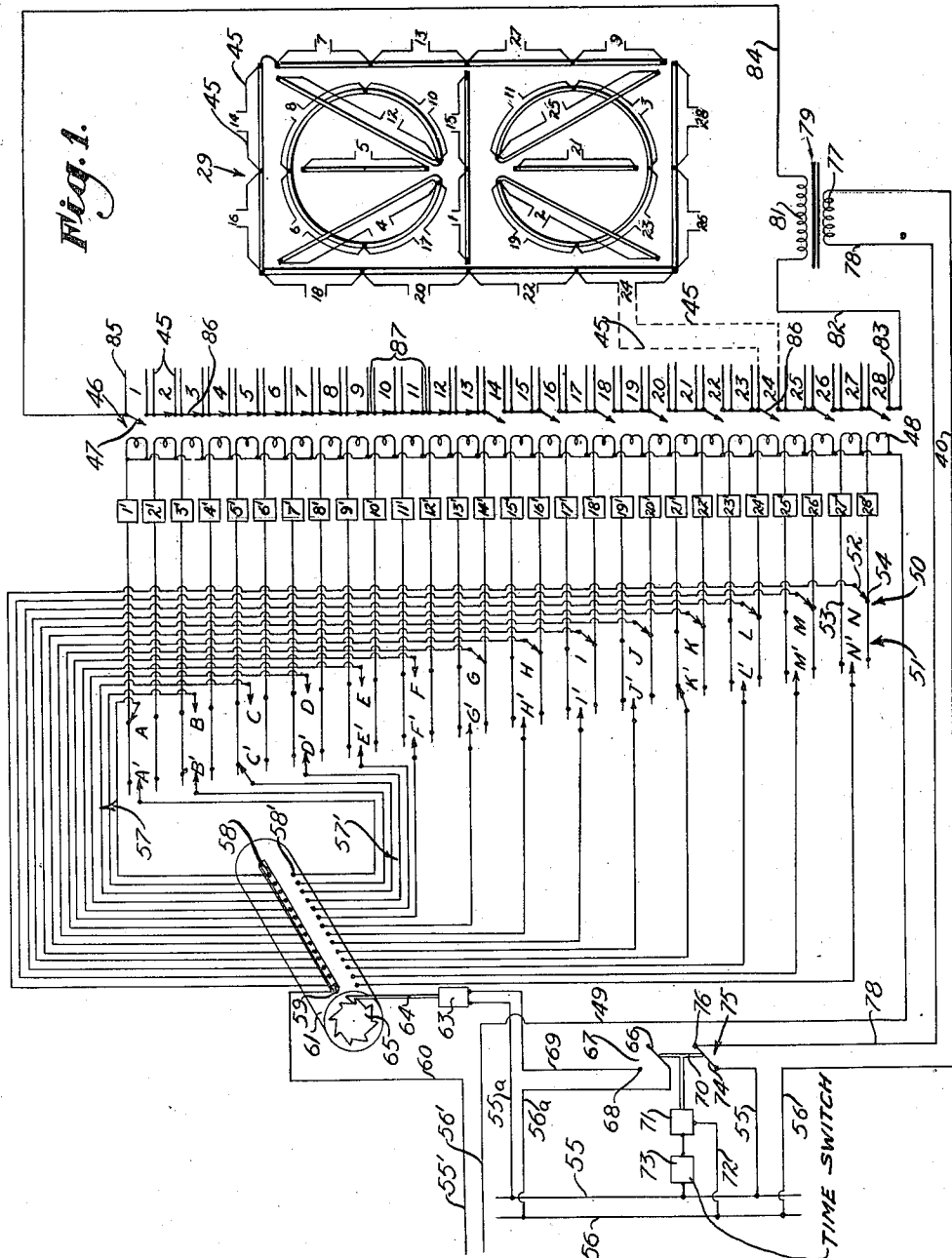
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2,290,261

ELECTRIC SIGN

Filed Dec. 27, 1937

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 2.

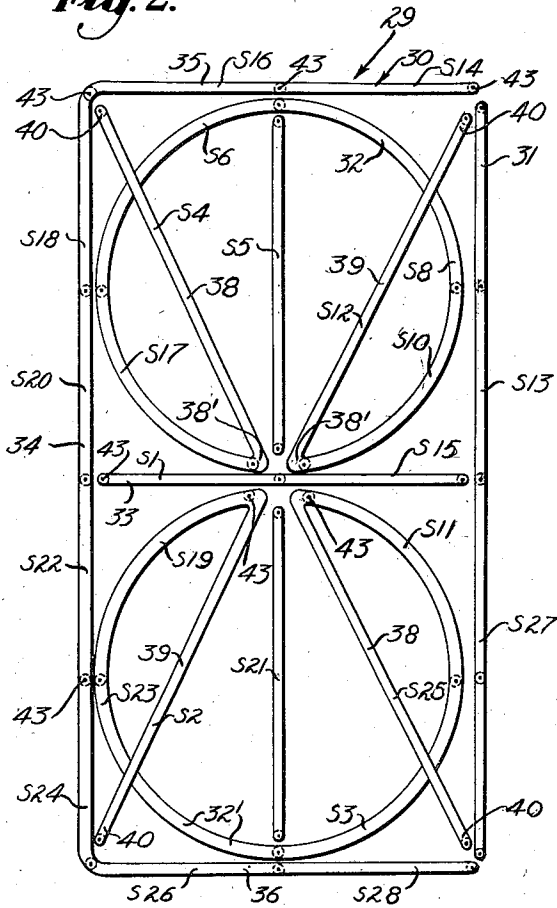


Fig. 4.

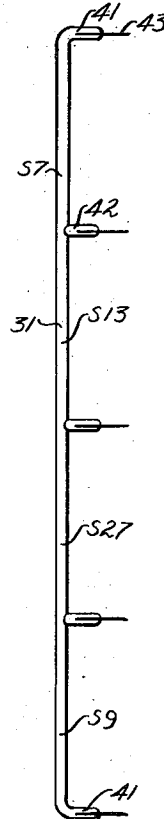


Fig. 3.

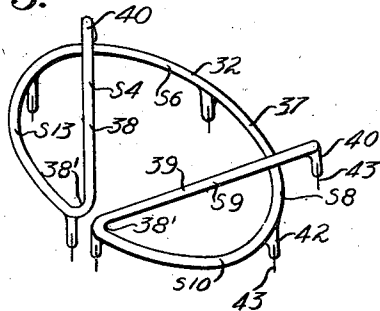


Fig. 5.



Fig. 6.



Fig. 7.



Fig. 8.



Fig. 9.



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# UNITED STATES PATENT OFFICE

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## ELECTRIC SIGN

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Application December 27, 1937, Serial No. 181,818

4 Claims. (Cl. 177—346)

My invention relates to signs of the selective character type wherein selected characters, such as the letters of the alphabet and numerals, may be caused to appear in consecutive order so as to impart to the observer a desired message.

It is an object of the invention to provide a sign comprising a desired number of letter formers, each of which letter former consists of an arrangement of glow tubes, for example neon tubes, so placed and connected with a simple control means that selected sections of these glow tubes may be caused to illuminate, thereby presenting to the eye of an observer a desired character or symbol.

It is a further object of the invention to provide a simple and effective means connected individually to the letter former and being capable of causing such letter former to consecutively display characters or symbols which will impart consecutive thoughts or ideas to an observer. For example, the letter former may be caused to consecutively display letters of the alphabet in a manner to spell out words and sentences which will impart a desired message. Accordingly, for use of a display member or sign occupying a relatively small space a sentence employing a relatively large number of words may be displayed in a manner which will attract the attention of an observer and which will clearly impart the desired message to such observer.

It is a further object of the invention to provide a letter former consisting of an arrangement of glow tubes wherein the entire length of one or more of the glow tubes, or selected portions of individual tubes, may be employed in the formation of a symbol, this enabling me to use a reduced number of electrodes in the formation of the relatively complete letter former.

A further object of the invention is to provide a control system wherein each letter former is controlled through the use of an individual control panel having consecutive groups of switches which may be adjusted in desired order prior to the display of symbols by the letter former, there being means for consecutively connecting these separate switch groups with a source of electrical energy so that the letter former associated therewith will be caused to display consecutive symbols in accordance with the setting of the switch means of the consecutive groups of control switches.

A further object of the invention is to provide individual groups of selector switches, each selector switch having an individual feed line, and there being associated feed switch means for

selectively connecting these feed lines with the source of electrical energy; and it is a further object of the invention to provide means for consecutively advancing the connection of the source of electrical energy from one group of selector switches to the next and concurrently therewith controlling the delivery of high voltage electrical energy to the glow tubes in such manner that the high voltage electrical energy will be applied only during the time associated switches are closed and not during the time contact thereof is being made or broken, this resulting in a preservation of switch contacts.

Further objects and advantages of the invention will be brought out in the following part of the specification.

Referring to the drawings which are for illustrative purposes only:

Fig. 1 is an electrical diagram showing a preferred embodiment of my invention.

Fig. 2 is an enlarged view of the preferred form of letter former.

Fig. 3 is a perspective view of one of the tube elements.

Fig. 4 is a side view of the right vertical tube element of Fig. 2.

Figs. 5 to 9 inclusive are schematic views showing how different characters may be displayed by a letter former.

The letter former 29, shown in detail in Fig. 2, is comprised of elements 30, 31, 32, 32', 33, 35 and 321 which are respectively formed from glass tubes, are suitably gas filled and are provided with electrodes. In the ordinary practice of the invention the elements may be neon tubes. The element 30 comprises a tube bent at two points so as to form a vertical leg 34 and upper and lower rightwardly extending branches 35 and 36. The element 31 is straight and is vertically placed at the ends of the branches 35 and 36 so as to form, in conjunction with the element 30, a rectangle. The element 32, as shown in the segment in Fig. 3 is a tube having an intermediate portion 37 bent to form a circle, the ends 38' of the portion 37 substantially meeting, and end portions 38 and 39 extending from the ends 38' of the central portion 37 in diverging relation so as to substantially form a letter V, the angle of divergence of these parts 38 and 39 being such that the ends 40 thereof will lie in the upper corners of the rectangle defined by the elements 30 and 31.

The element 32' is constructed in the same manner as the element 32 but is reversed so that the end portions 38 and 39 thereof diverge down-

wardly and have their ends 40 disposed in the lower corners of the rectangle formed by the elements 30 and 31. The element 33 is a straight tube extending laterally in an intermediate position between the upper and lower branches 35 and 36 and the elements 5 and 21 extend vertically and diametrically within the elements 32 and 32'. So that all of the elements may be clearly seen, they have been drawn in such relation that one tube does not overlie the other, but it will be recognized that in actual practice top, bottom, and side portions of the central section 37 of the elements 32 and 32' may pass under the elements 30, 31, and 33, or vice versa.

The element 31 is provided with rearwardly turned ends 41, and three intermediate extensions 42 formed of sections of glass tubing connected to the element 31 by fusion. The rearwardly turned ends 41 and the extensions 42 serve as supports for electrodes 43 which divide the element 31 into tube sections S7, S13, S27, and S9, which are substantially of equal length. In a similar manner, the element 30 is provided with nine equally spaced electrodes 43, dividing the upper branch 30 into tube sections S14 and S16, the vertical portion 34 into tube sections S18, S20, S22 and S24, and the lower branch 36 into tube sections S26 and S28. As shown in Fig. 2, the element 32 has projecting electrode supports 42, supporting electrodes 43 and being so placed as to divide the element 32 into tube sections S4, S12, S6, S8, S10 and S17. In a similar manner the element 32' is divided by electrodes 43 into tube sections S2, S19, S23, S3, S11, and S25. The equally spaced electrodes 43 divide the element 31 into a pair of tube sections S1 and S22, of substantially equal length. Elements S5 and S21 have electrodes 43 disposed at the ends thereof and accordingly may be referred to as tube sections S5 and S21 respectively.

Figs. 5 to 9 inclusive show how different symbols, such as letters and numerals, may be displayed by the letter former 29. In Fig. 5, the illumination of the entire element 30 and section S1 of element 33 will display the letter E. The letter O is produced by the illumination of sections S20, S22, S23, S3, S27, S13, S8, and S6. The manner of forming letter Z and numerals 4 and 5 may be observed from an inspection of Figs. 7, 8, and 9. The letter former disclosed is capable of displaying all of the letters of the alphabet and all of the numerals. It will be noted that there are twenty-eight of the tube sections S1 to S28, and that many of the electrodes 43 serve two adjacent tube sections.

As shown in Fig. 1, twenty-eight pairs of conductors 45 provide series circuits for electrical energization of the individual tube sections, such circuits being numbered 1 to 28 inclusive, and all of the circuits being extended to a relay switch bank 46 containing twenty-eight electromagnetic relays 47 each of which is connected to one of the circuits 1, 2, 3, etc. in such a manner as to bridge across or unbridge the pair of conductors constituting the circuits to which the individual relays 47 are connected, such bridging or unbridging depending on whether the relays are closed or open.

The series circuits 1 to 28 are connected in series, either by the connecting of two adjacent wires to a single electrode 43 or by the use of jumpers 87 between adjacent contacts of adjacent relays 47 associated with the series circuits. One side of the electro-magnet 48 of each relay 47 is connected to a common wire 49, and se-

lector circuit wires 1' to 28' inclusive are connected in consecutive order to the electro-magnets 48 of the respective relays 47. The conductors 1' to 28' extend in parallel through a plurality of selector switch banks of which any desired number may be provided. For the purpose of explanation, I have shown two of such selector switch banks 50 and 51. Each control switch bank includes 14 selector switches A to N inclusive, this number of selector switches being half the number of circuits 1' to 28'.

Each selector switch of the group A to N inclusive includes a movable switch contact 52 and a pair of stationary contacts 53 and 54 each of which is connected to a conductor 1' to 28'. For example, as shown in selector switch N, the contacts 53 and 54 are connected respectively to the conductors 27' and 28'. Means are provided for simultaneously connecting or simultaneously disconnecting all of the movable switch members 52 to a low voltage electrical supply wire 55', the electro-magnets 48 of the relays 47 being connected through the conductor 49 with the associated low voltage feed conductor 56'. This means for connecting the movable contact 52 with the conductor 55 comprises fourteen feed conductors 57 extending to fourteen contacts 58, adapted to be simultaneously engaged by a single bar contact 59 which is connected through a conductor 60 to the wire 55'. As a means for bringing the bar contact 59 into engagement with the contact 58 I have shown a drum 61 on which the bar contact 59 is mounted, the rotation of this drum 61 moving the bar 59 first into engagement with the contacts 58 and then from engagement with the contact 58 to consecutive sets of contacts such as the set shown at 58', the number of sets of such contacts 58-58' being in accordance with the number of groups of selector switches A-N. The contacts indicated at 58' are connected through conductors 57' with the movable contact members 52 of the control switch bank 51, which is a duplicate of the control switch bank 50.

As a means for advancing the drum 61 I provide an electro-magnet 63 having a pawl 64 adapted to engage the teeth of a ratchet 65 mounted or connected to the drum 61. From an electric service conductor 55 a wire 55a extends to the electro-magnet 63, and another wire 56a extends from a service conductor 56 to a movable contact 66 of a switch 67 having a cooperative stationary contact 68 which is connected through a conductor 69 with the electro-magnet 63. The switch 67 is adapted to be closed by means of a yoke 70 connected to and operated by an electro-magnet 71 which is connected in a circuit 72 with a timing device or switch 73. The yoke 70 is likewise operatively connected to the movable contact 74 of the switch 75, the movable contact 74 being in engagement with a stationary contact 76 when the switch 67 is open. The movable contact 74 is connected by means of a wire 55b to the feed wire 55, and the feed wire 56 is connected by means of a conductor 56b to one side of a primary winding 77 of a transformer 79, the other side of said winding 77 being connected through a conductor 78 with the contact 76 of switch 75. The transformer 79 has a secondary winding 81, one side of which is connected through a conductor 82 with the outside wire 83 of the series circuit 28, and the other side of the secondary winding 81 is connected through a conductor 84 with the outside wire 85 of series circuit 1.

The relays 47, of which there are twenty-eight, to correspond to the number of circuits 1—28, have normally closed contacts 86 which, when closed, connect together or bridge the conductors of the circuits associated therewith. For example, the contact 86 of the relay 47 associated with circuit 24 when closed will connect the wires 45 which form the circuit 24, thereby bridging the conductors forming series circuit 24. Accordingly, should all of the relays 47 be in closed position, as will occur when none of the electro-magnets 48 associated therewith are energized, the bar contacts 86 of these relays would form a direct short in the high potential circuit from conductor 82 to conductor 84. Wherever a relay 47 is opened, by the energization of its associated electro-magnet 48, the high potential electrical energy must flow through the circuit associated with the relay which is open. How this is employed in the displaying of a character on the letter former 29 will be perceived from the following.

Let it be assumed that the movable contact 52 of switch A in bank 50 is connected with conductor 1', the movable contact 52 of switch G is connected with the conductor 14, and the movable contact 52 of switches H, I, J, K, L, M, and N, are respectively connected with the conductors 16', 18', 20', 22', 24', 26', and 28'. With the selector switches so set, the movement of the bar contact 59 into engagement with the contact 58 will result in a flow of electrical energy through the conductors 1', 14', 16', 18', 20', 22', 24', 26', and 28', and through the relay electro-magnets 48 associated therewith. This will result in the opening of the relays 47 associated with circuits 1, 14, 16, 18, 20, 22, 24, 26, and 28. Should the transformer 79 be now energized, high voltage current will flow through the conductor 84, through circuits 1, 14, 16, 18, 20, 22, 24, 26, and 28, and then back to the transformer through conductor 82, the remaining circuits 2 to 13, 15, 17, 19, 21, 23, 25, and 27 associated with the letter former 29 being shorted out by the closed relays 47, the contacts 86 of these relays bridging the series circuits as shown. The foregoing operation of the relays 47 will result in energization of the entire element 30 and the tube section S1, with the result that the letter "E" will be displayed by illuminated neon tube sections as illustrated in Fig. 5. It will be noted that each control or selector switch A to N, or A' to N' controls a pair of the relays 1 to 28 and accordingly a pair of the sections S1 to S28, and that these sections are distributed in such a manner in the letter former that only one relay of each pair is employed at any one time in the forming of a character. For example, relay 1 is used in the forming of letter E, but relay 2, which is paired therewith, is used in the letter X.

The bank of selector switches 51 is shown as set for the display of the letter "I." To display this letter requires only that the tube elements S5 and S21 be illuminated; therefore, circuits 5 and 21 need only be opened. Accordingly, in the switch bank 51 the movable contact of switch C' is connected with conductor 5', and the movable contact of switch K' is connected to conductor 21'. The advancing of the bar contact 59 into position to engage the contacts 58' will result in a flow of current through the conductors 5' and 21' to the electro-magnets of the relays 47 which are adapted to open the circuits 5 and 21. All of the remaining circuits will be shorted

out by reason of the fact that the relays associated therewith will remain closed, and current from the secondary 81 of the transformer 79 will flow only through the circuits 5 and 21 and through the neon tube elements S5 and S21.

The number of selector switch banks employed with a letter former 29 will correspond to the number of letter changes required. The number of sets of contacts 58 placed around the drum 61 will correspond to the number of selector switch banks employed. Each time the timing switch 73 energizes the electro-magnet 71, the yoke 70 will be actuated in leftward direction, opening switch 75 which controls the transformer 79 and closing switch 67 with the result that solenoid 63 will be energized and pawl 64 will advance the drum through one consecutive position so as to carry the bar contact 59 to the next set of contacts 58, for example, to the set of contacts indicated at 58'. It is a feature of the invention that during the time the bar contact is being moved from one set of contacts 58 to the next, the transformer 79 will be deenergized. Therefore, at this time, high voltage will not be impressed on any of the contacts 86 of the relays 47 and likewise no current will flow across during the time they are being opened and closed.

A further feature of the invention is that the number of conductors 57 extending from one selector switch bank 50 need only be half the number of circuits employed for the control of the relays. The double throw switches A—N are so connected with the relays 47 that only one contact 53 or 54 of each control switch need be employed at any one time during the display of a character on the associated letter former 29.

I claim as my invention:

1. In a changeable sign device of the character described, the combination of: a letter former having a plurality of illuminable glow tube sections arranged so that the selective illumination thereof will display characters; a series circuit connected to each of said sections, there being means for impressing an electrical potential across said series circuits; a relay connected to each of said series circuits and being operative to bridge and unbridge the same; a source of electrical energy; a separate selector circuit conductor extending from one side of each of said relays; a common conductor connected to the other side of all of said relays, said common conductor being connected to said source of electrical energy; a plurality of banks of selector switches, each selector switch comprising a pair of primary contacts individually connected to said selector circuit conductors and a secondary contact adapted to selectively engage said primary contacts; a set of feed conductors extending from each of said banks, said feed conductors being separate from each other and being connected to separate of said secondary contacts of said banks; and feed switch means operative to connect a selected set of said feed conductors to said source of electrical energy while the other sets thereof remain disconnected from said source of electrical energy.

2. In a changeable sign device of the character described, the combination of: a letter former having a plurality of illuminable glow tube sections arranged so that the selective illumination thereof will display characters; a series circuit connected to each of said sections, there being means for impressing an electrical potential

across said series circuits; a relay connected to each of said series circuits and being operative to bridge and unbridge the same; a source of electrical energy; a separate selector circuit conductor extending from one side of each of said relays; a common conductor connected to the other side of all of said relays, said common conductor being connected to said source of electrical energy; a plurality of banks of selector switches, each selector switch comprising a plurality of primary contacts each of which is connected to one of said selector circuit conductors, and each selector switch comprising a secondary contact for selective engagement with said primary contacts thereof; a set of feed conductors extending from each of said banks, said feed conductors being separate from each other and being connected to separate of said secondary contacts of said banks; and means operative to connect one of said sets of feed conductors to said source of electrical energy and then substantially instantaneously disconnect said source of electrical energy from said feed conductors and connect it to another set of said feed conductors.

3. In a changeable sign device of the character described, the combination of: a letter former having a plurality of illuminable glow tube sections arranged so that the selective illumination thereof will display characters; a series circuit connected to each of said sections, there being

means for impressing an electrical potential across said series circuits; a relay connected to each of said series circuits and being operative to bridge and unbridge the same; a source of electrical energy, a selector switch including a group of primary contacts each of which primary contacts is connected to one of said relays for energization thereof, and a selector contact adapted to selectively engage said primary contacts; and means for connecting said secondary contact with said source of electrical energy.

4. In a changeable sign device of the character described, the combination of: a letter former having a plurality of illuminable sections arranged so that the selective illumination thereof will display characters; means for controlling the illumination of said sections, each of said means comprising an electro-magnet; a source of electric energy; switch means for controlling the flow of electrical energy from said source; a plurality of feed conductors extending from said switch means toward said electro-magnets; selector switch means for each of said feed conductors and being operative to connect the same to any one of a plurality of said electro-magnets whereby current will flow from said source to selected electro-magnets; and conductor means for return of said current from said selected electro-magnets.

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