Sept. 6, 1949. T. R. WELCH 2,481,269

CONTROL SYSTEM FOR ELECTRIC SIGNS

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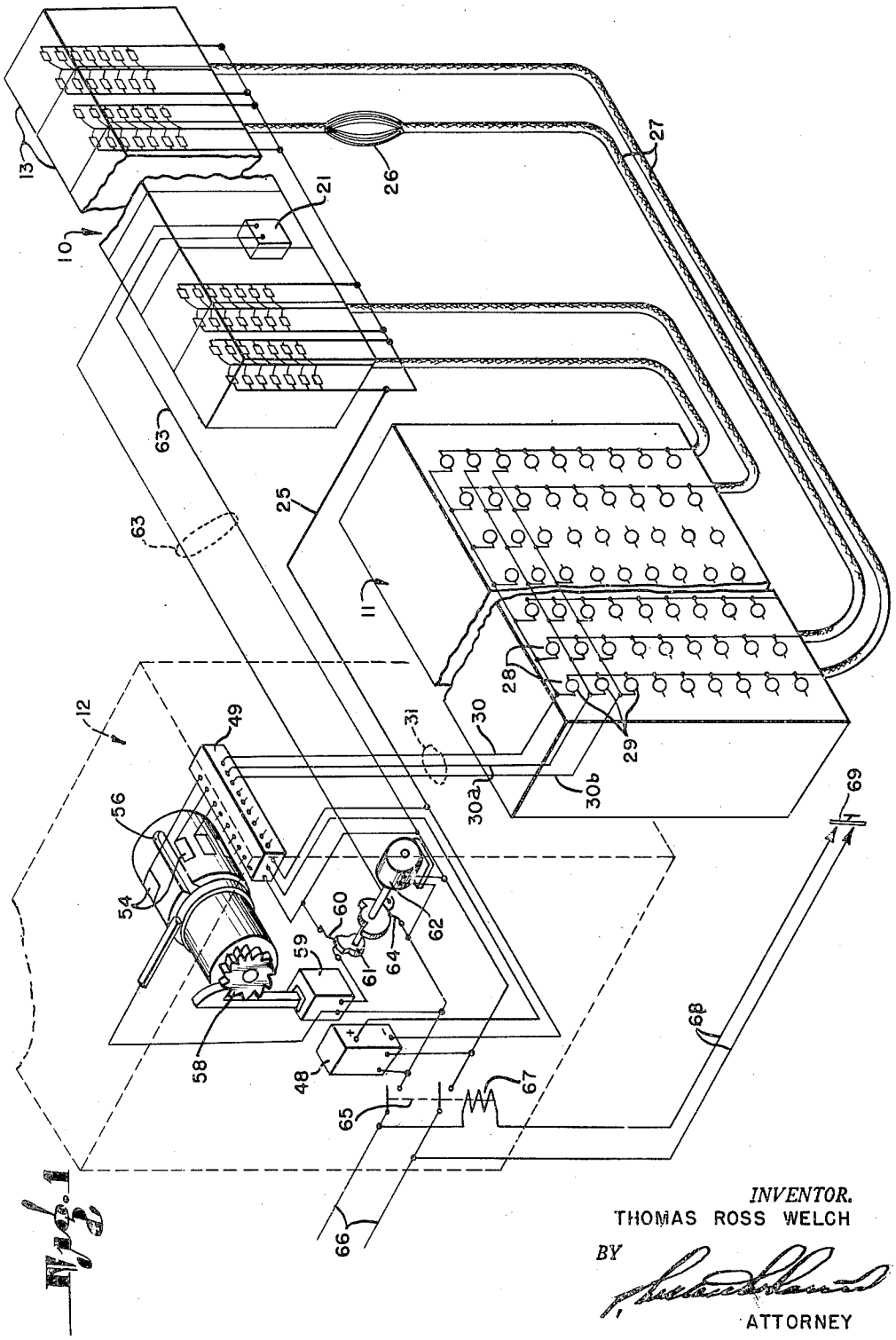


Fig. 1

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Fig. 2

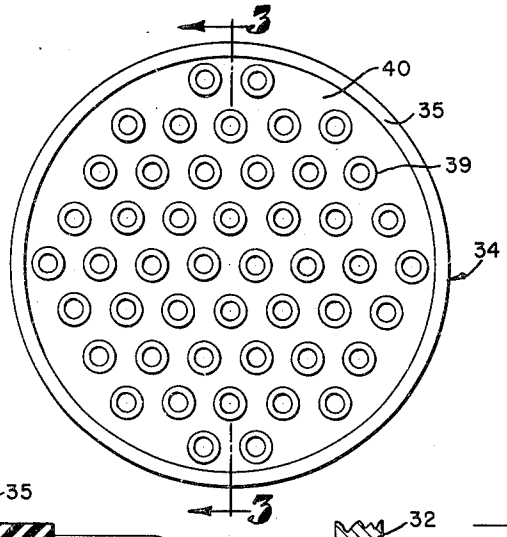


Fig. 5

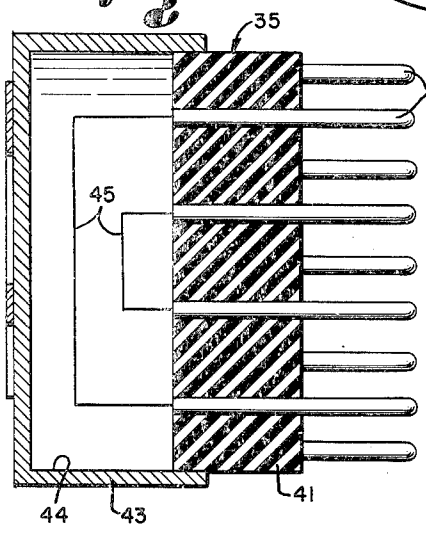
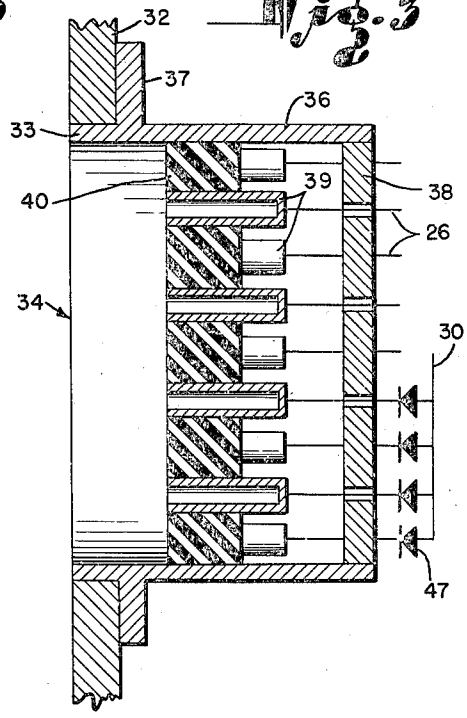


Fig. 3



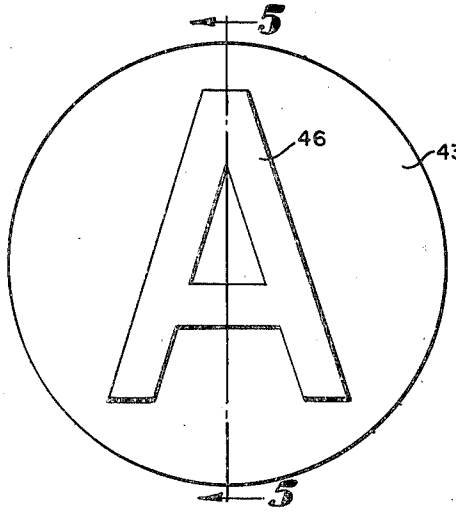


Fig. 4

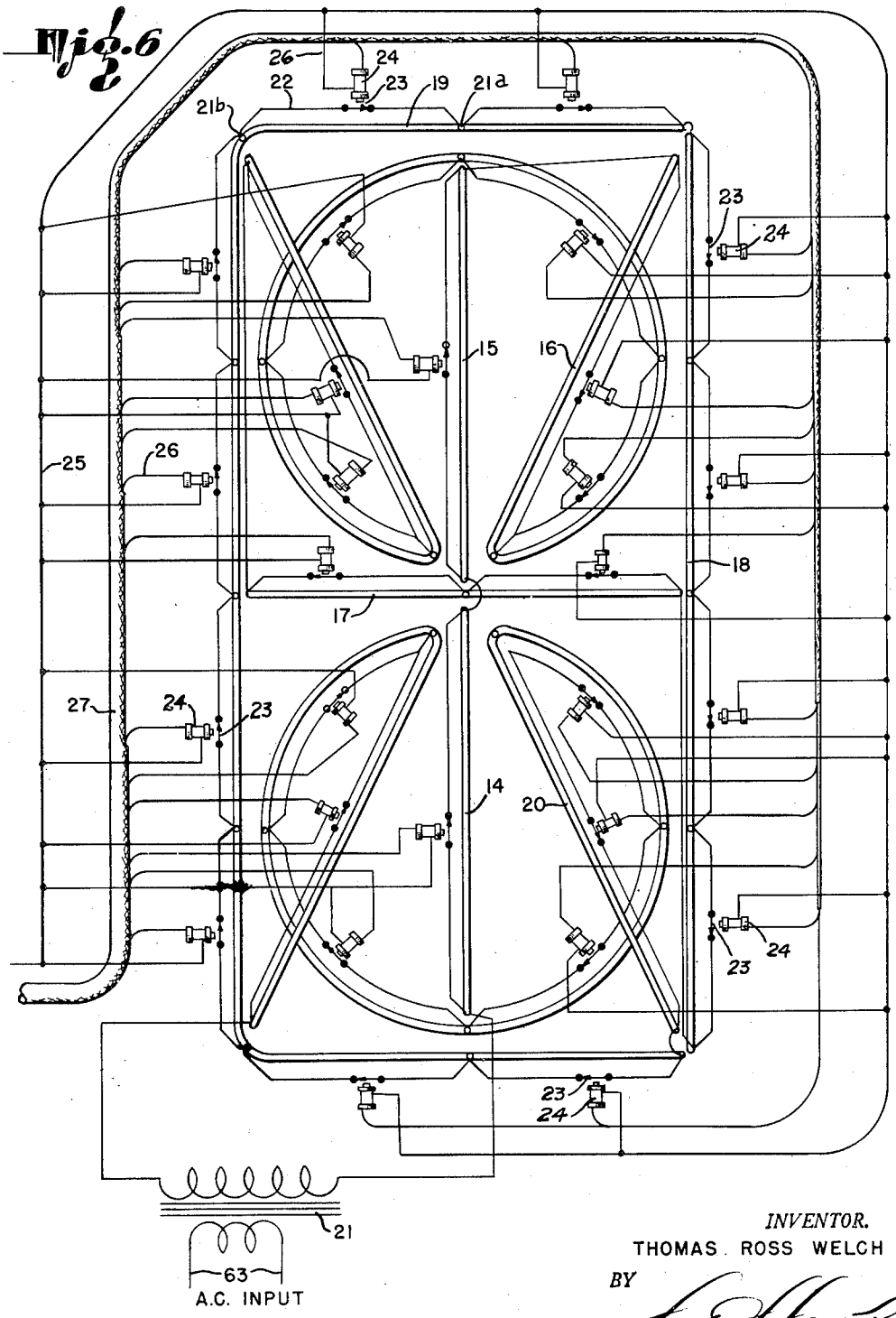
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Fig. 6



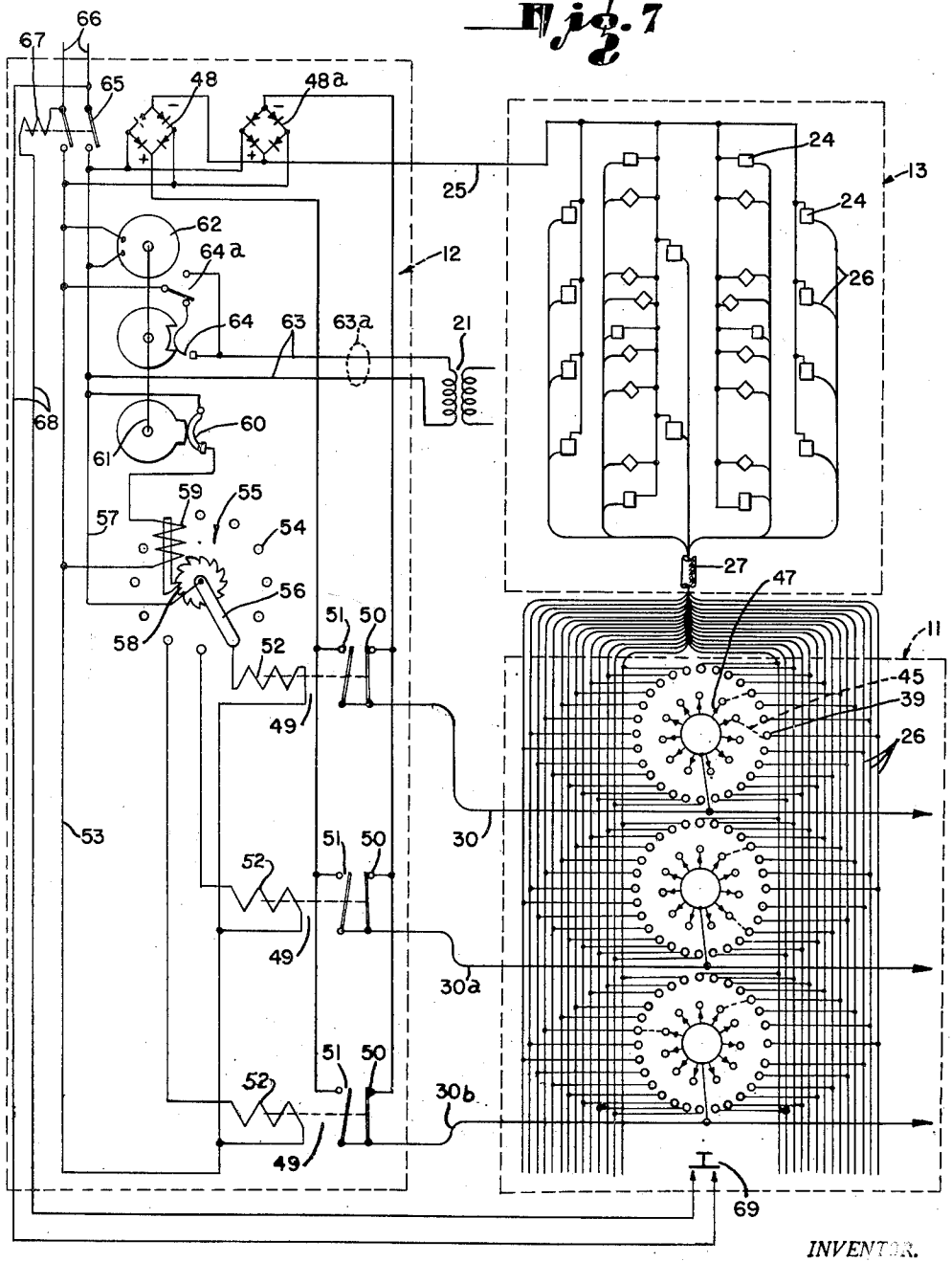
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Fig. 7



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CONTROL SYSTEM FOR ELECTRIC SIGNS

Thomas Ross Welch, Los Angeles, Calif.

Application December 26, 1946, Serial No. 718,433

8 Claims. (Cl. 177—350)

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The present invention relates generally to signs of the type in which pre-selected characters or symbols of a desired message may be caused to appear in successive order so as to visually impart the message to an observer, and is more particularly concerned with improvements in the control system for such signs.

Briefly, a sign and control system embodying the features of the present invention comprises a plurality of symbol formers arranged to be successively changed as a group to display a desired message or portion of a message consisting of words, letters, numerals and the like.

The particular symbol or character displayed by each symbol former during the successive group displays is determined by the pre-setting of a plurality of symbol selectors associated with each symbol former, and which are arranged to be successively energized. All the symbol selectors for a given symbol former are similarly connected to a set of common conductors leading to the symbol former, and all successive group changes for that particular symbol former are accomplished over this set of common conductors.

Undesired sneak or back circuits through portions of those common conductors and symbol selectors which are not being utilized for the group of symbols on display, is prevented by the utilization of one-way valves or rectifiers in such a manner as to confine current flow to the proper circuit paths.

It is a characteristic of this type of valve or rectifier that they will occasionally break down and permit current flow in a reverse direction. In other words, they may fail to act as valves for the confining of current flow to a desired flow path. This condition, however, is readily remedied by subjecting the valves to reversed polarity. The means for accomplishing the connection of reversed polarity to the rectifiers constitutes a feature of the control system of my present invention, which will be described subsequently in greater detail.

Having the foregoing in mind, it is a primary object of the present invention to provide an improved control system for display signs of the herein described type, which is economical of installation, efficient in operation, and which may be easily preset to produce different messages and displays, as desired.

A further object of the invention is to provide novel control whereby the valves or rectifiers of the system may be subjected to reversed polarity during periods of non-use in order to decrease the possibility of break-down and restore those rectifiers which may have broken

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down during operation, without the necessity of having to stop the sign operation or interrupt its continued operation in any way.

Further objects of the invention will be brought out in the following parts of the specification, wherein detailed description is for the purpose of fully disclosing preferred embodiments of the invention without placing limitations on the scope of the invention defined in the appended claims.

Referring to the drawings which are for illustrative purposes only:

Fig. 1 is a combined wiring diagram and schematic perspective view generally illustrating the principal components of a sign embodying the control system of the present invention;

Fig. 2 is a front view of a symbol selector receptacle as utilized therein;

Fig. 3 is a sectional view, taken substantially on line 3—3 of Fig. 2;

Fig. 4 is a front view of a symbol selector plug;

Fig. 5 is a sectional view through the plug, taken substantially on line 5—5 of Fig. 4;

Fig. 6 is a detailed wiring diagram and a schematic plan view of a symbol former and associated devices; and

Fig. 7 is a fragmentary wiring diagram illustrating circuit connection details for the entire control system.

Referring now to the drawings, the present invention is therein illustrated as generally comprising a sign 10, as viewed from the rear, which may be located on the top of a building or in other prominent position for the visual display of characters, numerals, or other indicia constituting a message. This sign which is of the changeable type, as will be described subsequently in detail, is interconnected with a control or program panel as generally indicated at 11 which may be remotely located with reference to the sign in any desired location within the building. The control panel is in turn connected with remotely located power supply apparatus as generally indicated at 12 which may be located in the basement of the building, or other desired location.

The sign 10 comprises a plurality of identical symbol formers 13 assembled in aligned relation for the individual formation and display of characters, symbols, or the like of the message to be visually displayed by the sign.

The details of the construction of the symbol former are shown in Fig. 6. Each symbol former is composed of a plurality of illuminable tube sections 14 to 20, inclusive, which are interconnected to form a series electrical circuit supplied

from the secondary winding of a suitable supply transformer 21.

The tube sections are respectively formed from glass tubes, filled with suitable gas and provided with electrodes intermediate their ends for enabling all or a part of each tube section to be illuminated. In practice, these tubes may be of the neon type. The tubes are positioned and variously formed so that when selected portions thereof are illuminated, the illuminated sections combine to compositely form a desired symbol or character.

As an example of the manner in which each tube section is broken down into illuminable portions, it will be noted that the tube 19 is divided into interconnected portions by spaced electrodes therein, eight portions being provided. Adjacent electrodes—for example, electrodes as indicated at 21*a* and 21*b* at the top portion of the tube 19—are interconnected by a bridging conductor 22 having control contacts 23 therein which are operatively associated with operating coil 24. By means of this switch, the portion lying between adjacent electrodes may be controlled as to its illumination or non-illumination. The contacts 23 are of the normally closed type so that initially all the tube portions are bridged and consequently rendered non-illuminable. It will be apparent that by selectively energizing the operating coils 24, the illumination and non-illumination of the portions of the respective tube sections may be controlled to form the desired symbols or characters. In order that flexible control may be accomplished, one side of each coil 24 is connected to a common conductor 25 and the other side of each coil is connected to an individual control conductor 26. The conductor 26 for each symbol former is carried through a common cable 27 for association with symbol selectors at the program panel, as will hereinafter be more fully described in detail.

Each symbol former is interconnected through its conductors 26 in a similar manner to a plurality of symbol selectors arranged in a vertical bank 28 for successive energization to cause successive characters as determined by the symbol selector to appear on the associated symbol former of the sign. The symbol selectors for all the symbol formers are horizontally aligned and interconnected to form groups 29, whereby the symbol formers of the entire sign will be activated as a group for each successive change thereof. The respective groups of symbol selectors are energized through common supply conductors 30—30*a*—30*b*, etc. All these conductors may be contained in a single interconnecting cable 31 extending to the power supply apparatus 12.

The symbol selector may be of the type disclosed in my copending application covering a Visual signal program system, Serial No. 694,664, filed September 3, 1946, or it may be as particularly disclosed in Figs. 2, 3, 4, and 5 herein. Referring to Fig. 3, the program panel is provided with a front panel board 32 having a plurality of holes or openings 33 therein arranged to form the mounting positions for the vertical banks 28 and horizontal groups 29 of symbol selectors, as shown in Fig. 1. Each symbol selector is composed of two parts, namely, a receptacle assembly 34 and a plug assembly 35.

The receptacle assembly comprises a tubular casing 36 having an integrally formed flange 37 adjacent one end, by means of which it may be mounted in an opening 33 with the flange extending over the rear surface of the panel board.

The receptacle may be secured in operative position by means of suitable screws or other securing members connecting the flange with the panel board. The rear end of the tubular casing may be closed by a bottom member 38 which may be apertured for supporting connection wires passing to the receptacle interior. A plurality of pin receiving sockets 39 are supported in a disc 40 of insulating material, these sockets having their open ends facing the front open end of the casing 36 and being spaced relatively as shown in Fig. 2 of the drawings.

Referring now to Fig. 5 of the drawings, the symbol selector plug 35 is shown as comprising a disc shaped base member 41 of suitable insulating material having a plurality of contact pins 42 set therein with their ends similarly projecting beyond the base member and correspondingly located and spaced to correspond with the positioning of the pin receiving sockets 39. Suitable means (not shown) are provided for orienting the selector plug relative to the selector socket so that the same pins will always go in the same socket each time the plug is inserted. The base member 41 of the plug assembly is provided with a cup shaped cap 43 which is partially inserted over the opposite side of the base member from that in which the pins 42 project. This cap member cooperates with the base member to define an interior space or cavity 44 within which connection may be made between certain of the pins in the plug for a purpose hereinafter to be described more fully. As shown, however, jumper connections 45 in this space are utilized for interconnecting certain pins of the upper part of the plug with other pins of the lower part of the plug. These jumpers are so arranged that interconnections are established with the control conductors 26 to the associated symbol former so as to determine the character which will be displayed. This character, for convenience, is indicated on the outside of the bottom of the cap 43, and, in this case, constitutes the letter "A" as shown in Fig. 4 and indicated by numeral 46.

As shown in Fig. 3, the upper five rows of the pin sockets total twenty-eight in number and correspond to the total number of operating coils 24 associated with each symbol former. Moreover, each of these sockets is connected by a control conductor 26 with one of the coils. The remaining sockets in the lower half of the receptacle 34 are utilized for connecting the desired pins in the upper portion of the receptacle with a supply circuit by means of jumpers 45 to give the appropriate selectivity in the signal former to form the proper display characteristics. The sockets in the lower portion of the receptacle 34 are respectively provided with valves 47 for limiting the direction of flow of current through their associated sockets in one direction only from a common conductor such as a common supply conductor 30.

Referring to Fig. 7, the various elements of the system have been more or less diagrammatically represented and is restricted to the first three symbol selectors of a vertical bank 28 associated with one of the symbol formers. It is thought, however, that the description in this connection will be clearly understood and fully illustrate the operation of the other components of the system.

Current for the energization of the operating coils 24 for the contacts 23 of each symbol former is supplied from a bridge connected rectifier 48. Provision is made for selectively connecting the common supply conductors 30, 30*a* and 30*b* to

the positive polarity side of the rectifier 48 and to the side of rectifier 48*a*, these two rectifiers being series-connected with their common interconnection connected to common conductor 25. The foregoing is accomplished by means of a plurality of electrically actuated switches 49, each switch having normally closed contacts 50 for connecting the common supply conductors of the symbol selectors to the negative side of the rectifier 48*a*, and normally open contacts 51 operable to connect the common conductor to the positive side of the rectifier 48 when the operating coil 52 of the switch is energized.

A switch 49 is thus provided to control the energization of the feeder conductor for each group 29 of symbol selectors, and provision is made for successively energizing the operating coils 52 of the switches in timed sequence. For such purpose, one side of the operating coils 52 are commonly connected to a conductor 53 of an alternating current supply circuit, and the other side of these coils 52 are respectively connected with stationary contacts 54 of a stepping switch generally indicated by the numeral 55. This switch is provided with a rotating contact 56 arranged to successively engage the stationary contacts 54. The rotating contact has electrical connection with a conductor 57 which constitutes the other side of the supply circuit. Periodic movement of the contact 56 is accomplished by means of a pawl and ratchet mechanism 58 operatively associated with an actuating coil 59 having one terminal thereof connected to the conductor 53 and its other terminal connected to the conductor 57 of the supply circuit through the contacts 60 of a cam switch 61. The cam switch 61 is driven at a constant speed by a suitable motor 62 having its terminals connected to the circuit conductors 53 and 57.

The primary winding of the transformer 21, located at the sign, is supplied over a pair of conductors 63, which may be grouped in a single cable as indicated at 63*a*, and connected directly to circuit conductors 53 and 57 or through a cam operative switch 64 by means of a selector switch 64*a*. The switch 64 is normally closed and is arranged to open in predetermined time relation to the actuation of the switch 61, being driven also by the motor 62. More specifically, the switch 64 opens to deenergize the sign before the switch 61 closes to successively connect the next group of symbol selectors. The switch 64 again closes to energize the sign, and thereafter the switch 61 again opens the circuit preparatory to shifting to the next group upon the next closure of the switch 61.

Starting and stopping of the sign and its control system is accomplished through a main switch 65 which is provided for connecting the circuit conductors 53 and 57 with a main electric supply source 66. The switch 65 may be manually operable or, if desired, may be arranged, as shown, with an operating coil 67 having one side connected to the main supply source 66 and its other side connected through a pair of control conductors 68 having connection with a remotely located push button 69 located adjacent the control program panel.

With further reference to Fig. 7, when a switch 49 is energized, in this case, the switch connected to the common conductor 30, the conductor 30 is connected to the positive side of the rectifier 48 so that current is fed through the associated symbol selector in flow paths containing the rectifiers or valves 47 and jumpers 45 to pin receiving sockets 39 respectively connected to conductors 26 leading to the control coils 24 of the contacts 23, and thence back over common conductor 25 to the negative side of the rectifier 48. Under such conditions, and as determined by the jumpers in the symbol selector, a particular character will be displayed by the symbol former.

It will become apparent, however, that due to the fact that the pin sockets of the symbol selectors of each bank are connected to the same conductors 26, there might be occasions when feed backs through jumpers of an assembled selector of the bank would permit energization of operating coils 24 of the symbol former, controlled by this bank, out of their proper sequence. It is for this reason that the valves 47 are utilized. Thus, the valves in the symbol selectors of a connected group will operate to permit the passage of current in normal direction; whereas, the valves of one of the other groups will prevent passage of current in a reverse direction, which would be necessary to energize the coils 24 through a sneak or back circuit.

It will be apparent that the use of these valves is particularly advantageous and results in greater economy of installation and operation than would otherwise be possible. These valves, however, being of the dry disc type of selenium or copper oxide rectifier, are inherently subject to occasional break-down, and will permit current to pass in an opposite direction. It has been found, however, that valves which have thus failed may be readily restored to normal condition by subjecting them to reversed current flow for a period of time.

The present control system guards against breakdown of the valves as well as for restoring them to operative condition, without the necessity of having to shut down or otherwise interfere with the operation of the sign or its component parts. This is accomplished by the contacts of the switches 49. As previously explained, the contacts 51 operate to connect the selected group of symbol selectors to the positive side of rectifier 48. It will be noted, however, by reference to the contacts of the switches 49 which are associated with common conductors 30*a* and 30*b*, that the contacts 51 are in open position and the contacts 50 are in closed position. The conductors 30*a* and 30*b* are thus connected to the negative side of rectifier 48*a*, so that a reversed potential would be applied to any defective or broken down valves which might be associated with the symbol selectors connected to the conductors 30*a* or 30*b*. The same is true of the valves of symbol selectors in any of the other groups of selectors which are not actively connected for energization of the symbol selectors in the normal manner.

I claim as my invention:

1. In changeable sign apparatus, the combination of: a symbol former having sections selectively energizable to form illuminated display characters; electrically actuated switches for respectively controlling said sections; a source of uni-directional electrical energy; control circuits for said switches extending from one side of said source of energy and including individual supply conductors; a plurality of symbol selectors, each having a first set of contacts connected respectively to said supply conductors and a second set of contacts having a common connection; means for pre-selecting in each symbol selector interconnections between its sets of contacts; valves associated with the pre-selected interconnections

for limiting current flow to one direction therethrough; and switching means for successively connecting the common connections for the symbol selectors to the other side of said source of energy for normal current flow, and while each is so connected, applying reversed voltage across valves associated with other symbol selectors.

2. In changeable sign apparatus, the combination of: a symbol former having a plurality of sections selectively illuminable to display characters; a source of electrical energy; means for controlling the illumination of said sections, each of said means having an operating coil connected on one side to said source of energy; individual supply conductors connected to the other sides of said coils; a plurality of symbol selectors connected with each of said conductors and having pre-selectable current flow paths therethrough from a common connection, valves in said paths for limiting current flow to one direction therethrough; switch means for successively connecting the common connections of the symbol selectors to said source of energy with the same polarity in each case; and means for applying a reversed polarity to the common connections of the symbol selector when unconnected by said switch.

3. In a changeable sign apparatus, the combination of: a symbol former having a plurality of sections selectively illuminable to display characters; a source of electrical energy; means for controlling the illumination of said sections, each of said means having an operating coil connected on one side to said source of energy; individual supply conductors connected to the other sides of said coils; a plurality of symbol selectors connected with each of said conductors and having pre-selectable current flow paths therethrough from a common connection, valves in said paths for limiting current flow to one direction therethrough; electric polarity reversing switches connecting the common connections of the symbol selectors to said source of energy; and means for successively energizing said switches.

4. In a changeable sign apparatus, the combination of: a symbol former having a plurality of sections selectively illuminable to display characters; a source of electrical energy; means for controlling the illumination of said sections, each of said means having an operating coil connected on one side to said source of energy; individual supply conductors connected to the other sides of said coils; a plurality of symbol selectors connected to each of said conductors and having pre-selectable current flow paths therethrough from a common connection with the other side of said source of energy; valves in said paths for limiting current flow to one direction therethrough; and switch means for successively reversing the polarity applied to said common connections by said source of energy.

5. In a changeable sign apparatus, the combination of: a symbol former having a plurality of sections selectively illuminable to display characters; a source of electrical energy; means for controlling the illumination of said sections, each of said means having an operating coil connected on one side to said source of energy; individual supply conductors connected to the other sides of said coils; a plurality of symbol selectors connected with each of said conductors and having pre-selectable current flow paths therethrough from a common connector; valves in said paths for limiting current flow to one direction therethrough; transfer switches having one position

normally connecting the common connectors to one side of said source of energy and another position connecting said common connectors to the other side of said source of energy; and means for actuating said switches from the one position to the other in timed sequence.

6. In a changeable sign apparatus, the combination of: a symbol former having a plurality of sections selectively illuminable to display characters; an energy source including a pair of rectifiers having a series interconnection; means for controlling the illumination of said sections, each of said means having an operating coil connected on one side to the interconnection of said rectifiers; individual supply conductors connected to the other side of said coils; a plurality of symbol selectors connected with each of said conductors and having pre-selectable current flow paths therethrough from a common connector; valves in said paths for limiting current flow to one direction therethrough; transfer switches having one position normally connecting the common connectors to one polarity of said source of energy and another position connecting said common connectors to another polarity of said source of energy; and means for selectively actuating said switches.

7. In combination with a changeable display sign having a plurality of devices selectively actuatable to control the form of the character displayed; a plurality of control conductors individually connected to said devices; a plurality of selectors, each connected with said control conductors and operable to pre-select current flow paths to one or more of said control conductors, from an energy source; valves in the flow paths of each selector permitting uni-directional current flow to said conductors; means for successively connecting the flow paths of each selector to the energy source for normal current flow; and means for subjecting valves of the selectors to reversed polarity during periods in which there is no normal current flow therethrough.

8. In an electrical device for connection with a source of electrical energy: a symbol former having a plurality of actuatable sections; control means for selecting said sections, each of said means having an operating coil adapted to be connected to one side of said source of energy; individual supply conductors connected to the other side of said coils; a plurality of symbol selectors connected with each of said conductors and having pre-selectable current flow paths therethrough from a common connection; valves in said paths for limiting current flow to one direction therethrough; and means for supplying inverse polarity to said valves.

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