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ELECTRONIC ANIMATED ADVERTISING SIGN SYSTEM

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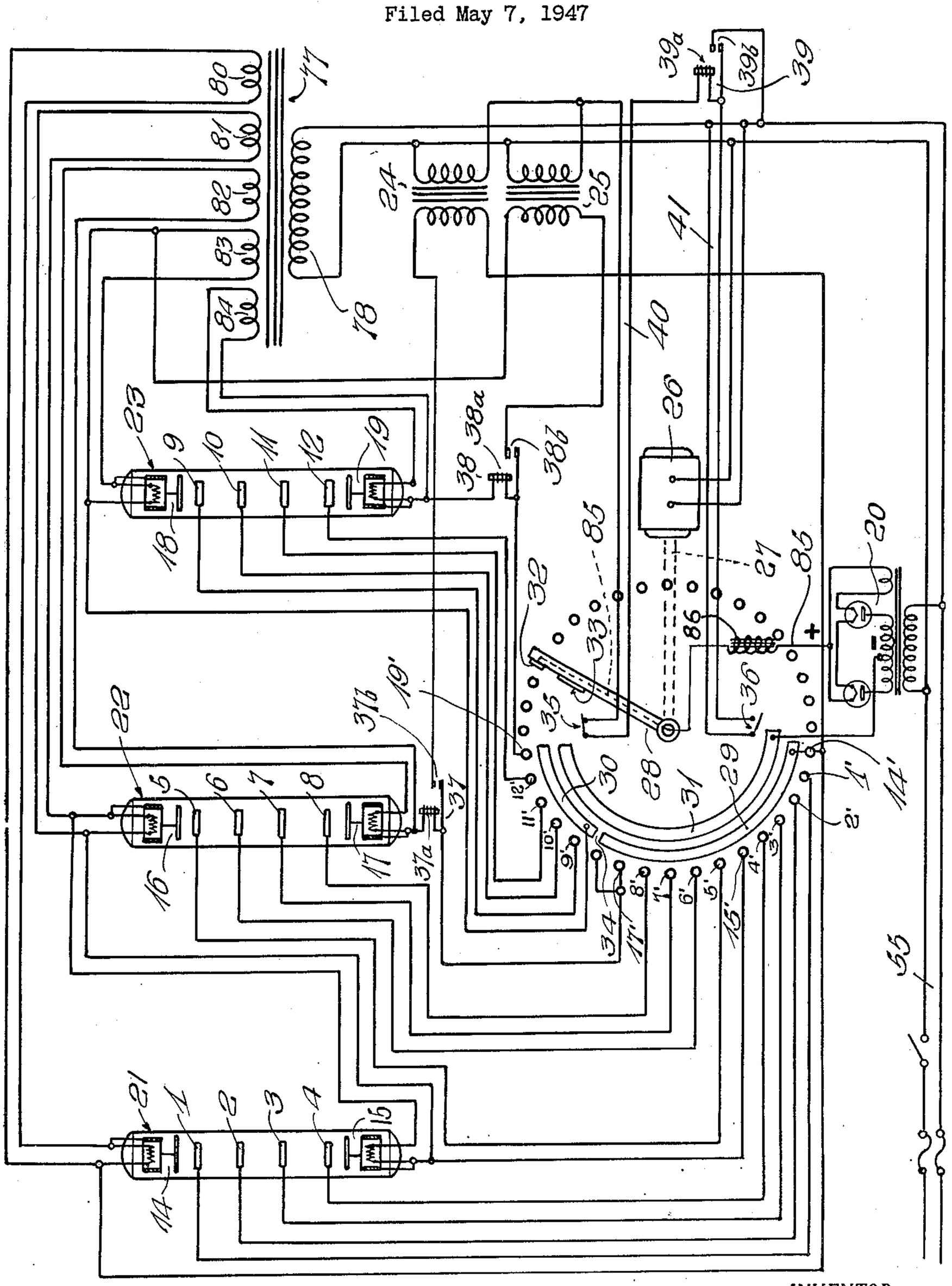

INVENTOR.

Richard H. Seaman,

BY

John B Brady

ATTORNEY

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ELECTRONIC ANIMATED ADVERTISING SIGN SYSTEM

Richard H. Seaman, Los Angeles, Calif., assignor to Mega Corporation, Los Angeles, Calif., a corporation of California

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My invention relates broadly to animated electronic discharge tube sign systems and more particularly to a circuit arrangement for an electronic discharge tube sign system employing composite pulse and alternating current excitation.

One of the objects of my invention is to provide a circuit arrangement for an electronic discharge animated sign system employing a multiplicity of coacting electronic discharge tubes with composite associated power supply circuits for furnishing direct current pulses to the tube circuits for effecting an animated operation of the circuit and supplying alternating current to the tube circuits for sustaining the discharge established through the tube system.

Another object of my invention is to provide a combined current pulse and alternating current excitation system for electronic discharge signs.

Another object of my invention is to provide an electronic discharge animated and writing sign system for operation from standard commercial alternating power and employing a multiplicity of electronic discharge tubes with minimum utilization of rectifying power for operation of the sign.

Another object of my invention is to provide a circuit arrangement for an animated or writing electronic discharge sign employing a multiplicity of coacting luminous discharge tubes including a power supply and distribution system for maintaining substantial uniform illumination during writing as well as burning operations.

A still further object of my invention is to provide a circular arrangement for an electronic discharge sign system employing a multiplicity of coacting electronic discharge tubes including starting means for exciting the tubes in direct current power supply pulses and sustaining means for exciting the electronic discharge tubes from alternating current in a manner insuring intense brilliancy of the tube systems.

Other and further objects of my invention reside in the composite direct current-alternating current animated electronic discharge sign system as set forth more fully in the specification herein after following by reference to the accompanying drawing which diagrammatically and schematically shows the system of my invention.

My invention is directed to a novel method of operation and a circuit arrangement for an animated sign in which repeated and cyclic writing effects are displayed. The novel method employed consists in the energization of the mechanism of coacting electronic discharge tubes in cyclic order by electrical currents of widely different characteristics. The system of my invention employs direct current pulses for starting the electronic discharge and alternating current for sustaining the discharge, that is, unidirectional current pulses are applied to electronic discharge tubes of symmetrical construction for starting the discharge, while bilateral current or commercial sinusoidal alternating current is applied to the symmertically constructed tubes during the running operation of the sign.

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Referring to the drawing in detail the coacting electronic discharge tube sections are represented at 21, 22 and 23. A composite cathode and anode electrode is mounted in each of the ends of each of the tubes as represented at 14 and 15 in tube 21; 16 and 17 in tube 22; and 18 and 19 in tube 23. A series of spaced anodes are arranged within each of the tubes as represented at 1, 2, 3 and 4 in tube 21; 5, 6, 7 and 8 in tube 22; and 9, 10, 11 and 12 in tube 23. Thus, a symmetrical construction and system of coacting tubes is provided.

The composite cathode and anode devices operate to facilitate the establishing of a growing luminous glow which progressively fills out all tube sections 21, 22 and 23, then quenches and repeats over and over again. The coacting tube system produces a continuous writing glow. The multiple sections 21, 22 and 23, etc., of the tubes are used to permit lower applied anode voltages to be employed and thereby comply with the Board of Fire Underwriters regulations. Sections 21 and 22 may be shorter than section 23 when they apply to letters which may be shorter in tube length than the letter represented by tube 23. That is to say the principles of my invention apply irrespective of the lengths of the tubes. The two sections 22 and 23 may be connected in electrical series, just as section 21 is in series with section 22. Section 23 is representative of a tube long enough to require a separate anode source.

The system is energized from the standard power source such as 60 cycle alternating current, indicated at 55. The full wave rectifier system 21 supplies rectified pulses to each of the electrodes of the several tubes for starting the writing or animation or design. The alternating current source for sections 21 and 22 is represented by the secondary winding of transformer 24. The secondary winding of transformer 25 constitutes the anode supply for tube section 23.

In order to selectively excite the electrodes of the several tubes I provide driving motor 26 which operates shaft 27 to drive switch arm 28 which rotates over the circular row of contacts 1'—12' and the intermediate contacts 14', 15', 17' and 19' and the segmental rings 29, 30 and 31 arranged in the path of contactors 32 and 33 car-

ried by arm 28. The tubes 21 and 22 are electrically connected in series while tube 23 is independent of tubes 21 and 22. The activation of the electrodes is effected by movement of the contactor 32 on switch arm 28 over the contacts 1'—12' and the intermediate contacts. The full wave rectifier system 20 is used in building up the glow in the respective tube sections 21, 22 and 23. This requires only one full wave rectified current supply system 20, even though a multiple number of tube sections 21, 22 and 23 are employed instead of a multiplicity of such supplies as normally required. The sustained activation secured by the operation of the tubes by the alternating current supply system insures the operation of the glow sign, so that it burns with as great a brilliancy as it writes.

To accomplish all these objects I provide a special rotary switch system or commutator for which 28 is the revolving arm on which 32 and 33 are metallic contactors carried thereby. Contactor 32 is electrically connected to the positive terminal of the full wave rectifier system 20 through a conductor 85 carried through insulated arm 28. Contactor 33 is carried on arm 28 and insulated from contactor 32 and serves the purpose of bridging electrically the metallic segments 29, 30 and 31 as the arm 28 moves over these segments. There is a break in the outer metallic segment 29 at 34. There are two switches 35 and 36 associated with the revolving contact mechanism. Switch 35 is normally closed when arm 28 does not go over it, while switch 36 is normally open when arm 28 does not go over it. There are also relays 37, 38 and 39 whose contacts are only closed when the respective associated relay coils 37*a*, 38*a* and 39*a* can carry current.

When arm 28 rests on contact 1' the contactor 32 establishing electrical connection therewith, the positive terminal of the full wave rectifier system 20 is connected to anode 1 of tube 21. The output circuit of rectifier system 20 is unfiltered but includes the conventional resistive reactance which I have designated at 86 and which is connected between the output of the rectifier system 20 and the arm 28, providing a load on the rectifier system from which pulses are supplied to the tube electrodes. Hence, a glow discharge occurs between the composite cathode and anode electrode 14 of tube 21 and anode 1. When arm 28 moves to contact point 2' the glow has grown to anode 2 of tube 21. Accordingly, when arm 28 has moved progressively or sequentially into position of contact point 15' the positive voltage of source 20 is applied to the composite cathode and anode electrode 15 of the tube 21 and the entire tube 21 glows along its entire length. In the same way as arm 28 moves progressively to contact 5', not only the entire tube 21 glows, but also tube 22 has started a glow from composite cathode and anode electrode 16 towards anode 5. As the arm 28 moves progressively to contact 6' the glow of tube 22 grows as far as the anode 6. When arm 28 moves further in a clockwise direction to cover contact 17' then the entire tube 22 glows. This means that glow exists over both full lengths of tubes 21 and 22.

By means of metallic contactor 33 on the arm 28 both segmental rings 29 and 31 are connected to the negative terminal of the full wave rectifier system 20 through contactor 33 and the composite cathode and anode 14 of tube 21 and 18 of tube 23 during a given portion of the writing cycle. The negative terminal of the rectifier system 20 is connected via contactor 33 and ring 31 to composite cathode and anode 14 in tube 21. The negative terminal of the rectifier system 20 is then applied through contactor 33 to segmental ring 30 to composite cathode and anode 18 of tube 23. Contactor 32 connects to contact 9' which charges anode 9 in tube 23 whereby glow appears between composite cathode and anode 18 and anode 9. When arm 28 has progressively moved over contact 19' the entire tube section 23 glows along its entire length. Hence, all three tube sections 21, 22 and 23 glow fully. When arm 28 leaves contact 19' it affects switch 35, opening switch 35 which turns the anode power off by opening circuit 40, because switch 35 opens the current supply to relay coil 39*a* and the contacts 39*b* of relay 39 open. Hence tubes 21, 22 and 23 can no longer glow.

But as soon as arm 28 passes switch 35, the switch 35 closes again, but contacts 39*b* of relay 39 remain open, due to the open switch 36. Therefore, tubes 21, 22 and 23 will not glow. The unnumbered contact points constitute rest points for revolving arm 28 and are swept by arm 28 without any effect until arm 28 hits switch 36 and closes switch 36. The time interval consumed by the movement of switch arm 28 over the blank contacts enhances the attractiveness of the display or growing column of light. Switch 36 controls circuit 41 which causes relay contacts 39*b* to close and the anode supply power is activated again. As arm 28 leaves switch 36, switch 36 will open again, but contacts 39*b* of relay 39 remain closed and the anode power stays on. Now there are other expedients and functions: When contact 17' is electrically contacted by contactor 32 on arm 28 and tubes 21 and 22 glow entirely, relay coil 37*a* becomes energized and closes contacts 37*b* of relay 37. This puts the secondary winding of A. C. power transformer 24 on tubes 21 and 22. Therefore, as arm 28 is just about to connect contact point 17' all of the anode power comes from the full wave rectifier supply source 20. But, after contact 17' is connected by arm 28 all of the anode power of tubes 21 and 22 comes from the secondary winding of transformer 24.

As arm 28 moves to contact 9', tubes 21 and 22 still run from the secondary winding of transformer 24, but tube 23 builds up by means of the rectified current supply system 20. Therefore, as arm 28 sweeps from contact 9' to contact 10', tube 23 still builds up from rectified supply 20, while tubes 21 and 22 are run by means of A. C. power from the secondary winding of transformer 24. When arm 28 moves to a position in which contactor 32 connects with contact 19' the winding 38*a* of relay 38 becomes energized. The contacts 38*b* of relay 38 close and the secondary winding of transformer 25 then supplies the alternating current power for the anodes of tube 23. After contactor 32 on arm 28 leaves contact 19 and relay 38 has closed circuit contact 38*b* transformer secondary 25 then energizes tube 23 and remains on for a desired time interval after which contact arm 28 strikes contact switch 35 and the sign goes out or turns off.

Source 20 is used only to build up to the condition of glow. The full glow per tube is sustained by the alternating current transformer supply. However, only one full wave rectifier 20 is needed for the multiplicity of tubes as shown. The alternating current for energizing the cathode portions of the composite cathodes and anodes 14—15—16—17—18—19 is supplied by trans-

former system 77 having primary winding 78 connected to the alternating current power supply system 55 and the multiple number of secondary windings 80—81—82—83 and 84, respectively, connected with the cathode portions of the composite cathodes and anodes 14—15—16—17—18 and 19.

The direct current pulse circuit constituted by the unfiltered rectifier system 20 furnishes power to the tube system for only a comparatively short period of time. In the example illustrated the tubes are powered by D. C. pulses for only a minor portion of the time during which the alternating current power is impressed upon the sign system. The sign system of my invention employs both the advantages of pulse excitation and the reversing operating of alternating current excitation of the several tubes. The reversing process obtained by the application of alternating current to the symmetrically arranged cathode and anode terminals means in each of the coacting tubes insures ionization of the tubes under conditions of such intensity that brilliancy of the discharge is secured. Because of the efficiency in securing ionization through the composite excitation method set forth herein the total power consumed for the given brilliancy of operation of the sign is substantially less than the power consumed in conventional neon signs.

The circuit arrangement of my invention is particularly desirable by reason of the requirement of but one rectifier system for excitation of a multiple number of discharge tubes. During the time interval that the tubes operate in a writing condition as single or unsymmetrical devices having electronic emissive ends conduction can only occur in one direction; therefore, direct current pulses of sufficient amplitude to energize the entire length of the tube are applied to each of the intermediate anode electrodes in sequential order. After conduction has taken place over the entire tube length, the relay system energized by the current drawn by the tubes operates in such manner that the relay system applies an alternating current of equal potential as the direct current pulses of the rectifier system to the electrodes of the electron discharge tubes.

No change in illumination occurs when the sign is switched from pulse excitation to ordinary alternating current excitation.

The installation of the sign of my invention is much simpler than the installation of conventional high potential neon signs. Moreover, the maintenance of the sign constructed in accordance with my invention and employing the method of operation herein set forth is much simpler and less expensive than maintenance required for conventional signs.

While I have described my invention in certain of its embodiments I realize that modifications in detail may be made and I intend no limitations upon my invention other than may be imposed by the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. In an animated electronic sign system, a multiplicity of coacting electron discharge tubes each including symmetrical terminal electrode arrangements formed by composite cathodes and anodes with a multiplicity of spaced anode electrodes disposed therebetween, a source of alternating current, a full wave rectifier system connected therewith, means for selectively and sequentially connecting said rectifier system with

the anodes of said composite cathodes and anodes and with said anode electrodes for starting the luminous discharge through said tubes, and cyclically disconnecting said rectifier system from the anodes of said composite cathodes and anodes and from said anode electrodes and connecting said source of alternating current with said composite cathodes and anodes for continuously exciting said anodes of said composite cathodes and anodes and said anode electrodes in cyclic progression.

2. In an animated electronic sign system, a multiplicity of coacting electron discharge tubes each including symmetrical terminal electrode arrangements formed by composite cathode and anode electrodes with a multiplicity of spaced anode electrodes disposed therebetween, a source of alternating current, a full wave rectifier system connected therewith, means for selectively and sequentially distributing direct current pulses from said rectifier system to said anode electrodes at a rate greater than the persistence of vision, and means controlled by the flow of electron current through said tubes for supplying alternating current to said composite cathode and anode electrodes for sustaining electronic discharge through said coacting tubes.

3. In an animated electronic sign system, a multiplicity of coacting electron discharge tubes each including symmetrical terminal electrode arrangements formed by composite cathode and anode electrodes with a multiplicity of spaced anode electrodes disposed therebetween, a source of alternating current, a full wave rectifier system connected therewith, means for selectively and sequentially distributing direct current pulses from said rectifier system to said tube electrodes at a rate greater than the persistence of vision and interrupting the supply of direct current pulses to said electrodes and means controlled by the flow of electron current through said tubes for substituting alternating current from said source for excitation of said composite cathode and anode electrodes for sustaining electronic discharge through said coacting electron discharge tubes.

4. In an animated electronic sign system, a multiplicity of coacting electron discharge tubes each including symmetrical terminal electrode arrangements formed by composite cathode and anode electrodes with a multiplicity of spaced anode electrodes disposed therebetween, a source of alternating current, means for exciting the cathodes of said composite cathode and anode electrodes from said source of alternating current, a full wave rectifier system connected with said source of alternating current. means for selectively and sequentially distributing direct current pulses from said rectifier system to said anode electrodes at a rate greater than the persistance of vision, means individual to certain of said tubes and controlled by the flow of electron current therethrough for cyclically interrupting the supply of alternating current to said composite cathode and anode electrodes.

5. In an animated electronic sign system, a multiplicity of coacting electron discharge tubes each including symmetrical terminal electrode arrangements formed by composite cathode and anode electrodes with a multiplicity of spaced anode electrodes disposed therebetween, a source of alternating current, means for exciting the cathodes of said composite cathode and anode electrodes from said source of alternating cur-

rent, a full wave rectifier system connected with said source of alternating current, means for selectively and sequentially connecting said rectifier system with said anode electrodes for operating said tubes unsymmetrically, and means controlled by the electronic current through said tubes and connected with said source of alternating current for operating said tubes selectively and sequentially symmetrically.

6. In an animated electronic sign system, a multiplicity of coacting electron discharge tubes each including symmetrical terminal electrode arrangements formed by composite cathode and anode electrodes with a multiplicity of spaced anode electrodes disposed therebetween, a source of alternating current, means for exciting the cathodes of said composite cathode and anode electrodes from said source of alternating current, a full wave rectifier system connected with said source of alternating current, means for selectively and sequentially applying unidirectional current to said anode electrodes from said rectifier system for starting the luminous discharge through said tubes, and means controlled by the electronic current through said tubes and for supplying sinusoidal alternating current to said composite cathode and anode electrodes during running operation of said sign system.

7. In an animated electronic sign system, a multiplicity of coacting electron discharge tubes each including symmetrical terminal electrode arrangements formed by composite cathode and anode electrodes with a multiplicity of spaced anode electrodes disposed therebetween, a source of bilateral current, means for exciting the cathodes of said composite cathode and anode electrodes from said source of bilateral current, a full wave rectifier system connected with said source of bilateral current means for selectively and sequentially applying unidirectional current to said anode electrodes from said rectifier system for starting the luminous discharge through said tubes, and means controlled by the electronic current through said tubes for applying bilateral current sequentially to said composite cathode and electrodes during the running operation of said tubes.

8. In an animated electronic sign system, a multiplicity of coacting electron discharge tubes each including symmetrical terminal electrode arrangements formed by composite cathode and anode electrodes with a multiplicity of spaced anode electrodes disposed therebetween, a source of alternating current, means for exciting the cathodes of said composite cathode and anode electrodes from said source of alternating current, a full wave rectifier system connected with said source of alternating current, a rotatable switch carrying contactors thereon, a multiplicity of contacts disposed in the path of the contactors on said switch and individually connected with the anode electrodes in said tubes, electrical connections from said full wave rectifier through said switch for applying direct current pulses from said rectifier to said electrodes in sequential order for establishing the electronic discharge through said tubes and electrical connections between said source of alternating current and said composite cathode and anode electrodes for applying alternating current to said composite cathode and anode electrodes in sequence during the running operation of said sign system under control of electron current established through said tubes.

9. In an animated electronic sign system, a multiplicity of coacting electron discharge tubes each including symmetrical terminal electrode arrangements formed by composite cathode and anode electrodes with a multiplicity of spaced anode electrodes disposed therebetween, a source of alternating current, means for exciting the cathodes of said composite cathode and anode electrodes from said source of alternating current, a full wave rectifier system connected with said source of alternating current, a rotatable switch carrying contactors thereon, a multiplicity of contacts disposed in the path of the contactors on said switch and individually connected with the anode electrodes in said tubes, electrical connections from said full wave rectifier through said switch for applying direct current pulses from said rectifier to said anode electrodes in sequential order, said rotatable switch operating to interrupt the supply of direct current pulses to said anode electrodes, and means controlled by the flow of electronic current through said tubes for establishing the supply of alternating current from said source of alternating current to said composite cathode and anode electrodes and sequentially controlling the progressive excitation of said composite cathode and anode electrodes from said alternating current source during the running operation of said sign system.

10. In an animated electronic sign system, a multiplicity of coacting electron discharge tubes each including symmetrical terminal electrode arrangements formed by composite cathode and anode electrodes with a multiplicity of spaced anode electrodes disposed therebetween, a source of alternating current, means for exciting the cathode of said composite cathode and anode electrodes from said source of alternating current, a full wave rectifier system connected with said source of alternating current, a rotatable switch arm having contactors thereon, a multiplicity of contacts arranged in the path of one of said contactors and electrically connected with the anode electrodes of said tubes, a set of segmental rings arranged adjacent said contacts in the path of one of the contactors carried by said switch arm, a pair of diametrically disposed on and off switches arranged in the path of said switch arm and actuated thereby, electrical connections from said rectifier system through said set of segmental rings for sequentially applying through the associated contactors direct current pulses upon said anode electrodes in succession, and means actuated by said on and off switches for cyclically interrupting the application of alternating current to said composite cathode and anode electrodes.

RICHARD H. SEAMAN.

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