March 9, 1937. A. F. HENNINGER, JR 2,073,062

ANIMATED FIGURE NEGATIVE GLOW DEVICE

Filed June 6, 1931

Fig. 1

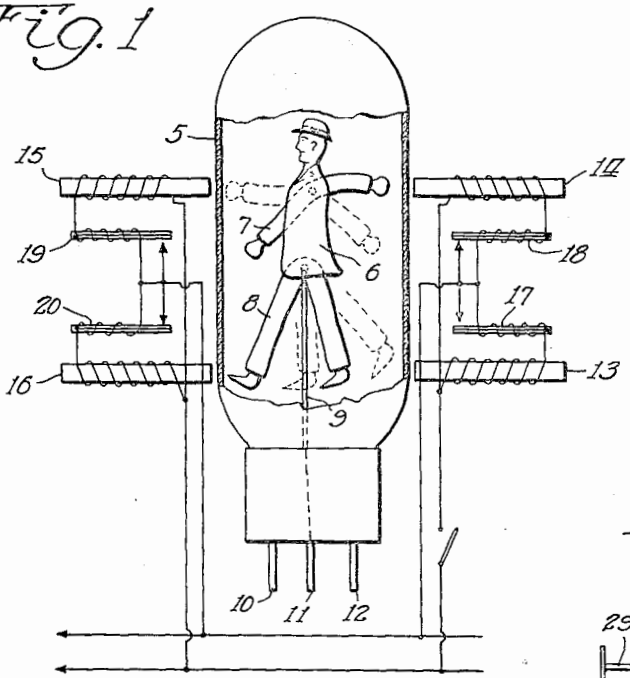


Fig. 4

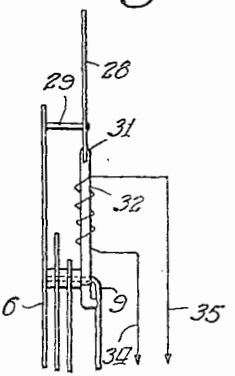


Fig. 2

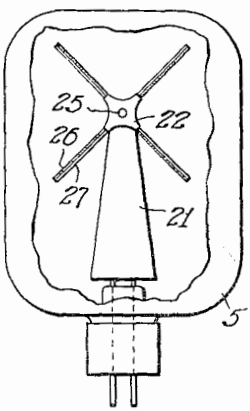


Fig. 3

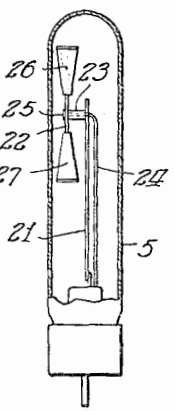
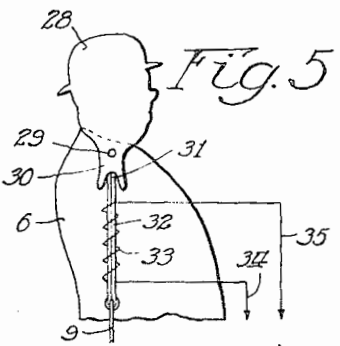


Fig. 5



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UNITED STATES PATENT OFFICE

2,073,062

ANIMATED FIGURE NEGATIVE GLOW DEVICE

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Application June 6, 1931, Serial No. 542,512

8 Claims. (Cl. 176—14)

My invention relates to negative glow devices embodying as a portion thereof an animated figure.

It is the principal purpose of this invention to provide a negative glow device in which the electrodes or at least two of them may be caused to change their relative positions while glowing to create an actual movement within the gas filled envelope.

It is also a purpose of this invention to provide a novel means for causing the relative motion which means may be set to cause a more or less rapid motion if desired.

Another specific purpose of the invention is to provide a device of this character in which the motion is due to an inherent part of the discharge which causes the glow of the electrode.

I will describe the preferred form of my invention by reference to the accompanying drawing wherein—

Fig. 1 is an illustration of a negative glow device in which the relative movement of the electrodes is accomplished by means exterior to the gas filled envelope;

Figs. 2 and 3 illustrate another form of the invention in which the relative motion is due directly to the discharge which causes the electrodes to glow; and

Figs. 4 and 5 illustrate a modification applied to the device shown in Fig. 1.

Referring now in detail to the drawing, the numeral 5 illustrates an evacuated envelope preferably filled with a suitable inert gas, such as neon, to the proper pressure for devices of this character. I find that the pressure between 10 and 20 millimeters of mercury with practically pure neon to be very satisfactory.

Within the tube 5 I provide a plurality of electrodes the electrode 6 being stationary while electrodes 7 and 8 are movable and pivoted to the stationary electrode 6. Suitable connections such as indicated at 9 may be employed for supplying current to the electrodes from the terminals 10, 11, and 12. These electrodes may be, of course, made to glow all together or to glow in rotation as for example in the disclosure of my prior application Serial No. 516,079, filed February 16, 1931, for Circuits for negative glow devices.

Electrodes 7 and 8 being pivoted may, of course, be operated to actually cause an appearance of motion, and, in order to do this, I employ a series of electro-magnets such as 13, 14, 15, and 16 which electro-magnets are capable of attracting the electrodes 7 and 8. It is understood that the electrodes 7 and 8 are made of a suitable material to permit them to be attracted or repelled by a magnetic force. These electro-magnets may be energized in succession or in any desired timed relation so as to cause the electrodes 7 and 8 to move back and forth between the dotted and full line position shown. As a means for causing this operation, I prefer to employ the system shown in Fig. 1 wherein each electro-magnet has associated therewith a thermostat such as the thermostats 17, 18, 19, and 20.

The operation of the device is as follows: Thermostats 17 and 19 are so timed as to operate together and thermostats 18 and 20 are timed to operate together. In the position shown, thermostats 18 and 20 have closed circuits for their respective magnets 14 and 16 due to their heating coils being heated up, and magnets 14 and 16 are therefore energized to attract the electrodes 7 and 8 to the full line position shown.

Now as these thermostats cool, the heating coils of thermostats 17 and 19 being connected in series with the electro-magnets 13 and 15 heat up their thermostatic elements and at the same time limit the current in the electro-magnets 13 and 15 to such an extent as to make them much weaker than 14 and 16 and therefore permit the attraction thus previously described. The cooling of elements 18 and 20 and the heating up of elements 17 and 19 soon causes a reversal of conditions to energize electrodes 13 and 15 by closing the contacts of thermostats 17 and 19 so that 13 and 15 tend to attract the electrodes 7 and 8 into the dotted line position shown. The cooling of elements 18 and 20 due to the fact that their heating coils have been short circuited causes the circuit to break at the contacts on 18 and 20 thus deenergizing magnets 14 and 16 and permitting the attraction of electrodes 7 and 8 into the dotted line position shown.

In Figs. 4 and 5, the head of the figure is shown as being separately movable with respect to the body. This head, indicated by the numeral 28, is supported from body 6 by means of pin 29 upon which the head is free to turn. A depending forked extension 30 on the head is engaged by the upper end 31 of a bimetallic thermostat element 32 similar to element 17. This element 32 is fixed to the supporting stem 9 of the body preferably at two points so as to make a rigid support for the thermostat. Heating coil 33 has one lead 34 connected in parallel with the lead to the thermostat of one of the coils of the electromagnets such for example as the lead from 14 to 18 so as to be heated when this magnet is energized. The other lead 35 may

be connected direct to the source of current supply. The periodic heating of thermostat 32 will cause it to bend in a well known manner, and this will cause the head 28 to swing about its pivot and thus nod while the feet and arms of the figure are caused to move by means of the electromagnetic devices.

It is obvious that various other means may be used for moving the electrodes, and it must be understood that these electrodes remain connected to their terminals in all positions.

Referring now to Figs. 2 and 3, in this case the envelope 5' has two electrodes 21 and 22, the electrode 22 being rotatably mounted on and insulated from electrode 21 by means of the bushing 23. The lead-in wire 24 for electrode 22 preferably makes a friction contact therewith on the surface as at 25 so as to maintain this element in circuit with its terminal at all times.

In order to cause element 22 to move relative to element 21 as indicated at 26, I preferably coat one side of the vanes of electrode 22 with an insulating or non-conducting material or a material having a much lower conductivity or electron affinity. The discharge then against the conducting side 27 of the vanes being much greater than the discharge to a non-conducting discharge will tend to rotate the electrode 22, and in fact experiment has shown that electrode 22 will be rotated in this fashion. Thus I have obtained a relative movement between the two glowing electrodes of a negative glow device wherein the cause of the relative movement is within the envelope instead of exterior thereto as in Fig. 1.

From the above description it is believed that the construction and operation of this device will be clear to those skilled in the art and the advantages thereof readily apparent.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. Means for creating an animated effect in negative glow devices comprising a gas filled envelope having therein a plurality of electrodes some of which are movable so constructed as to simulate a figure capable of motion, said electrodes having means for connection to a source of current supply whereby they may be caused to glow by passage of current therebetween, and means outside of said envelope for causing relative movement between the electrodes while they are glowing, said last named means including a plurality of opposed devices capable of attracting said movable electrodes, and mountings for said movable electrodes whereby they may move toward and away from said devices.

2. Means for creating an animated effect in negative glow devices comprising a gas filled envelope having therein a plurality of electrodes some of which are movable so constructed as to simulate a figure capable of motion, said electrodes having means for connection to a source of current supply whereby they may be caused to glow by passage of current therebetween, and means outside of said envelope for causing relative movement between the electrodes while they are glowing, said last named means including a plurality of electro-magnetic devices adapted to exert magnetic forces on said movable electrodes from different directions.

3. Means for creating an animated effect in negative glow devices comprising a gas filled envelope having therein a plurality of electrodes some of which are movable so constructed as to simulate a figure capable of motion, said electrodes having means for connection to a source of current supply whereby they may be caused to glow by passage of current therebetween, and means outside of said envelope for causing relative movement between the electrodes while they are glowing, said last named means including a plurality of electro-magnetic devices adapted to exert magnetic forces on said movable electrodes from different directions, and means for energizing said devices in a definite order.

4. Means for creating an animated effect in negative glow devices comprising a gas filled envelope, a plurality of electrodes therein, means supporting a portion of said electrode to permit relative movement thereof, an electromagnet positioned adjacent to said movable portion but outside of said envelope, a coil for said magnet, a source of current, a circuit for said coil including said source and switching means for opening and closing said circuit.

5. Means for creating an animated effect in negative glow devices comprising a gas filled envelope, a plurality of electrodes therein, means supporting a portion of said electrodes to permit relative movement thereof, an electromagnet positioned adjacent to said movable portion but outside of said envelope, a coil for said magnet, a source of current, a circuit for said coil including said source, and means for automatically and intermittently completing said circuit.

6. Means for creating an animated effect in negative glow devices comprising a gas filled envelope, a plurality of electrodes therein, means supporting a portion of said electrodes for relative movement therein, a coil of wire, a source of current, a circuit for said coil including said source, switching means for opening and closing said circuit, a bimetal warp member adjacent to said coil, and means controlled by said warp member for causing movement of said movable portion of said electrodes.

7. Means for creating an animated effect in negative glow devices comprising a gas filled envelope, a plurality of electrodes therein, means supporting one of said electrodes in fixed relation to said envelope, means pivotally supporting one of said electrodes to permit relative motion thereof, a source of current supply, electrical conductors joining said source to said electrodes, a coil of wire, a circuit for said coil including said source, and switching means for opening and closing said circuit, said coil being arranged so as to cause movement of said movable electrode upon completion of the circuit therethrough.

8. Means for creating an animated effect in negative glow devices comprising a gas filled envelope, a plurality of electrodes therein, means supporting a portion of said electrodes in fixed relation to said envelope, means supporting portions of said electrodes to permit relative movement thereof, a source of current supply, electrical conductors connecting said electrodes to said source, a magnetic coil, a circuit for said coil including said source, and switching means for opening and closing said circuit, said coil being arranged to produce motion of said pivotally supported portion of said electrodes upon completion of said circuit.

ANDREW F. HENNINGER, JR.