May 29, 1934. R. COMPARE 1,960,618

ELECTRICAL DISPLAY APPARATUS

Filed Aug. 13, 1932 2 Sheets-Sheet 1

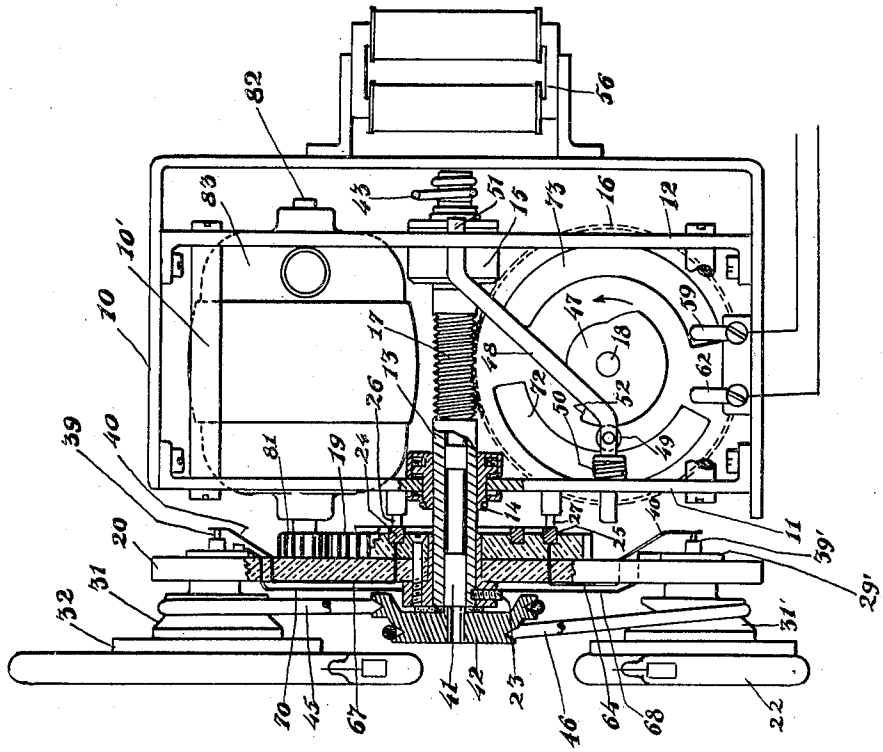


Fig. 2.

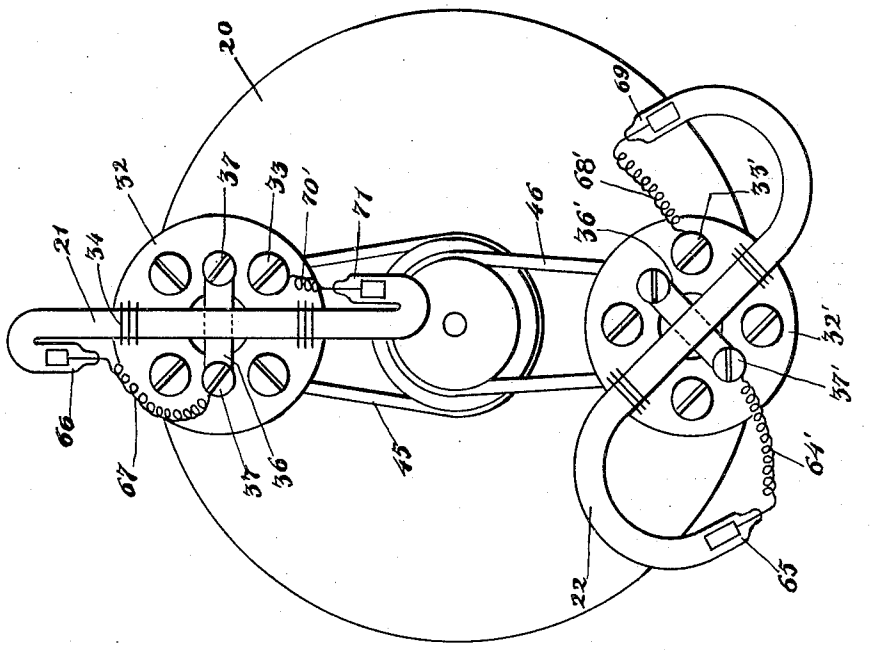


Fig. 1.

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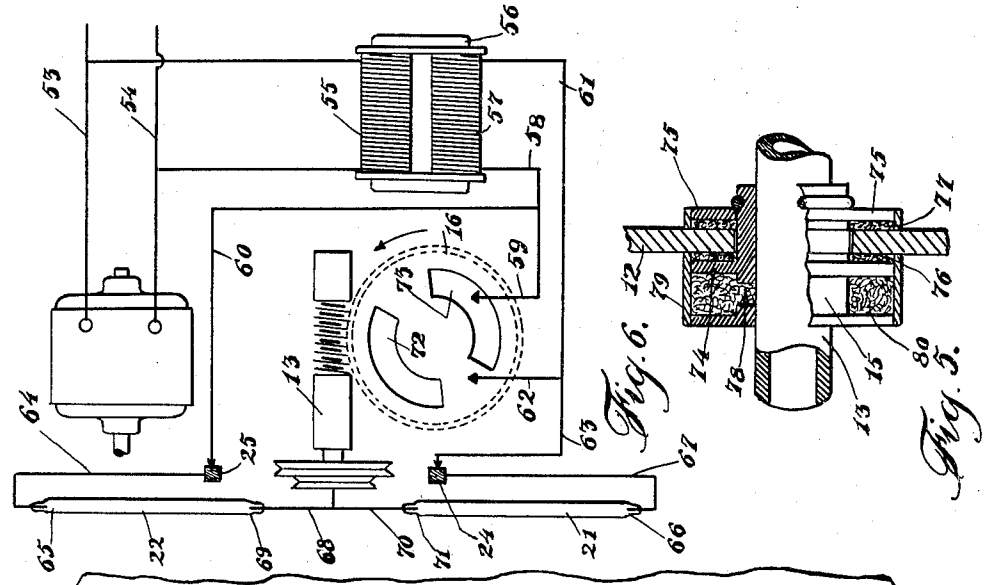


Fig. 6.

Fig. 5.

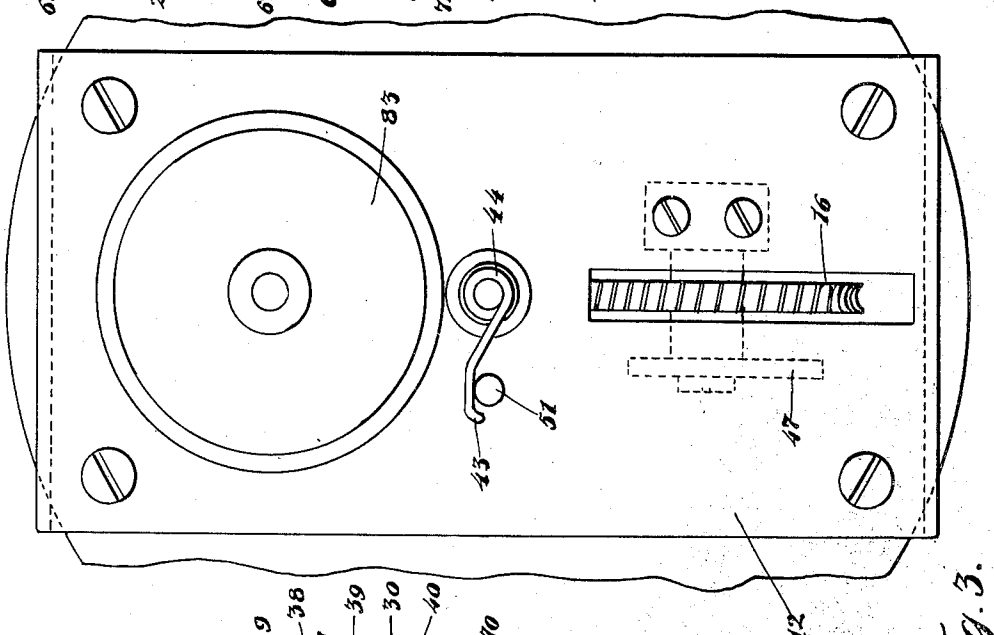


Fig. 3.

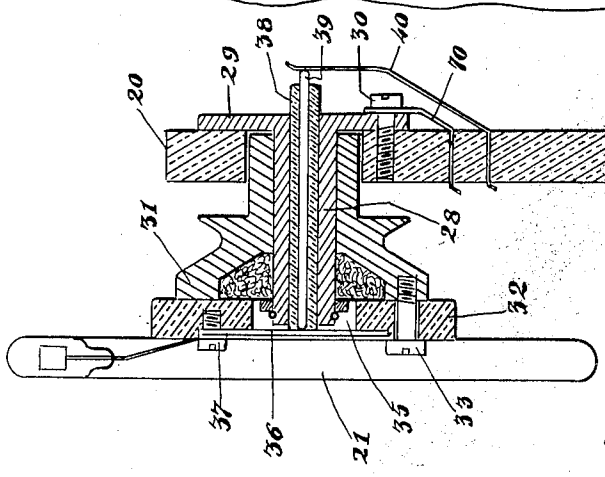


Fig. 4.

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UNITED STATES PATENT OFFICE

1,960,618

ELECTRICAL DISPLAY APPARATUS

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Application August 13, 1932, Serial No. 628,716

15 Claims. (Cl. 240—10.1)

This invention relates to electrical display apparatus and more particularly refers to improvements in that class of luminous display devices where electric light generating elements are caused to rotate, in order to produce novel and variegated display effects intended to attract the attention of passers-by.

In devices of this character it is customary to employ varicolored light generating means, in order to enhance the effectiveness of the resulting display. The luminous elements preferably consist of gas filled tubes, such as neon tubes, for instance, because the absence of the afterglow makes it possible to effect sharp changes in the display effects, due to the suddenness with which a tube can be lighted or extinguished. The color of the light generated by each tube is, of course, determined by the gas with which the tube is filled and/or by the color of the glass used in the manufacture of the tube itself.

The primary object of this invention is to provide an electrical display device of a relatively simple and compact construction, whereby it is possible to obtain novel and greatly improved luminous displays in a variety of movements and colors.

Another object is to provide, in a device of the character specified, a plurality of electric light generating elements mounted so as to be rotatable about a common axis, as well as about their individual axes, and means automatically causing said elements to at times rotate both about their common axis and their individual axes and at times only about their common axis.

A further object is to provide, in a device of the character specified, comprising a plurality of electric light generating elements mounted on a common rotating carrier, novel and improved means automatically causing said elements to be energized in a predetermined sequence, so as to generate light individually or collectively during the rotational movement of their common carrier.

Other objects and advantages of the present invention will more fully appear as the description proceeds and will be set forth and claimed in the appended claims.

My invention is illustrated by way of example in the accompanying drawings, in which

Fig. 1 is a front view of a device embodying my invention;

Fig. 2 is a side view in elevation of the same, partly in section;

Fig. 3 is a fragmentary rear view, in an enlarged scale, of the rear upright supporting the moving parts of the mechanism;

Fig. 4 is a sectional detail, illustrating the manner of mounting the luminous tubes on the carrier;

Fig. 5 is another detail, partly in section, illustrating the preferred way of mounting the main shaft bearings; and

Fig. 6 is a diagrammatic illustration of the circuit connections employed.

Referring to said drawings, 10 designates a frame to which are secured two spaced uprights 11, 12, on which are mounted the moving parts of the device, said uprights being connected and positioned with respect to each other by four tie-rods 10'. The moving parts comprise a main hollow shaft 13, mounted in bearings 14, 15, and a worm wheel 16 in mesh with a worm section 17, of said shaft, said worm wheel, which is carried by a shaft 18, being accordingly driven by shaft 13.

The front end of shaft 13 extends frontwardly of upright 11, and carries a driving element, such as gear 19, for instance, and a disk 20, on which are mounted electric light generating elements, such as, for instance, luminous tubes 21, 22.

Both gear 19 and disk 20 are made of insulating material and are mounted on a common metallic collar 23, fixed onto the front end of shaft 13. On the inner surface of gear 19 are mounted two concentric metallic rings 24, 25, respectively contacting with brushes 26, 27, forming therewith part of the electric circuit which will be later described.

Each electric light generating element, which in the present case, as stated, consists of a gas filled tube, is mounted on the disk 20 in the manner illustrated in Fig. 4. In the same it is seen that a hollow stud 28 is caused to project frontwardly of disk 20 by means of screws 30. A grooved pulley 31 is rotatably mounted upon said stud and carries an insulating disk 32 fixed onto its outer surface by means of screws 33, said insulating disk in its turn acting as a carrier for the luminous tube 21 or 22. The luminous tube may be secured onto disk 32 in any suitable manner, for instance, by means of wire staples 34.

Disk 32 has a central opening 35 across which extends a metal contact plate 36, fastened to the disk by means of screws 37. Through hollow stud 28 is inserted an insulating rod 38, having a central metallic core 39, one end of which is normally held against plate 36 by a metallic spring 40, pressing against its other end.

Through hollow shaft 13 is inserted another idle shaft 41, both ends of which project beyond shaft 13, the front end carrying a multiple grooved pulley 42 and the rear end carrying a stop finger 43, which is preferably constituted by the free end of a coil spring 44, wound about the rear end of shaft 41.

In the case illustrated, pulley 42 is a double pulley operatively connected by belts 45, 46 to tube carrying pulleys 31, 31', respectively; it being understood, however, that the number of pulley carrying tubes carried by disk 20 is entirely arbitrary and that pulley 42 may have a greater or lesser number of grooves than that shown, as the case may be.

Under normal conditions when shaft 13 is rotated, shaft 41 will rotate with it and, therefore, luminous tubes 21, 22 will merely be carried around by disk 20 and will generate luminous circular bands concentric with shaft 13. If, however, shaft 41, and with it pulley 42, is prevented from rotating, while shaft 13 together with carrier disk 20 continues to rotate, belts 45, 46 will cause pulleys 31, 31', respectively, to rotate about their axes, so that the luminous tubes will now rotate about their own axes, as well as about the axis of shaft 13.

Means are provided whereby shaft 41 is alternatively permitted to rotate together with shaft 13 and prevented from doing so, said means cooperating with finger 43 when shaft 41 is to be restrained against rotation. Said means comprise a cam 47, fixed on shaft 18, and a shiftable stop bar 48, having a roller 49 bearing against cam 47, due to the action of a spring 50, normally urging said stop bar towards the rear of the frame.

Stop bar 48 is shiftably mounted in uprights 11, 12, so that when cam 47 retains it in its inoperative position, shown in Fig. 2, its rear end 51 clears finger 43, whereas when during rotation of shaft 18, in the counterclockwise direction indicated by the arrow, step 52 of the cam has passed beyond roller 49, spring 50 will force stop bar 48 rearwardly to a position where its rear end 51 will project directly in the path of finger 43. When this happens, shaft 41 will be restrained against rotation and the luminous tube will acquire a planetary in place of their former simple rotatory movement. As the rotation of cam 47 continues, stop bar 48 will be gradually forced back to its inoperative position shown, and shaft 41 will once more become free to follow the rotation of shaft 13.

It is obvious that due to the alternate changes in the rotatory movements of the luminous tubes and due to the fact that the tubes may be caused to generate lights of different colors and in different outlines, as shown, it is possible to obtain various striking and unique effects. The variety of these effects can be further increased by suitably controlling the electric circuit or circuits of which the luminous tubes form a part.

For instance, by means of a simple arrangement, it is possible to cause the two tubes shown to be energized singly or collectively in a predetermined sequence. Referring to the diagram of Fig. 6, 53, 54 represent the main electric supply lines, to which is connected the primary 55 of a transformer 56, said transformer being shown in Fig. 2 as being carried by frame 10. From the secondary coil 57 of the transformer one wire 58 leads to a brush 59 and to contact ring 25 through wire 60, the other wire 61 leads to a brush 62 and to contact ring 24, through branch wire 63. Contact ring 25 is connected by wire 64 to one of the terminals 65 of tube 22, while terminal 66 of tube 21 is connected by wire 67 to contact ring 24. The circuit is completed by a wire 68, leading from terminal 69 of tube 22 to the main shaft 13, and by another wire 70 also leading from terminal 71 to tube 21 to shaft 13, wires 68, 70 being adapted to form a series connection between the two tubes.

The circuit may either be completed through both tubes and through both contact rings, or through one or the other tube and corresponding contact ring, shaft 13, worm wheel 16 and one or the other of brushes 59, 62.

To this end, worm wheel 16 is provided with two segmental openings 72, 73, adapted to register with brushes 59, 62 during the rotation of worm wheel 16. When one or the other of said brushes is in actual contact with the worm wheel, the electric circuit is completed therethrough, whereas when both brushes are out of contact with worm wheel 16, due to one of the segmental openings 72, 73 being opposite thereto, the circuit is completed exclusively through both contact rings, and when this happens, both tubes will be energized. For instance, in the position shown in diagram of Fig. 6, the circuit from the secondary of the transformer can be traced through wire 58, wire 60, contact ring 25, wire 64, tube 22, wire 68, shaft 13, wheel 16, brush 62 and back through wire 61; tube 21 is short-circuited and will not be energized. After a while, as the rotation of worm wheel 16 in the counterclockwise direction indicated by the arrow continues, opening 72 will cut off brush 62 from the circuit, while brush 59 still continues to be cut off by opening 73. The current will then return through wire 70, tube 21, wire 67, contact ring 24 and wires 63, 61, so that both tubes will be energized. The rotation of worm wheel 16 continuing, brush 59 will eventually come in direct contact with wheel 16, while brush 62 will still continue to be cut off by opening 72.

The circuit can then be traced through wires 61, 63, contact ring 24 and wire 67, tube 21, wire 70, shaft 13, wheel 16 and back through brush 59 and wire 58; tube 22 will now, therefore, be short-circuited and only tube 21 will be energized.

In practice, the electrical connections to and from the rotating tubes are made in the manner illustrated in Fig. 2. In the same it will be seen that a wire 67 leads from contact ring 24 through gear 19 and disk 20, and then extends in a substantially radial direction along the outer surface of disk 20 and then it once more crosses disk 20 and reaches to contact spring 40, the free end of which presses against the rear end of metallic bar 39. This in turn presses against plate 36 of disk 32. The wire 67' leads from one of screws 37 to terminal 66 of tube 21, and another wire 70' leads from terminal 71 of said tube to one of screws 33, connecting disk 32 to pulley 31. This establishes a continuous circuit between contact ring 24 and stud 28, because pulley 31 is mounted directly upon said stud. Wire 70 then leads from one of the screws 30, securing flange 29 of stud 28 onto the rear surface of disk 20, to collar 23, establishing an individual return circuit for tube 21 through shaft 13 and worm wheel 16.

In a similar manner, wire 68 leads from collar 23 to the rear of flange 29' forming part of the stud supporting pulley 31', and wire 68' (see Fig. 1) leads from one of the screws 33', fastening disk 32' onto pulley 31', to terminal 69 of tube

22. This other circuit is then completed by a wire 64' connecting terminal 65 of tube 22 to one of screws 37', securing contact plate 36' onto disk 32'. From there the current reaches contact rod 39', contact spring 40', and through wire 64 contact ring 25.

It is thus seen that by virtue of this arrangement, practically no sliding contacts are employed except between brushes 26, 27, and contact rings 24, 25, respectively, where there is ample surface available for a good intimate contact to prevent the possibility of arcing. Contact bars 39, 39', as shown, bear directly against the center of contact plates 36, 36' and, therefore, make therewith what virtually amounts to a stationary contact.

In order to avoid the necessity of building the device with extreme precision and the consequent high cost, I prefer to allow for some play in the mounting of the main shaft, without interfering with the reliability and continuity of operation of the mechanism.

I attain this end by mounting the main shaft 13 in bearings 14, 15 of the type shown in Fig. 5. In the same it will be seen that the body of the bearing proper is provided with a flange 74 and is retained in position by a washer 75, the distance between the inner surfaces of said flange and washer being greater than the thickness of the upright on which the bearing is mounted. This accordingly makes it possible to insert in the clearance spaces between the inner surface of flange 74 and washer 75, respectively, and the opposite surfaces of the upright, resilient washers 76, 77, made of felt or other suitable material, which allow both for a slight thrust displacement of the main shaft and a slight tilting movement about its points of support.

Incidentally, such an arrangement is also to be advocated from the standpoint of noiselessness and flexibility in operation.

Each bearing is also provided with an annular space communicating with shaft opening through passage 78, said annular space being normally closed by a split ring 79 and containing waste or other suitable material 80, impregnated with some suitable lubricating agent. Such an arrangement makes for automatic and continuous lubrication of the main shaft and reduces to a minimum the necessity of oiling and inspection.

Although the main shaft can be driven by means of a pulley or any other suitable means, I prefer to use a gear 19, as shown, because this makes it possible to adopt a direct drive therefor, by means of a pinion 81, mounted on shaft 82 of an electric motor 83 directly secured on the same frame 10, which carries the other parts of the mechanism.

In this manner I achieve an extremely compact construction, complete in unit form, relatively light in weight and low in cost. The motor can, of course, be energized by the same main wires 53, 54, supplying current to the primary of the transformer, as shown in Fig. 6.

It will be observed that by means of a mechanism of extreme simplicity, I am able to produce a great variety of display effects, which can be changed at will merely by altering the outline and character of the luminous tubes mounted on disks 32, 32'. It will also be seen that all the parts of the mechanism, as well as the various contacts distributed along the electric circuit, are entirely accessible at all times, so that inspections and repairs can be easily and quickly made.

While, in its preferred form, my display apparatus is of the luminous type, it is within the scope of my invention to use white or colored non-luminous display elements, together with, or instead of, the gas filled tubes or other suitable electric light generating means mentioned in the course of this description. Non-luminous rotatable display elements can be quite effective if used in conjunction with daylight displays and it is, therefore, also possible to use vividly colored gas filled tubes without energizing them in day time and energizing them at night.

It will be understood that openings 72, 73 are provided in wheel 16 for the purpose of at times shunting off one or the other light generating element from the main circuit, and that it is within the scope of my invention to provide recesses instead of through openings, or to fill the openings or recesses with insulating material, in order to produce an even side surface in the gear wheel. The term "openings" used in some of the claims should, therefore, be interpreted as covering all obviously alternative arrangements which can be used for the purpose specified.

It is obvious that the constructional details of my device can vary to a certain extent from those shown without departure from the inventive idea; the drawings, therefore, should be understood as being intended for illustrative purposes only and not in a limiting sense. I, accordingly, reserve the right to carry my invention into practice in all those ways and manners which may enter, fairly, into the scope of the appended claims.

I claim:

1. In a device of the character described, comprising a frame, a carrier rotatably mounted thereon, a display element rotatably mounted on said carrier eccentrically of the axis of rotation thereof. means for rotating said carrier, and means cooperating with said carrier for rotating said display element about its own axis simultaneously with said carrier, of means for at times rendering said display element rotating means inoperative, so as to terminate the movement of rotation of said display element about its axis for relatively prolonged periods, while said carrier continues to rotate about its own axis.

2. In a device of the character described, comprising a frame, a carrier rotatably mounted thereon, a display element rotatably mounted on said carrier eccentrically of the axis of rotation thereof, means for rotating said carrier, and means cooperating with said carrier for rotating said display element about its own axis simultaneously with said carrier, of means operatively associated with said carrier for at times rendering said display element rotating means inoperative, so as to terminate the movement of rotation of said display element about its axis for relatively prolonged periods, while said carrier continues to rotate about its own axis.

3. In a device of the character described, a frame, a carrier rotatably mounted thereon, an electric light generating display element rotatably mounted on said carrier eccentrically of the axis of rotation thereof, means for rotating said carrier, means cooperating with said carrier for rotating said display element about its own axis simultaneously with said carrier, and means for at times rendering said display element rotating means inoperative, so as to terminate the movement of rotation of said display element about its axis for relatively prolonged periods, while said carrier continues to rotate about its own axis.

4. In a device of the character described, a frame, a hollow shaft rotatably mounted there-

on, a carrier mounted on said shaft to rotate therewith, a display element rotatably mounted on said carrier eccentrically of said shaft, an idle shaft inserted through said hollow shaft, a driving element for said display element carried by said idle shaft, and means for at times restraining said idle shaft from sharing the rotation of said hollow shaft for relatively prolonged periods, causing the driving element carried thereby to cooperate with the rotating carrier in rotating said display element about its own axis.

5. In a device of the character described, a frame, a hollow shaft rotatably mounted thereon, a carrier mounted on said shaft to rotate therewith, a display element rotatably mounted on said carrier eccentrically of said shaft, an idle shaft inserted through said hollow shaft, a driving element for said display element carried by said idle shaft, and means operatively associated with said hollow shaft for at times restraining said idle shaft from sharing rotation of said hollow shaft for relatively prolonged periods, causing the driving element carried thereby to cooperate with the rotating carrier in rotating said display element about its own axis.

6. In a device of the character described, a frame, a hollow shaft rotatably mounted thereon, a carrier mounted on said shaft to rotate therewith, a display element rotatably mounted on said carrier eccentrically of said shaft, an idle shaft inserted through said hollow shaft, a driving element for said display element carried by said idle shaft, and cam controlled means operatively associated with said hollow shaft for at times restraining said idle shaft from sharing the rotation of said hollow shaft, causing the driving element carried thereby to cooperate with the rotating carrier in rotating said display element about its own axis.

7. In a device of the character described, a frame, a carrier rotatably mounted thereon, a plurality of electric light generating display elements rotatably mounted on said carrier eccentrically of the axis of rotation thereof, means for rotating said carrier, means cooperating with said carrier for rotating said display elements about their own axes simultaneously with said carrier, means for at times rendering said display element rotating means inoperative, so as to terminate the movement of rotation of said display elements about their respective axes for relatively prolonged periods, while said carrier continues to rotate about its own axis, and means operatively associated with said carrier, controlling the electrical operation of said light generating elements.

8. In a device of the character described, a frame, a carrier rotatably mounted thereon, a plurality of electric light generating display elements rotatably mounted on said carrier eccentrically of the axis of rotation thereof, means for rotating said carrier, means cooperating with said carrier for rotating said display elements about their own axes simultaneously with said carrier, means for at times rendering said display element rotating means inoperative, so as to terminate the movement of rotation of said display elements about their respective axes, while said carrier continues to rotate about its own axis, and means operatively associated with said carrier, controlling the electrical operation of said light generating elements, so as to cause said elements to be at times collectively, and at other times individually energized, in a predetermined sequence.

9. In a device of the character described, a frame, a hollow shaft rotatably mounted thereon, a carrier mounted on said shaft to rotate therewith, a plurality of electric light generating display elements rotatably mounted on said carrier eccentrically of said shaft, an idle shaft inserted through said hollow shaft, a driving element for said display elements carried by said idle shaft, means operatively associated with said hollow shaft for at times restraining said idle shaft from sharing the rotation of said hollow shaft, causing the driving element carried thereby to cooperate with the rotating carrier in rotating said display elements about their respective axes, and means operatively associated with said hollow shaft, controlling the electrical operation of said light generating means.

10. In a device of the character described, a frame,a hollow shaft rotatably mounted thereon, a carrier mounted on said shaft to rotate therewith, a plurality of electric light generating display elements rotatably mounted on said carrier eccentrically of said shaft, an idle shaft inserted through said hollow shaft, a driving element for said display elements carried by said idle shaft, means adapted to restrain said idle shaft from sharing the rotation of said hollow shaft, so as to cause the driving element carried thereby to cooperate with the rotating carrier in rotating said display elements about their respective axes, and a rotatable member, operatively associated with said hollow shaft, controlling the operation of said idle shaft restraining means, and controlling the electrical operation of said light generating means.

11. In a device of the character described, a frame, a carrier rotatably mounted thereon, a plurality of electric light generating display elements rotatably mounted on said carrier eccentrically of the axis of rotation thereof, means for rotating said carrier, means cooperating with said carrier for rotating said display elements about their own axes simultaneously with said carrier, means for at times rendering said display element rotating means inoperative, so as to terminate the movement of rotation of said display elements about their respective axes, while said carrier continues to rotate about its own axis, a rotatable member, operatively associated with said carrier, controlling the operation of said means for rendering the display element rotating means inoperative, said rotatable member forming part of the circuit of said display elements and being provided with openings, and contact members, also forming part of said circuit, normally resting against the surface of said rotatable member in the path of said openings, cooperating therewith in producing predetermined changes in the flow of current through said circuit during the rotation of said rotatable member, so as to produce corresponding variations in the energization of said light generating means.

12. In a device of the character described, a frame, a carrier rotatably mounted thereon, a plurality of electric light generating display elements rotatably mounted on said carrier eccentrically of the axis of rotation thereof, means for rotating said carrier, means cooperating with said carrier for rotating said display elements about their own axes simultaneously with said carrier, means for at times rendering said display element rotating means inoperative, so as to terminate the movement of rotation of said display elements about their respective axes, while said carrier continues to rotate about its

own axis, an electric circuit connecting in series said display elements, and means operatively associated with said carrier, for at times shunting off said circuit one or another of said display elements, so as to alter the display effects produced by said device.

13. In a device of the character described, a frame, a carrier rotatably mounted thereon, a plurality of electric light generating display elements rotatably mounted on said carrier eccentrically of the axis of rotation thereof, means for rotating said carrier, means cooperating with said carrier for rotating said display elements about their own axes simultaneously with said carrier, means for at times rendering said display element rotating means inoperative, so as to terminate the movement of rotation of said display elements about their respective axes, while said carrier continues to rotate about its own axis, an electric circuit connecting in series said display elements, a shunt circuit associated with said series circuit, a rotatable member, operatively associated with said carrier, controlling the operation of said means for rendering the display element rotating means inoperative, said rotatable member forming part of said shunt circuit and being provided with openings, and contact members, also forming part of said shunt circuit, normally resting against the surface of said rotatable member in the path of said openings, cooperating therewith in at times shunting off said series circuit one or another of said display elements, so as to alter the display effects produced by said device.

14. In a device of the character described, comprising a frame, a carrier rotatably mounted thereon, a support rotatably mounted on said carrier eccentrically of the axis of rotation thereof, and an electric light generating element fixed on said support, of means for conveying current to said light generating element, comprising a contact plate carried by said support, a contact bar coaxial with and slidable within said support, adapted to bear against said contact plate, and spring means normally urging said contact bar against said contact plate.

15. In a device of the character described, a frame, a hollow shaft rotatably mounted thereon, a carrier mounted on said shaft to rotate therewith, a plurality of electric light generating display elements rotatably mounted on said carrier eccentrically of said shaft, an idle shaft inserted through said hollow shaft, a driving element for said display elements carried by said idle shaft, means operatively associated with said hollow shaft for at times restraining said idle shaft from sharing the rotation of said hollow shaft, causing the driving element carried thereby to cooperate with the rotating carrier in rotating said display elements about their respective axes, means operatively associated with said hollow shaft, controlling the electrical operation of said light generating means, a gear wheel actuating said hollow shaft and carrier, and an electric motor, comprising a pinion directly meshing with, and driving said gear, also mounted in said frame.

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