Oct. 10, 1961 I. GOLDMAN 3,003,305

CLOCK

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Fig. 1

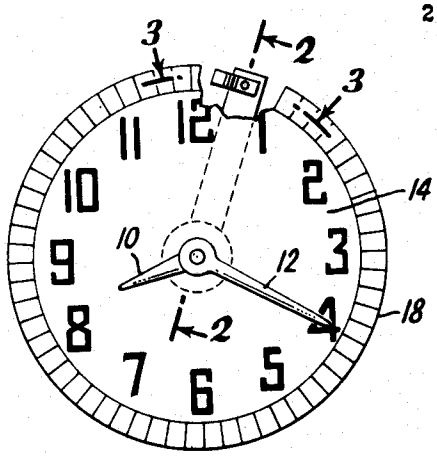

Fig. 2

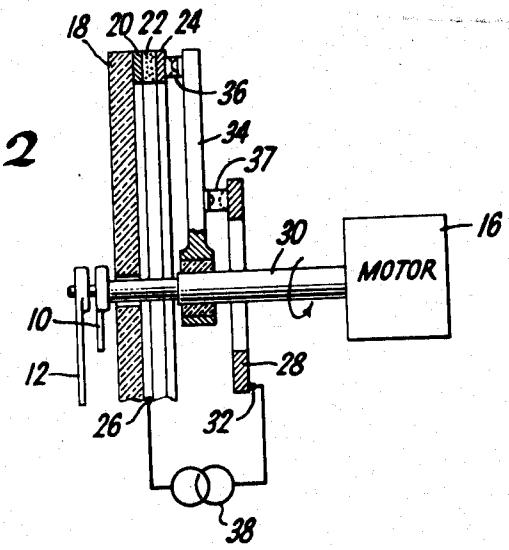

Fig. 3

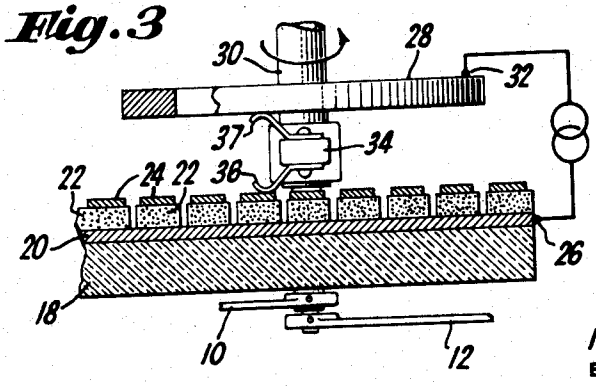

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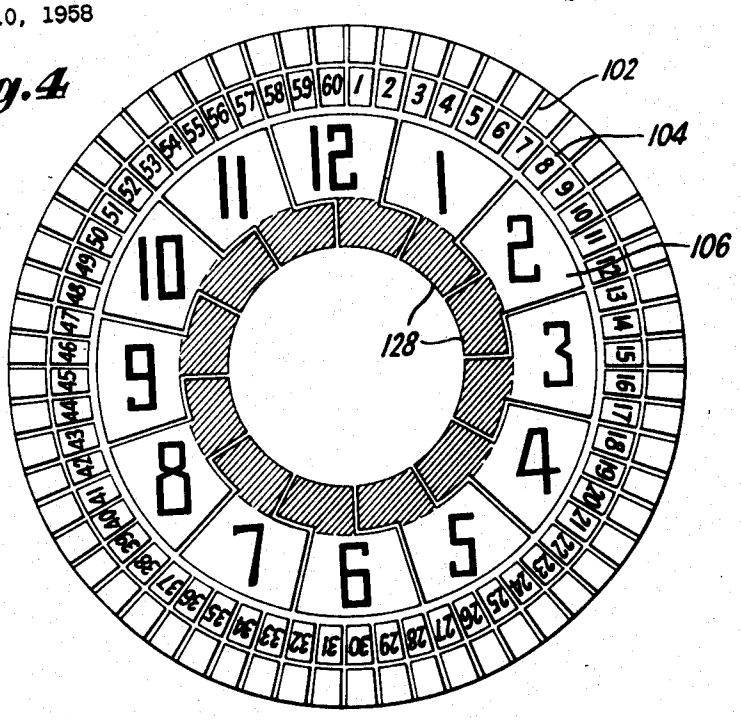
Fig. 4



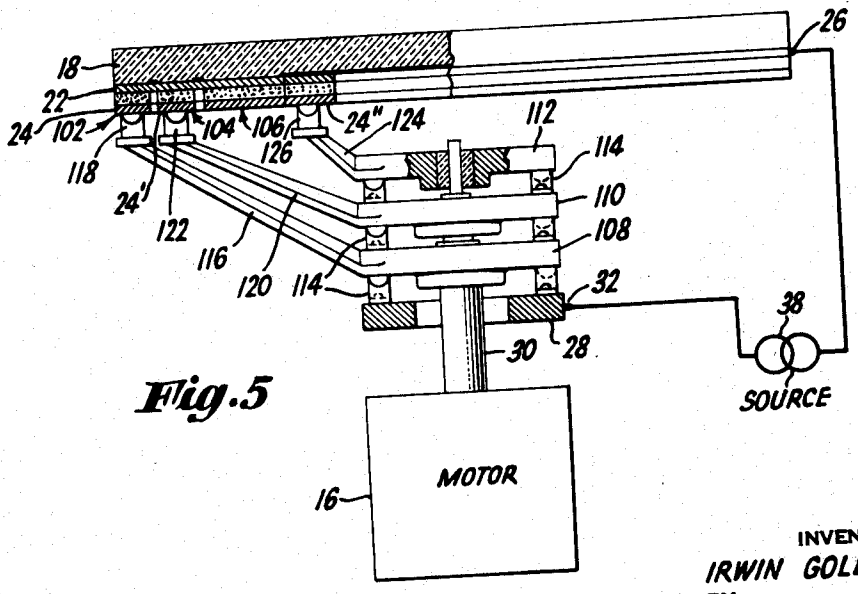


Fig. 5

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CLOCK

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Filed July 10, 1958, Ser. No. 747,668
3 Claims. (Cl. 58—50)

My invention is directed toward timepieces and more particularly is directed toward clocks.

It is an object of my invention to provide a new type of clock employing a plurality of electroluminescent lamps.

Another object is to provide a new type of clock wherein the passage of time is displayed as flashes of light.

Still another object is to provide a new direct reading numerical clock.

An electroluminescent lamp comprises first and second spaced apart electrodes and an electroluminescent layer interposed between and electrically connected to the electrodes. The first electrode (or both electrodes) permits the passage of light therethrough. The lamp is energized by applying a voltage between the electrodes, the light thus produced passing through the appropriate electrode or electrodes.

In accordance with my invention, I provide a clock face having at least one annular section. A plurality of electroluminescent lamps are secured to the clock face at corresponding discrete equidistantly spaced positions along the annular section. The first electrodes of all the lamps are connected together to a first terminal. A communtator rotating at a predetermined speed about an axis perpendicular to the clock face successively connects each second electrode in turn to a second terminal. A voltage is applied between the first and second terminals. Consequently, as the commutator rotates, each electroluminescent lamp in turn is successively lit and extinguished.

By using an appropriate number of lamps and appropriately adjusting the speed of rotation, the passage of time at fixed intervals can be indicated as flashes of light. For example, when sixty lamps are used and the commutator speed is adjusted to one revolution per minute or hour, the corresponding time intervals will be one second or one minute respectively. Further, when twelve lamps are used and the commutator speed is adjusted to one revolution per twelve hour period, the time interval will be one hour.

Consequently, by employing a clock face with first, second, and third concentric annular sections having respectively sixty, sixty and twelve equidistantly spaced electroluminescent lamps, and further by employing first, second and third commutators rotating at corresponding speeds of one revolution per minute, one revolution per hour and one twelfth revolution per hour respectively, the passage of time can be indicated in seconds, minutes and hours simultaneously.

Further, the lamps can be so constructed that the patterns of the light emitted will define the numbers, thus producing a direct reading numerical clock.

Illustrative embodiments of my invention will now be described with reference to the accompanying drawings wherein

FIG. 1 is a front view of one embodiment of my invention;

FIG. 2 is a sectional view taken along 2—2 in FIG. 1;

FIG. 3 is another sectional view taken along 3—3 in FIG. 1;

FIG. 4 is a front view of a second embodiment of my invention; and

FIG. 5 is a cross sectional view of the embodiment of FIG. 4.

Referring now to FIGS. 1, 2 and 3, there is shown an electric clock wherein an hour hand **10** and a minute hand **12** are rotated with respect to the clock face **14** in conventional manner by a 110 volt, 60 cycle synchronous motor **16**.

The clock face **14** includes an annular section comprising a glass ring **18**; a transparent electrically conductive ring shaped coating **20**; an electroluminescent phosphor layer, which can be continuous but, in this example, is constituted by sixty discretely spaced layer elements **22** defining a circle; and sixty discretely spaced electrodes **24**, each electrode being placed over a corresponding layer element **22**. The structure consisting of electrodes **24**, layer elements **22** and coating **20** (which constitutes a common electrode) thus forms a plurality of electroluminescent lamps, in this example sixty lamps.

The purpose of these lamps is to indicate the passage of time at one second intervals as flashes of light. To this end, coating **20** is connected to a first terminal **26**. An electrically conductive ring **28** is insulatedly mounted about the shaft **30** of motor **16** and further is electrically connected to a second terminal **32**. An electrically conductive arm **34** insulatedly secured to shaft **30** and driven thereby as a "second" hand, rotates brush **36** in a circular path at a rate of one revolution per minute. Brush **36** through arm **34** and brush **37** is in continuous contact with ring **28** and further successively contacts each electrode **24** in turn.

Hence, when a suitable voltage is applied between terminals **26** and **32** by source **38**, each lamp will be lit momentarily and then extinguished in the manner previously described.

Referring now to FIGS. 4 and 5, there is shown a direct reading numerical clock. The clock face **100** includes a first annular section **102** substantially identical to that shown in FIGS. 1–2 and adapted to indicate the passage of time in one second intervals. However, the clock face **100** also includes second and third separate annular sections **104** and **106** concentric with the first section.

These second and third sections are adapted to indicate the passage of time in minutes and hours, respectively. Thus, the clock of FIGS. 4 and 5 indicates the passage of time in hours, minutes and seconds simultaneously.

The second or middle annular section **104** is substantially the same as the first section and contains sixty separate electroluminescent lamps. The transparent coating **22** of this middle section, however, is suitably masked with opaque paint so that each lamp in this section, when lit, displays a different corresponding number from 1 to 60.

The third or inner annular section contains twelve separate electroluminescent lamps. The transparent coating **22** of this inner section is masked so that each lamp in this section, when lit, displays a different corresponding number from 1 to 12.

Coating **22** forms a ring electrode common to all three sections and is connected to a first terminal **26**. A first electrically conductive ring **28** is insulatedly mounted about shaft **30** of motor **16** and further is electrically connected to a second terminal **32**. A voltage source **38** is connected across terminals **26** and **32**. Second, third and fourth electrically conductive rings **108**, **110** and **112**, insulatedly secured to the shaft **30**, make electrical contact with each other and with ring **28** by means of brushes **114**.

A first electrically conductive arm **116** attached to the second ring **108** rotates brush **118** in a circular path at a rate of one revolution per minute. Brush **118** succes-

sively contacts each lamp electrode **24** of the first annular section **102** in turn and is therefore analogous to a "second" hand.

A second electrically conductive arm **120** attached to the third ring **110** rotates brush **122** in a circular path at a rate of one revolution per hour. Brush **122** successively contacts each lamp electrode **24'** of the second annular section **104** in turn and is therefore analogous to a "minute" hand.

A third electrically conductive arm **124** attached to the fourth ring **112** rotates brush **126** in a circular path at a rate of $\frac{1}{12}$ revolution per hour. Hence, brush **126** is analogous to an "hour" hand.

However, brush **126** does not contact each lamp electrode **24''** directly, but rather contacts corresponding offset inward extension **128** of each electrode **24''**. If these extensions were not used, each lamp would be successively lit and extinguished at improper times. More particularly, for example, the lamp numbered **12** would be lit at about 11:30 and extinguished at about 12:30. Use of the offset inward extensions **128** corrects the timing so that, for example, the lamp numbered **12** will be lit at 12:00 and extinguished at 1:00.

It will be apparent that the voltage source **38** can be used to energize the clock motor **16**. Alternatively, motor **16** can be spring driven and source **38** can be a battery.

It will be further apparent that the operation of my clocks can be reversed so as to selectively extinguish lamps rather than selectively energizing lamps as herein shown. For example, the brush **36** of FIG. 1 can be shaped into a circular arc of almost 360° such that brush **36** is in continuous contact with 59 lamps and energizes same while the 1 lamp not in contact with brush **36** is extinguished.

What is claimed is:

1. In a clock, a clock face having an annular section, said section comprising an annular transparent electrically conductive electrode, an annular electroluminescent layer, one surface of which is in contact with said annular electrode, and a plurality of separate electrodes in contact with the opposite surface of said electroluminescent layer at equidistantly spaced positions, each of said separate electrodes having an offset inward extension.

2. In a clock, a clock face having an annular section, said section comprising an annular transparent electrically conductive electrode, an annular electroluminescent layer, one surface of which is in contact with said annular electrode, and a plurality of separate electrodes in contact with the opposite surface of said electroluminescent layer at equidistantly spaced positions, each of said separate electrodes having an offset inward extension, said annular electrode being connected to a first terminal; and a commutator for sequentially connecting each of said offset extensions in turn to a second terminal, said first and second terminals being adapted for connection to a voltage source.

3. In a clock, a clock face having an annular section, said section comprising an annular transparent electrically conductive electrode, an annular electroluminescent layer, one surface of which is in contact with said annular electrode, and twelve separate electrodes in contact with the opposite surface of said electroluminescent layer at equidistantly spaced positions, each of said separate electrodes having an offset inward extension.

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