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Catto et al.

[11] **3,822,545**

[45] **July 9, 1974**

[54] **ELECTROMECHANICAL DIGITAL READOUT CLOCK**

[75] Inventors: **Kenneth A. Catto; Harold R. Burt,** both of Beaverton, Oreg.

[73] Assignee: **Data Time, Inc.,** Portland, Oreg.

[22] Filed: **Dec. 22, 1972**

[21] Appl. No.: **317,735**

Related U.S. Application Data

[63] Continuation of Ser. No. 220,923, Jan. 26, 1972, abandoned.

[52] **U.S. Cl.** ..... **58/23 R,** 58/50 R, 340/336

[51] **Int. Cl.** **G04c 3/00**

[58] **Field of Search** ..... 58/23, 23 D, 50 R; 340/309.4, 336, 338, 339

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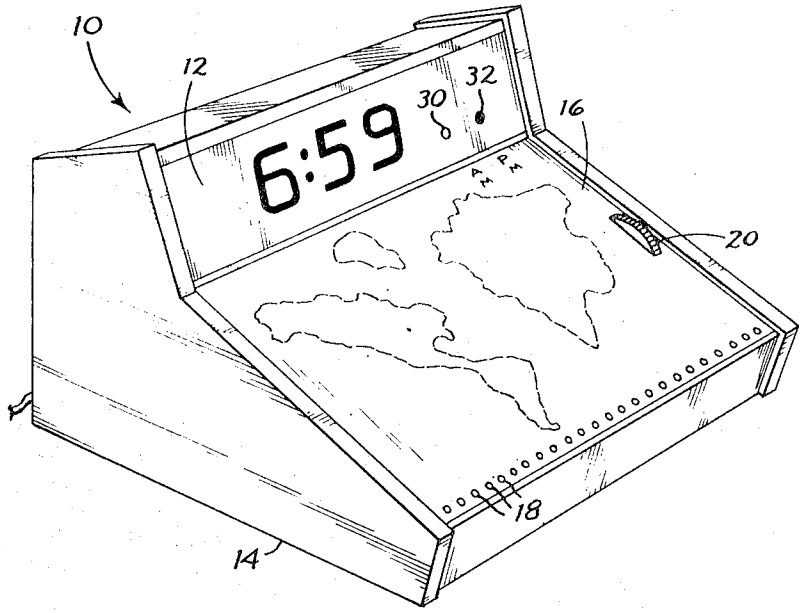
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Primary Examiner—Richard B. Wilkinson
Assistant Examiner—Edith Simmons Jackmon
Attorney, Agent, or Firm—Kolish, Hartwell & Dickinson

[57] **ABSTRACT**

An electromechanical digital readout clock including electrical digital readout devices. The readout devices are operated by different, periodically closed electrical circuits that are established through contacts (connected to the devices) engaged by conductors carried by a plurality of interengageable, intermittently driven rotors.

10 Claims, 4 Drawing Figures



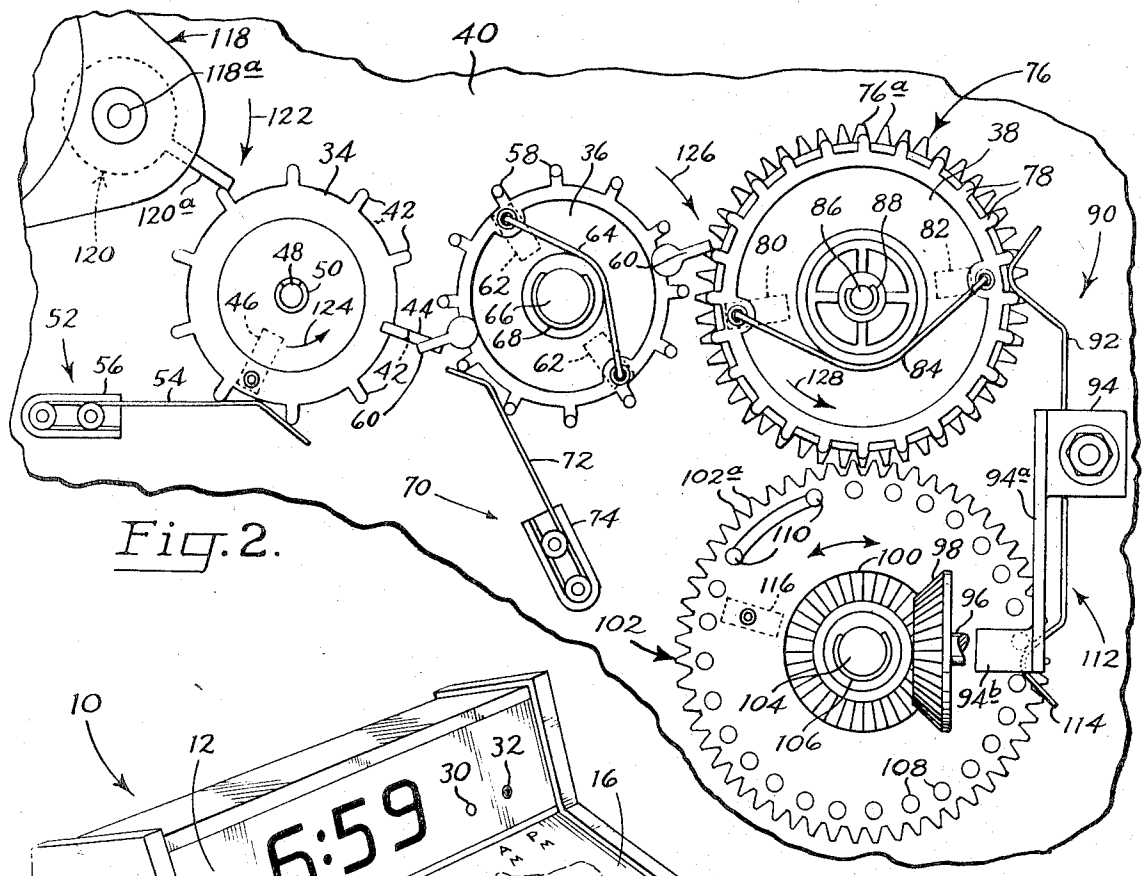


Fig. 2.

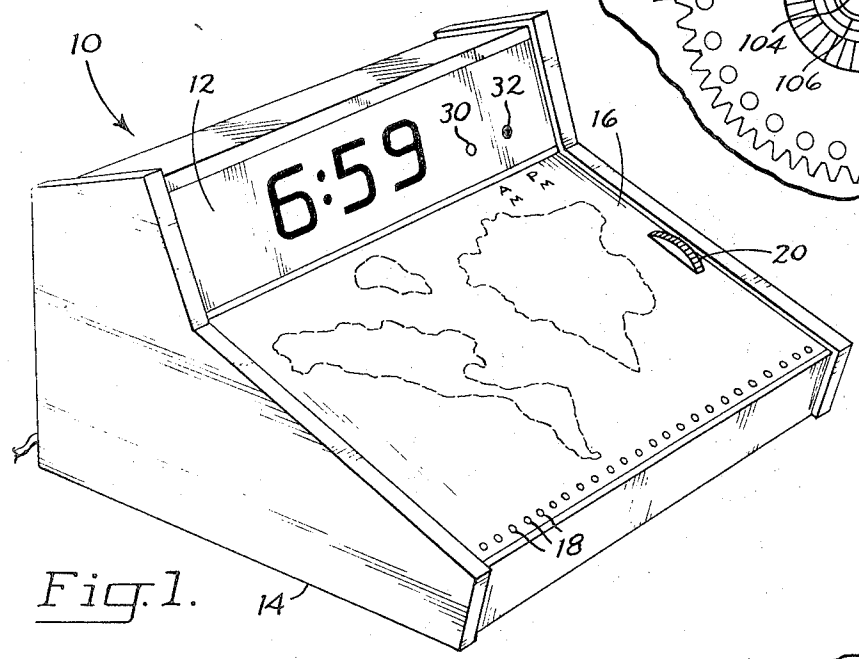


Fig. 1.

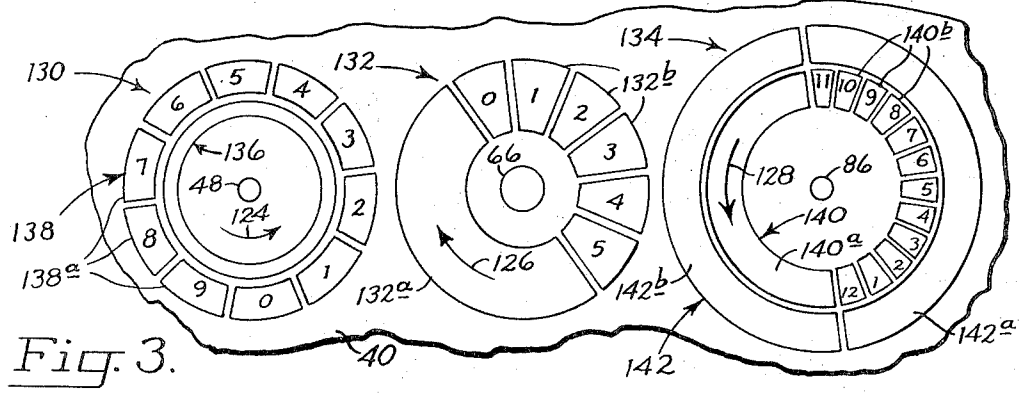


Fig. 3.

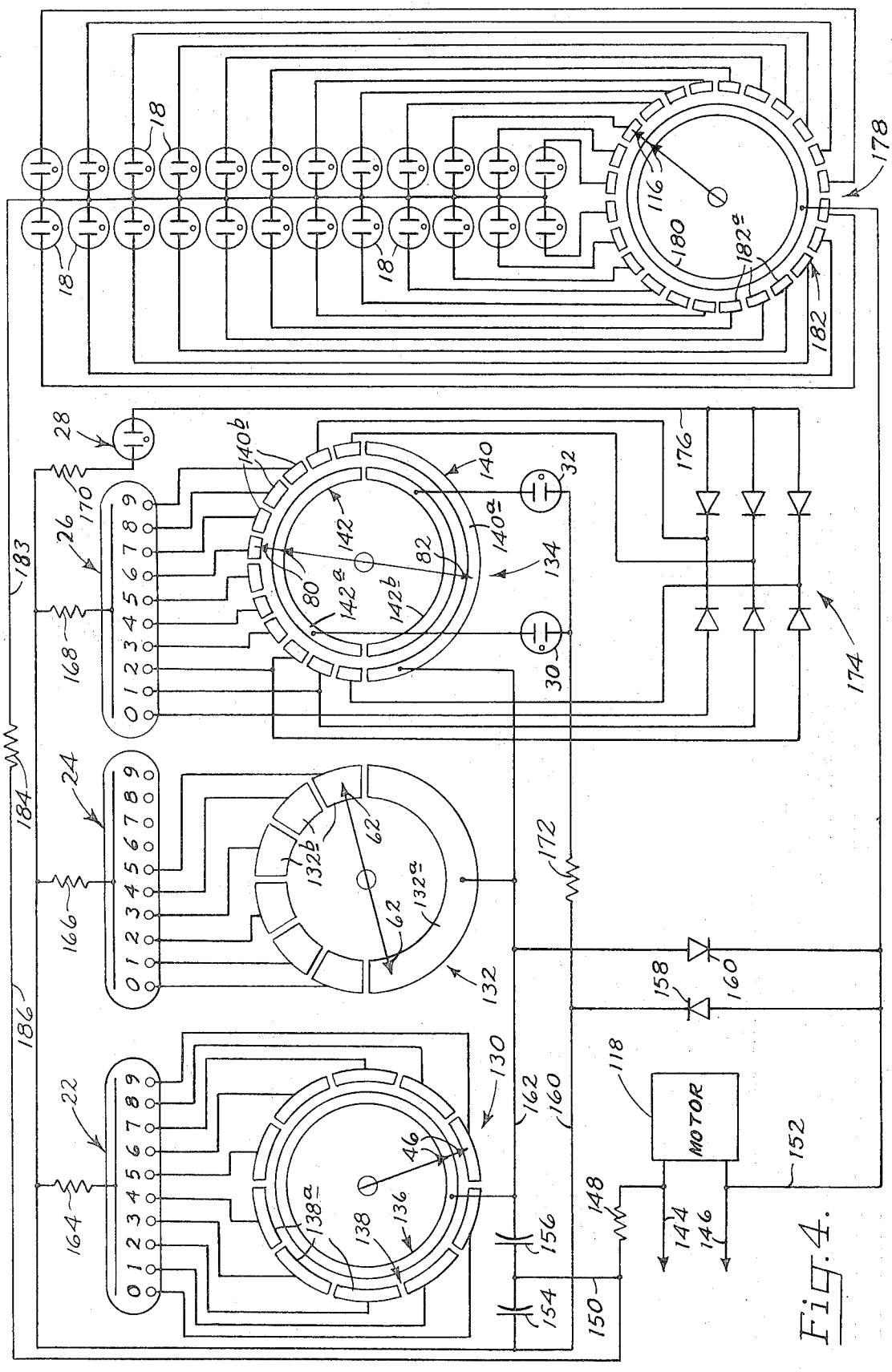

MOTOR
0 1 2 3 4 5 6 7 8 9
18
116
180
182a
182
178
28
170
140b
140
140a
142
82
80
142a
142b
134
32
30
176
174
26
168
183
184
24
166
132b
62
132a
132
172
158
160
186
22
164
130
162
160
118
46
138a
138
136
148
156
154
150
144
146
152

Fig. 4.

ELECTROMECHANICAL DIGITAL READOUT CLOCK

CROSS-REFERENCE TO PRIOR-FILED COPENDING U.S. APPLICATION

This is a continuation of our prior-filed, copending U.S. application, Ser. No. 220,923, filed Jan. 26, 1972 for "Electromechanical Digital Readout Clock," now abandoned.

BACKGROUND AND SUMMARY OF THE INVENTION

This invention pertains to an electromechanical digital readout clock. More specifically, it pertains to such clock which includes electrical digital readout devices that are energized to tell time through periodic selective closings of circuits (connected to the devices) which closings are effected by rotations of a plurality of intermittently driven rotors.

Digital readout-type clocks, and particularly those having electrical time-readout devices, have become increasingly popular in recent years. In such a clock, each specific time indication (typically limited to hours and minutes) requires the establishment of a specific energizing circuit for each of the readout devices required to produce the particular indication. Such circuits must, of course, be changed appropriately to indicate the passing of time.

A general object of the present invention is to provide novel electromechanical means, employable in a clock of the type generally indicated above, to establish such energizing circuits.

Another object of the invention is to provide such means which is both extremely reliable in operation, and relatively simple and inexpensive in construction.

According to a preferred embodiment of the invention, a clock mechanism is proposed including electrical digital time-readout devices which are energized through circuits established through contacts (connected to the devices) engaged by conductors, such as wipers, carried by a plurality of rotors. The particular rotors disclosed herein are specially constructed for intermittent driving engagement, with one of these rotors driven in steps periodically by a suitable time-base drive means, such as a synchronous AC motor.

The use of such conductor-carrying rotors, which are driven intermittently in steps, eliminates the need for costly, and sometimes unreliable, electronic switching circuitry for energizing the time-readout devices. In addition, such construction lends itself especially to relatively simple low cost manufacturing, and has been found through experience to offer extremely reliable performance.

These and other objects and advantages attained by the invention will become more fully apparent as the description which follows is read in conjunction with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a simplified perspective view illustrating one form of clock constructed in accordance with the present invention;

FIG. 2 is an enlarged fragmentary view illustrating portions of the inner workings of the clock of FIG. 1,

and more specifically illustrating a plurality of conductor-carrying rotators as contemplated herein;

FIG. 3 is a fragmentary view, on about the same scale as FIG. 2, illustrating three clusters of conductive expanses which underlie conductors in three of the rotors shown in FIG. 2; and

FIG. 4 is a schematic electrical diagram illustrating electrical connections employed in the clock of FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

Turning now to the drawings, and referring first to FIG. 1, indicated generally at 10 is a digital readout clock embodying the present invention. More specifically, clock 10 is what might be thought of as an electrical digital readout clock, wherein time indications are presented by means of conventional electrical digital readout devices, such as conventional neon Nixie tubes. Such tubes are referred to herein collectively as time-readout means. In FIG. 1, clock 10 is shown presenting the time indication "6:59" (P.M.) through a transparent window 12 mounted on a base 14 in the clock.

The particular clock shown in FIG. 1 is intended to seat on a table or desk top, and is constructed to be manually adjustable to indicate, selectively, the corresponding times in each of the 24 time zones in the world. There is thus provided on base 14, below window 12, a deck 16, on the upper surface of which is printed a simplified map of the world, along with time-zone markings. Adjacent the bases of the marked time-zone areas are neon lamps, such as lamps 18, which light up selectively, as will be more fully explained, to indicate which time zone has its time presented through window 12. A rotary knob, or adjusting means, 20, which protrudes through deck 16, is used (as will be explained) to select the desired time zone in which one wants to know the time. Knob 20 is also referred to herein as a time zone change adjuster.

Considering now FIGS. 2, 3, and 4, four time-readout devices, taking the form (as mentioned above) of conventional digital readout, neon Nixie tubes are used in clock 10. These four devices are indicated generally at 22, 24, 26, 28 in FIG. 4. Tubes 22, 24, 26 are substantially identical in construction, each being capable of presenting selectively any digit from 0–9, inclusive. Tube 22 is adapted herein to indicate units-of-minutes, tube 24 to indicate tens-of-minutes, and tube 26 to indicate units-of-hours. Tubes 22, 24 collectively comprise a minutes readout means. Tube 26 comprises an hours readout means. It is these three tubes which are lighted in FIG. 1 to present the time indication shown therein—tube 22 presenting the "9," tube 24 presenting the "5," and tube 26 presenting the "6." Tube 28 is a single-digit tube, capable when lit of presenting the digit "1." This tube is employed to indicate tens-of-hours.

Neon lamps 18 which, as mentioned earlier, are used to indicate selectively the different time zones, are shown as a group of 24 lamps adjacent the right side of FIG. 4. Also employed in clock 10 are conventional neon lamps 30, 32 which are substantially the same in construction as lamps 18. Lamps 30, 32 may be thought of as "A.M." and "P.M." lamps, respectively—lamp 30 lighting to indicate forenoon times in a selected time zone, and lamp 32 lighting to indicate afternoon times. These two lamps are visible in FIG. 1

through window **12**, lamp **32** being shown as a solid darkened dot to indicate that it is currently lit.

According to the present invention, circuits for energizing tubes **22, 24, 26, 28**, and lamps **30, 32**, are established through the operations of a plurality of mechanical rotors. More specifically, three such rotors are employed, these being indicated generally at **34, 36, 38** in FIG. **2**. These three rotors, along with other parts shown in FIG. **2**, are mounted on a support deck **40** provided in clock **10**. Rotor **34** may be thought of as a units-of-minutes rotor, rotor **36** of a tens-of-minutes rotor, and rotor **38** as an hours rotor. These three rotors are preferably formed of a suitable electrically insulating plastic material.

Rotor **34** includes, about its circumference, ten uniformly spaced cogs, such as cogs **42**. Adjacent cogs are spaced apart by an angle of about 36°. In addition to cogs **42**, rotor **34** includes an elongated radially projecting finger **44** which is in an axial plane in FIG. **2** closer to the viewer than the axial plane containing the cogs. Finger **44** projects radially in rotor **34** further than the cogs. Mounted on the underside of rotor **34** is an electrical conductor taking the form of a wiper **46**. The function performed by this wiper will be explained shortly.

Rotor **34** is mounted for rotation on a spindle **48** which is suitably joined to deck **40**. The rotor is retained on this spindle by a conventional snap-ring retainer **50**.

Indicated generally at **52** in FIG. **2** is a detent mechanisms, or means, for rotor **34**. This mechanism includes an elongated slender angular spring **54** whose inner end is mounted on deck **40** through an anchor **56**. The outer or free end of spring **54** engages the periphery of rotor **34** in the axial plane of cogs **42**. This spring functions, among other things, releasably to lock the rotor in any one of ten different, equally angularly spaced, angular positions about the axis of spindle **48**. Rotor **34** is shown thus locked in one of such positions in FIG. **2**.

Rotor **36** includes twelve uniformly circumferentially distributed cogs, such as cogs **58**. Adjacent cogs **58** are spaced apart angularly by about 30°. Rotor **36** also includes a pair of diametrically opposed, elongated, radially projecting fingers **60**. These fingers project radially in the rotor farther than cogs **58**. Mounted on the underside of rotor **36** are two diametrically opposed electrical conductors taking the form of wipers **62**. These wipers are electrically connected by a jumper **64**.

Rotor **36** is mounted for rotation on a spindle **66** which is suitably joined to deck **40**. The rotor is retained on this spindle by a snap-ring retainer **68**. Rotor **36** is positioned with cogs **58** in substantially the same axial plane as finger **44** in rotor **34**. Fingers **60** are disposed in an axial plane which is toward the viewer in FIG. **2** from that containing cogs **58**.

Indicated generally at **70** in FIG. **2** is a detent mechanism for rotor **36**. This mechanism is similar to previously described mechanism **52**. Mechanism **70** thus includes an elongated, slender, angular spring **72** having its inner end mounted on deck **40** through an anchor **74**. The outer free end of spring **72** engages the periphery of rotor **36** in the axial plane of cogs **58**. Among other things, spring **72** functions releasably to lock rotor **36** in any one of twelve different, equally angularly spaced, angular positions about the axis of spindle **66**. In FIG. **2**, rotor **36** is shown thus locked in one of such positions.

Rotor **38**, as viewed in FIG. **2**, overlies and partially obscures a gear wheel **76**, the peripheral teeth **76***a* of which can be seen adjacent the perimeter of the rotor. Rotor **38** and wheel **76** are separate independently movable parts.

Distributed uniformly about its circumference, rotor **38** includes 24 equally angularly spaced cogs, such as cogs **78**. Adjacent cogs are spaced apart by an angle of about 15°. Mounted on the underside of rotor **38** (i.e., the side facing wheel **76**), are two diametrically opposed electrical conductors taking the form of wipers **80, 82**. For reasons which will be more fully explained shortly, wiper **80** has a considerably larger radial dimension than does wiper **82**. These two wipers are electrically connected by a jumper **84**.

Rotor **38**, as well as wheel **76**, are mounted for rotation on a spindle **86** which is suitably joined to support deck **40**. As was mentioned earlier, the rotor and wheel can be moved (i.e., rotated on spindle **86**) independently of one another. A snap-ring retainer **88** retains these parts on the spindle. Rotor **38** is disposed with cogs **78** in substantially the same axial plane in FIG. **2** as fingers **60** in rotor **36**. Wheel **76** is disposed with teeth **76***a* below this plane in FIG. **2**.

Indicated generally at **90** in FIG. **2** is a detent mechanism for rotor **38**. Like the other detent mechanisms described earlier, mechanism **90** includes an elongated, slender, angular spring **92**. The inner end of this spring is mounted on deck **40** through a mounting **94** which is somewhat different in construction from previously described anchors **56, 74**. The outer free end of spring **92** is disposed in substantially the same axial plane as cogs **78**. The outer free end engages the cogs in rotor **38** releasably to lock the rotor in any one of 24 different, uniformly angularly spaced, angular positions about the axis of spindle **86**. Rotor **38** in FIG. **2** is shown so locked in one of such positions.

Previously mentioned knob **20**, which projects through deck **16** in the clock (and is shown in FIG. **1**), is drivingly connected to wheel **76** through a shaft **96**, a pair of meshed bevel gears **98, 100**, and a gear wheel **102**. Bevel gear **100** and gear wheel **102** are formed herein as a unitary member which is mounted for rotation on deck **40** through a spindle **104**. This member is retained on spindle **104** by a snap-ring retainer **106**.

Further describing the mechanism for turning wheel **76**, gear wheel **102** includes peripheral teeth **102***a* which mesh with teeth **76***a* in wheel **76**. Formed on the top (exposed) side of wheel **102** in FIG. **2**, and distributed partially circumferentially about this wheel, are twenty-four uniformly angularly spaced axial projections, such as projections **108**. Also formed on this side of wheel **102** are two spaced-apart axial projections **110** which extend toward the viewer in FIG. **2** a considerably greater distance than projections **108**.

Previously mentioned mounting **94** includes an elongated arm **94***a* on which is formed a tab **94***b* that extends over wheel **102** as shown. More specifically, tab **94***b* clears the tops of projections **108**, but not those of projections **110**. This tab, thus, acts as a stop—limiting the amount (in either direction) which wheel **102** can be rotated. In particular, it limits rotation of wheel **102** to that angular amount sufficient to produce a single revolution (in either direction) of wheel **76**.

Indicated generally at 112 in FIG. 2 is a detent mechanism for wheel 102. Mechanism 112 includes an elongated, slender, angular spring 114, the inner end of which is mounted on deck 40 through mounting 94. The outer free end of this spring is disposed in substantially the same axial plane as projections 108, and is adapted to engage these projections releasably to lock wheel 102 in 24 different, equally angularly spaced, angular positions about the axis of spindle 104. Wheel 102 is shown thus locked in one of such positions.

Mounted on the underside of wheel 102 is an electrical conductor in the form of a wiper 116.

Still referring particularly to FIG. 2, indicated generally at 118 is a portion of a conventional synchronous AC motor, or time-base drive means, employed herein to transmit drive periodically into rotors 34, 36, 38. Motor 118 is adapted for connection to the usual 60-Hertz AC power line, and when running operates at a speed essentially locked to the frequency of current in such a line. Motor 118 includes an output shaft 118*a*, which, with running of the motor, turns at the substantially constant speed of one revolution per minute. Suitably anchored to shaft 118*a* is a drive member 120, including a single, radially extending, elongated finger 120*a*. Finger 120*a* is disposed in the axial plane of, and is adapted to engage, cogs 42.

Explaining briefly how drive is transmitted into and through the rotors, motor 118 turns shaft 118*a* (at the speed mentioned) in the direction of arrow 122 in FIG. 2. Once during each revolution of the shaft, finger 120*a* engages a cog 42 in rotor 34, thus establishing a drive train between member 120 and the rotor, and initiates turning of this rotor in the direction of arrow 124 in FIG. 2. Initial turning of rotor 34 is yieldably resisted by spring 54. However, with continued turning of the rotor, and on a cog 42 passing the sharp angular bend adjacent the outer end of spring 54, the spring acts to accelerate, and does accelerate, turning of the rotor (in the direction of arrow 124) toward the next "locked" angular position about spindle 48. Such acceleration in the turning of the rotor takes place independently of movement of finger 120*a*, and in fact results in the cog previously engaged with this finger disengaging from the finger during such acceleration. Rotor 34 thus quickly adjusts or steps to a new (updated) angular position—not relying on the relatively slow speed of finger 120*a* finally to position the rotor in this new position. Spring 54 locks the rotor in such new position.

Once in each revolution of rotor 34, finger 44 engages a cog 58 in rotor 36, and, through the drive train thus established between rotor 34, 36, initiates the same sort of action in rotor 36 and mechanism 70 as was described previously in connection with rotor 34 and mechanism 52. More specifically, when finger 44 engages a cog 58, rotor 36 begins to turn in the direction of arrow 126. Initial turning of rotor 36 is under the influence of finger 44, and is yieldably resisted by spring 72. However, on a cog 58 passing the sharp angular bend at the outer end of the spring, the spring then accelerates rotor 36 toward its next "locked" angular position. As was true in the case of stepping of 34, rotor 36 thus steps quickly to a new angular position about spindle 66.

Twice during each revolution of rotor 36, a finger 60 engages a cog 78 in rotor 38, establishing a drive train between rotors 36, 38, and causing rotor 38 to turn in the direction of arrow 128. Shortly thereafter, spring 92 accelerates rotor 38 with substantially the same action described earlier for rotors 34, 36. As a consequence, rotor 38 steps quickly to a new angular position about spindle 86.

It will thus be apparent that regular intermittent drive is transmitted into and through rotors 34, 36, 38, with the rotations of rotors 34, 36 being utilized regularly to cause rotation in rotors 36, 38, respectively. Moreover, it will be noted that these rotors are not locked together whereby their relative movements would be totally interdependent. This feature, coupled with the acceleration feature afforded by the detent mechanisms, enables the rotors to step very quickly to successive angular positions. This, in turn, enables the time indications presented by clock 10 to change over quickly.

Referring now to FIG. 3 along with FIG. 2, disposed beneath rotors 34, 36, 38, respectively, are three generally circular clusters of conductive expanses, or means, shown generally at 130, 132, 134 in FIG. 3. Clusters 130, 132 are mounted directly on deck 40. Cluster 134 is mounted on the upper side of gear wheel 76, i.e., that side which faces rotor 38. In order to simplify FIG. 3, the three rotors, and wheel 76, have been omitted from the figure.

The conductive expanses in cluster 130 are arranged generally in the form of inner and outer rings 136, 138, respectively. Inner ring 136 is continuous. Outer ring 138 is divided into ten substantially equal size, equally angularly spaced segments, such as segments 138*a*. For the purpose of aiding in an understanding of how parts shown in FIG. 3 relate to parts shown in FIG. 4, the ten digits 0–9, inclusive, have been placed as shown on segments 138*a*. This has been done specifically to relate these segments (electrically) to the 10 correspondingly numbered cathode terminals shown in tube 22 in FIG. 4.

Previously mentioned wiper 46 on rotor 34 bridges rings 136, 138. With the rotor locked in one of its 10 different angular positions, rotor 46 engages ring 136 and one of segments 138*a*. With rotor 34 in the angular position shown in FIG. 2, wiper 46 engages ring 136 and the segment 138*a* bearing the digit "9" in FIG. 3.

In cluster 132, the conductive expanses are distributed in the form of a single ring, including a semicircular expanse 132*a*, and six segments 132*b*. Placed on different segments 132*b* in the figure are six digits 0–5, inclusive. This has been done as an explanatory aid to relate these segments (electrically) to the six correspondingly numbered cathode terminals in tube 24 in FIG. 4.

In any angular position of rotor 36, one of wipers 62 engages expanse 132*a*, and the other wiper engages one of segments 132*b*. With rotor 36 in the angular position shown in FIG. 2, the upper wiper 62 in this figure engages expanse 132*a* and the lower wiper in FIG. 2 engages the segment bearing the digit "5" in FIG. 3.

The expanses in cluster 134 which, it will be recalled, are mounted on the upper side of wheel 76, are distributed generally as inner and outer rings 140, 142, respectively. Inner ring 140 includes a semicircular expanse 140*a*, and twelve segments, such as segments 140*b*. Marked in FIG. 3 on segments 140*b* are the digits 1–12, inclusive, for the purpose of relating these segments to corresponding segments shown in FIG. 4.

Outer ring 142 in cluster 134 takes the form of two semicircular expanses 142*a*, and 142*b*. As will become

apparent, expanse 142*a* is associated with forenoon time indications, and expanse 142*b* is associated with afternoon time indications.

Wiper 80 in rotor 38 is constructed to bridge rings 140, 142. Wiper 182 is constructed to contact only parts in ring 140. With rotor 38 locked in one of its different angular positions, the particular wiper (i.e., wiper 80 or 82) which then contacts the segmented part of ring 140, contacts only one of segments 140*b*. With rotor 38 in the angular position shown in FIG. 2, wiper 80 bridges expanses 140*a*, 142*b*, and wiper 82 contacts the segment 140*b* bearing the digit "6" in FIG. 3.

Turning now to FIG. 4, this illustrates the electrical connections in clock 10 existing between the tubes, lamps, and conductive expanses discussed heretofore. For the purpose of simplifying the showings of electrical connections in FIG. 4, various parts in clusters 130, 132, 134 are shown differently in this figure than in FIG. 3. More specifically, the angular positions of certain parts in the clusters are shown differently in FIG. 4; and in cluster 134, inner and outer rings 140, 142 are shown in reversed positions (i.e., with ring 142 inside of ring 140).

Indicated at 144, 146 in FIG. 4 are power-input conductors adapted for connection to the usual 60-Hertz AC power line. Conductor 144 is connected to one of the input terminals of motor 118, and in addition, is connected through a resistor 148 to a conductor 150. Conductor 146 is connected to the other input terminal of the motor, and also to a conductor 152.

Conductors 150, 152 feed a rectifying circuit made up of capacitors 154, 156 and diodes 158, 160. This circuit applies positive voltage to a conductor 160 and negative DC voltage to a conductor 162. Positive voltage on conductor 160 is applied through resistors 164, 166, 168, 170 to the anodes in tubes 22, 24, 26, 28, respectively. Conductor 160 also applies positive voltage through a resistor 172 to the anodes in lamps 30, 32. The cathodes of lamps 30, 32 are connected to conductive expanses 142*a*, 142*b*, respectively. Conductor 162 applies negative DC voltage directly to ring 136 and to conductive expanses 132*a*, 140*a*.

Considering segments 138*a* of ring 138, it will be noted that each of these segments is connected to a different one of the ten numbered cathode terminals provided in tube 22. The segment shown connected to the pin designated by the digit "O" in FIG. 4 is the same as the segment in FIG. 3 bearing the digit "0." Such holds true for the other segments 138*a*.

The six segments 132*b* in cluster 132 are each connected to a different one of the first six numbered cathode terminals in tube 24. True for each of these segments, is that it corresponds to the segment in cluster 132 (FIG. 3) which bears the digit corresponding to the numbered terminal in FIG. 4 to which the segment is shown connected.

Segments 140*b*, and the ten numbered cathode terminals in tube 26, are interconnected (as shown) with one another, and with a six-diode circuit indicated generally at 174. The anodes of the three diodes on the right side of circuit 174 in FIG. 4, which anodes are connected together, are connected through a conductor 176 to the cathode in tube 28.

Completing a description of FIG. 4, indicated generally at 178 in the lower right corner of the figure is a generally circular cluster of conductive expanses distributed in two rings 180, 182. This cluster is formed on support deck 40 beneath gear wheel 102 in FIG. 2. Wiper 116 on wheel 102 is adapted to bridge rings 180, 182.

Ring 180, which is the inner ring in cluster 178, is a continuous ring connected directly to conductor 152. Outer ring 182 comprises 24 substantially equal size, equally angularly spaced segments, such as segments 182*a*. Each of segments 182*a* is connected to one side of a different one of previously mentioned lamps 18. The other sides of these lamps are connected together, and are connected through a conductor 183, a resistor 184, and a conductor 186 to the junction between resistor 148 and conductor 150. With wheel 102 locked in one of its 24 different angular positions (as mentioned earlier), wiper 116 engages ring 180 and one of segments 182*b*.

From an examination of the circuit diagram of FIG. 4, it is believed to be self-apparent how, as rotors 34, 36, 38 move, different electrical circuits are established through the wipers and conductive expanses which energize tubes 22, 24, 26, 28 and lamps 30, 32 to indicate the proper time. As has already been mentioned, because of the way in which the detent mechanisms described earlier perform, changeover from one time indication to the next time indications occurs very rapidly.

When it is desired to adjust the clock to indicate time in a different time zone, this is accomplished simply by manipulating knob 20 to rotate wheel 102 and thereby wheel 76. It should be noted particularly that rotation of wheel 76 does not disturb the position of "hours" rotor 38. Merely, it changes the relative angular position of cluster 134 with respect to wipers 80, 82. Thus, such an adjustment in no way disturbs the proper position of rotor 38, while at the same time enabling one to determine relatively simply what the corresponding time is in another time zone. Lamps 18 light up selectively to show in which zone time is being indicated.

Obviously, the organization proposed herein, employing wiper-carrying rotors whose wipers move over conductive expanses to energize the time-indicating tubes and lamps, results in relatively simple construction. Moreover, there is virtually no chance that the clock, once properly adjusted as to time, will give a false time reading. Maintenance is little or no problem. It should be understood, of course, that the conductors moved by the rotors need not necessarily be wipers. For example, the rotors could instead carry conductive expanses which engage adjacent stationary wipers. Or, certain kinds of switches could be used with rotations of the rotors utilized to actuate the switches. Other specific arrangements are also possible.

A clock embodying the invention may, of course, take any number of different forms. Further, the means provided to impart drive to the rotors need not necessarily be an AC synchronous motor. In other words, other suitable time-base drive means, such as solenoid (or other means), may be employed. Further, it is appreciated that different specific mechanisms may be employed to transmit driving forces from one rotor to another. For example, a cam, pawl and gear arrangement may conveniently be used.

Thus, while an embodiment of the invention has been described herein, it is appreciated that variations and modifications may be made without departing from the spirit of the invention.

It is claimed and desired to secure by letters Patent:

1. In an electromechanical clock including a plurality of selectively electrically operable digital time-readout means:
plural conductor means connected to different ones of said time-readout means;
plural intermittently drivingly interengageable rotors positioned adjacent said conductor means, each rotor carrying for rotation as a unit therewith an electrically conductive wiper engageable selectively with different ones of said conductor means with turning of the rotor, a wiper and a conductor means when engaged forming part of an electrical circuit for operating a time-readout means; and
time-base drive means positioned adjacent said rotors for driving the same.

2. The clock of claim 1 which further comprises detent means for each rotor acting on the rotor, each detent means tending to maintain its associated rotor in a fixed angular position until the same is driven, and under the latter circumstance effecting accelerated turning of the rotor toward a new fixed angular position.

3. The clock of claim 1, wherein said drive means comprises a synchronous AC motor.

4. In an electromechanical clock including a plurality of selectively electrically operable digital time-readout means:
plural conductor means connected to different ones of said time-readout means;
plural intermittently drivingly interengageable rotors positioned adjacent said conductor means, each rotor carrying an electrically conductive wiper engageable selectively with different ones of said conductor means with turning of the rotor, a wiper and a conductor means when engaged forming part of an electrical circuit for operating a time-readout means;
the conductor means engageable by a wiper in one of said rotors comprising a plurality of conductive expanses, said conductive expanses being disposed on a wheel mounted adjacent said one rotor for selective independent rotation relative to, and on substantially the same rotational axis provided for, said one rotor; and
time-base drive means positioned adjacent said rotors for driving the same.

5. An electromechanical clock comprising:
a plurality of selectively electrically operable digital time-readout means;
plural conductor means connected to different ones of said time-readout means;
plural intermittently drivingly interengageable rotors positioned adjacent said conductor means, each rotor carrying for rotation as a unit therewith an electrically conductive wiper engageable selectively with different ones of said conductor means with turning of the rotor, a wiper and a conductor means when engaged forming part of an electrical circuit for operating a time-readout means;
detent means for each rotor acting on the rotor, each detent means tending to maintain its associated rotor in a fixed angular position until the same is driven, and under the latter circumstance effecting accelerated turning of the rotor toward a new fixed angular position; and
time-base drive means positioned adjacent said rotors for driving the same.

6. An electromechanical clock comprising:
plural electrically operated time-readout means including an hours readout means and a minutes readout means;
a minutes circuit including multiple switches which are opened and closed to control the minutes readout means;
an hours circuit including multiple switches which are opened and closed to control the hours readout means;
a minutes rotor which on incremental rotation, actuates different switches on the minutes circuit to produce different minutes readings in the minutes readout means, and an hours rotor which on incremental rotation actuates different switches of the hours circuit to produce different hours readings in the hours readout means;
said rotors being arranged whereby rotation of one regularly causes rotation of the other; and
a selectively movable time zone change adjuster, and means whereby movement of the time zone change adjuster produces movement of a portion of the hours circuit relative to the hours rotor to produce actuation of switches in the hours circuit changing the hours reading in the hours readout means.

7. The clock of claim 4 which further comprises means for adjusting said wheel to different selected angular positions about said rotational axis.

8. The clock of claim 7, wherein certain ones of said conductive expanses are each associated with different hour readings produceable by said time-readout means.

9. A clock comprising:
plural selectively electrically operable digital time-readout means;
plural conductor means connected to different ones of said time-readout means, said conductor means comprising plural conductive expanses distributed in plural generally circular clusters;
plural intermittently drivingly interengageable rotors, one for each of said clusters, each rotor being mounted adjacent its associated cluster for rotation about the axis of the cluster, and each rotor carrying an electrically conductive wiper engageable selectively with different ones of the conductive expanses in the associated cluster, a wiper and a conductive expanse when engaged forming part of an electrical circuit for operating a time-readout means; and
a synchronous AC motor positioned adjacent said rotors for driving the same.

10. The clock of claim 9 which further comprises detent means for each rotor acting on the rotor, each detent means tending to maintain its associated rotor in a fixed angular position until the rotor is driven, and under the latter circumstance effecting accelerated turning of the rotor toward a new fixed angular position.

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