

PATENT SPECIFICATION (11)

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(54) DIGITAL CLOCK

(71) We, GENERAL ELECTRIC COMPANY, a corporation organised and existing under the laws of the State of New York, United States of America, residing at 1 River Road, Schenectady 12305, State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to digital clocks.

Our British Patent Specification No. 1,371,401 discloses a display indicator having a plurality of horizontal and vertical bars or lines arranged in the shape of a numeral 8 for indicating numerals 0 to 9. As shown in the Patent Specification, the numerals from 0 to 9 may be readily formed by the use of specific combinations of seven straight line indicator bars which are arranged in the shape of the figure 8. The seven indicator bar segments include three generally parallel horizontally arranged bars and four generally vertically arranged bars positioned as aligned pairs on opposite sides of the horizontal bars. With this arrangement, should it be desired to display a numeral 1, all bar segments except the two right vertical segments would be blocked out. To form the numeral 0, it is only necessary to block out the middle horizontal bar. It follows that the numeral 3 may be formed by blocking out the two left vertical bars.

According to the present invention there is provided a digital clock comprising two display indicators for visually displaying numerals from 0 to 9 to indicate minutes and tens of minutes; a rotatable units cam for progressively actuating the minutes display indicator to display numerals from 0 to 9 to indicate minutes; a rotatable tens cam spaced from the units cam for progressively actuating the tens of minutes display indicator for displaying numerals to the left of the units numerals in order to indicate tens of minutes; supporting means rotatably supporting said units and tens cams on axes generally parallel to each other and spaced from each other; a drive lever pivotally

mounted on said supporting means between said units and tens cams; a pawl lever comprising a central portion and two side portions, said central portion being pivotally mounted on said drive lever, said pawl lever having a units pawl formed in one of its side portions for engaging the units cam for moving the units cam one increment each minute; said pawl lever having a tens pawl formed in its other side portion for engaging and moving the tens cam an increment every ten minutes; means urging the units pawl into engagement with the units cam such that the tens pawl is normally spaced from the tens cam; and means operable to move said drive lever through one complete cycle of movement each minute for causing a corresponding single incremental movement of the units pawl and the units cam every minute; said units cam being adapted to tilt the pawl lever to engage the tens pawl with the tens cam to permit the drive lever and the tens pawl to move the tens cam one increment every ten minutes.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings in which:

Fig. 1 is a front elevational view of a digital clock according to the invention;

Fig. 2 is a fragmentary front elevational view of a portion of the mechanism for setting and indexing the minutes, tens of minutes, hours and tens of hours display indicators of the digital clock shown in Fig. 1;

Fig. 3 is a fragmentary front elevational view of a portion of the cam mechanism for actuating the minutes, tens of minutes, hours and tens of hours display indicators of the digital clock shown in Fig. 1;

Fig. 4 is a fragmentary exploded front perspective view of the drive cam mechanism for successively indexing the minutes, tens of minutes and hours display indicators of the digital clock shown in Fig. 1;

Fig. 5 is a fragmentary front elevational view of the digital clock shown in Fig. 1, showing portions of the vertically movable shutters of the units, tens and hours indica-

tor, along with the cam mechanisms for driving them;

Fig. 6 is a fragmentary front elevational view of portions of the horizontally movable shutters and the drive cams for the shutters of the digital clock shown in Fig. 1;

Fig. 7 is a fragmentary side elevational view of a portion of the drive mechanism of the digital clock shown in Fig. 1;

Fig. 8 is a fragmentary exploded perspective view of the indexing mechanism for the units, tens of minutes and hours cams for the display indicators of the block shown in Fig. 1;

Fig. 9 is a front elevational view of the units and tens cam indexing mechanism of the digital clock shown in Fig. 1, the parts being shown in the position wherein the minutes cam is being indexed one increment;

Fig. 10 is a front elevational view similar to Fig. 9 with the parts being shown in the position wherein both the minutes cam and the tens cam are being indexed one increment;

Fig. 11 is a front elevational view similar to Fig. 9 with the parts being shown in the position wherein the drive lever for the units and tens cam is being returned to the starting position after the drive lever has indexed the units cam one increment; and

Fig. 12 is a fragmentary bottom plan view of the digital clock shown in Fig. 1.

Referring now to the drawings and first particularly to Figs. 1, 2 and 3, there is shown a digital clock which includes an indexing and drive arrangement for appropriately actuating four numeral display indicators 2, 4, 6 and 8 which respectively indicate minutes, tens of minutes, hours and tens of hours.

The digital display indicators 2, 4 and 6 for displaying minutes, tens of minutes, and hours may be substantially identical to each other, and it can be appreciated that each display indicator includes a plurality of horizontal and vertical bars or lines arranged in the shape of a numeral 8 for indicating numerals from 0 to 9. There are seven indicator bar segments including three generally parallel horizontally arranged bars 10, 12 and 14, and four generally vertically arranged bars 16, 18, 20 and 22 positioned as aligned pairs on opposite sides of the horizontal bars. Thus, should it be desired to display a numeral 1 all bar segments except the two right vertical segments would be blocked out.

In the embodiment illustrated in Fig. 1, it can be seen that the right three display indicators 2, 4 and 6 are displaying numerals 2, 3 and 5, respectively. Thus, as seen in Fig. 1 the display indicator 2 has the lower right and upper left vertical bars blocked out to display the numeral 2. In display

indicator 4 the two left vertical bars are blocked out to display the numeral 3, and in display indicator 6 the upper right and lower left vertical segments are blocked out to display the numeral 5.

As shown in Fig. 1, the display indicators 2, 4 and 6 include a common front plate 24 which may be formed of a sheet of plastics slotted or blocked out to reveal three clear numerals 8's, one for each of the display indicators 2, 4 and 6. With particular reference to Figs. 4 and 5, each of the display indicators 2, 4 and 6 include a vertically movable shutter 30, 32 and 34, respectively for selectively blocking out one or more of the horizontal indicator bars 10, 12 and 14. It can be appreciated that all of the horizontal bars should be blocked out for displaying a numeral 1 while only the central bar 12 should be blocked out for displaying the numeral 0. To achieve this, a plurality of opaque shutter bars 36, 38 and 40 are painted or otherwise formed on the vertically movable shutter members 30, 32 and 34 respectively for blocking out the appropriate horizontal indicator bars. The shutters may be formed of a relatively thin plastics material, and with such a construction, light which emanates from lamps 42 and 44 or other suitable light source may flow through the clear portions of the shutters 30, 32 and 34, and hence, through any of the unobstructed generally horizontal bars 10, 12 and 14 of any of the slotted numerals 8's.

With particular reference to Figs. 4 and 6, horizontally slidable shutters 46 and 48 and 50 are positioned behind the vertically slidable shutters 30, 32, 34 for selectively obstructing the vertical bars 16, 18, 20 and 22 of the slotted figure 8 numerals of the display indicators 2, 4 and 6. It can be appreciated for example that the upper left vertical bar 18 should be blocked out to display numerals 1, 2 and 3 while it would be unobstructed to display the numerals 6, 8 and 9.

It can be readily appreciated that in order to display a particular numeral the vertical shutter has to be moved to one particular position and the horizontally movable shutter has to be moved to one particular position. For example, in order to display the numeral 2 as shown in Fig. 1, the vertically movable shutter has to be moved to leave all of the horizontal bars 10, 12 and 14 unobstructed. In a similar manner the horizontally movable shutter has to be moved to block out only the lower right and upper left vertical indicator bars 20 and 18, respectively.

As shown more particularly in Figs. 4, 5 and 7, two-faced rotatable cams 52, 54 and 56 are provided for moving the vertical shutters 30, 32 and 34, respectively, and the horizontal shutters 46, 48 and 50, respectively.

The front faces of each of the cams include a cam groove 60 for receiving a cam follower 62 in order to appropriately position the vertically movable shutters 30, 32 and 34. The cam followers 62 are integrally formed on respective levers 64 which are connected at one end to the vertically movable shutters 30, 32 and 34 by means of a pivot 66 formed on the lever and a slot 68 integrally formed in the lower portion of each of the vertical shutters 30, 32 and 34. The other ends of the levers for the vertically movable shutters may be suitably pivotally connected at 63 to the front plate 24 of the display indicators.

With particular reference to Figs. 4, 6 and 7, a cam groove 70 is formed in the rear face of the rotatable cams 52, 54 and 56 for moving the horizontal shutters 46, 48 and 50 back and forth behind the vertical shutters 30, 32 and 34. As shown, a cam follower 72 which is formed on a lever 74 is positioned within each cam track 70 on the rear surface of the cams 52, 54 and 56. The levers 74 are mounted on the digital clock by means of pivoting to shafts such as 76 which extend through apertures in the plate 100. A slot 78 is formed in the upper arms of the levers for receiving rearwardly extending lugs 80 which are integrally formed on the horizontal shutters 46, 48 and 50. With this construction, when the cams 52, 54 and 56 are rotated in a clockwise direction as illustrated in Figs. 4, 5 and 6, the front cam groove and cam follower causes the vertical shutters to move upwardly and downwardly with respect to the slotted front plate 24, and each rear cam track 70 causes the associated cam follower 72 and the lever 74 to move the horizontal shutters 46, 48 and 50 to the right and left behind the vertical shutters and the respective numeral 8's.

The horizontal and vertical shutters 30, 32, 34, and 46, 48, 50 respectively, and the cam groove arrangement for moving them are illustrated and described in greater detail in our aforementioned British Patent No. 1,371,401.

A mechanism is positioned between the units and tens cams 52 and 54 for indexing the minutes cam once every minute and for simultaneously indexing the tens cam one increment at the instant that the units cam is being indexed a tenth increment, so that the units cam and the tens cam are simultaneously indexed to the next succeeding numbers when the units cam is being moved to its tenth position. To achieve this, special cam teeth indicated generally at 81 and 82 are integrally formed on the outer periphery of the cams 52 and 54 for cooperating with a pawl lever 84 which is positioned between the cams. The teeth 81 on the cam 52 consist of nine teeth 114 of one height and a

single tooth 122 of greater height. As shown more particularly in Figs. 8, 9, 10 and 11, the indexing mechanism includes a drive lever 86 which is pivotally mounted on the digital clock between the units and tens cams 52 and 54, respectively. In order to suitably support the drive lever 86 on the clock, the lever 86 includes an integrally formed pivot shaft 88 having reduced end portions 90 and 92 which are suitably fitted within apertures 94 and 96 (Fig. 4) which are formed in plates 98 and 100 of the digital clock.

An arrangement for oscillating the drive lever 86 to provide a rapid clockwise advance stroke of about five seconds duration and a slower return stroke once per minute is shown more particularly in Figs. 8, 9, 10 and 11. To accomplish this, the drive lever 86 is provided with two cam surfaces 102 and 104 for cooperating with an eccentric drive roller 106 mounted on a gear 108 that is rotated at one revolution per minute by a synchronous electric motor pinion 110. While the motor for driving the pinion 110 is not illustrated, it can be appreciated that it is a particular advantage that the drive arrangement may be operated with a synchronous motor having a relatively low power output.

With particular reference to Fig. 9, it can be seen that the gear 108 and its eccentric roller 106 are rotated in a clockwise direction and when the roller 106 reaches the position illustrated in Fig. 9, it abuts the rapid advance cam surface 102 to pivot the upper portion of the drive lever 86 to the right about its lower pivot 88 to move a units pawl 112 of the pawl lever 84 to the right, as shown in Fig. 9, against a tooth 114 of the units cam to move the units cam 52 one increment to thereby actuate the units display indicator 2 to display a next succeeding numeral. With particular reference to Fig. 11, it can be appreciated that continued rotation of the eccentric roller moves the roller into contact with the return stroke cam surface 104 to move the drive lever 86 and the pawl lever 84 to the left as shown in Fig. 11.

The pawl lever 84 is shaped, weighted and pivoted so that the relatively small pawl lever 84 may reliably index both the units cam 52 and the tens cam 54. The pawl lever 84 includes a central portion 116 which is loosely pivoted to the drive lever 86 by a pivot pin 118, a right-side portion having a units pawl 112 formed thereon for indexing the units cam and a left-side portion having a pawl 120 formed therein for indexing the tens cam 54. As shown more particularly in Fig. 8, the pawl lever 84 is weighted by a counterweighted portion 113 in the vicinity of the units pawl 112 so that the pawl 112 gently rests on the units cam 52 as shown in Fig. 8. In this position, it

can be appreciated that the tens pawl 120 is located above the teeth 82 on the tens cam 54. Thus, during nine of the ten incremental movements of the pawl lever 84, the tens pawl 120 clears the teeth 82 on the tens cam 54, and consequently, the tens cam 54 remains stationary.

During the tenth incremental movement of the drive lever 86 the mechanism indexes both the units cam 52 and the tens cam 54 simultaneously so that the succeeding numerals will simultaneously appear at the display indicators 2 and 4. To accomplish this the tenth tooth 122 of the teeth 81 on the units cam is made much higher than the other nine teeth 114 of the units cam which correspond to numerals 1 to 9. With particular reference to Fig. 10 it can be seen that as the eccentric roller 106 pushes on the advance cam surface 102, the pawl 112 slides upwardly on the high tooth 112 to pivot the pawl lever 84 counterclockwise about pivot 118 from the position illustrated in Fig. 9 to the position illustrated in Fig. 10. This causes the left tens pawl 120 to be moved downwardly to engage one of the teeth 82 on the tens cam. Accordingly, the units pawl 112 is in engagement with the high tooth 122 on the units cam, and tens pawl 120 is in engagement with one of the teeth on the tens cam 54, and further rotation of the eccentric roller 106 against the rapid advance cam surface 102 will cause the drive lever 86 and the pawl lever 84 to be moved to the right as shown in Fig. 10 to index both the units cam 52 and the tens cam 54 one increment. It can be appreciated that this movement of both cams occurs simultaneously, and thus, a person viewing the digital clock will observe a simultaneous change in both the unit and the tens numerals which appear on display indicators 2 and 4, respectively.

With the mechanism thus far described, it can be appreciated that the units display indicator 2 is rapidly indexed one incremental movement each minute by the eccentric roller 106 when it is moved against the rapid advance cam surface 102 and that the units and tens display indicators 2 and 4 are simultaneously rapidly indexed to their next succeeding positions once every ten minutes when the parts are in the positions illustrated in Fig. 10. A mechanism is also provided for rapidly indexing the hours digital display indicator 6 once every hour. The mechanism for achieving this is driven from the tens cam 54, and thus, the mechanism is arranged to simultaneously index the hours display indicator 6 on every sixth indexing movement of the tens cam. As shown more particularly in Figs. 2, 4 and 8, a six slotted geneva gear 124 and a two lug geneva driver 126 are positioned between the tens cam 54 and an hours cam 56. As shown more par-

ticularly in Fig. 4, the geneva driver 126 is positioned on the same axis as the tens cam gear 54 and is directly keyed thereto by means of a radial lug 128 which is integrally formed with the tens cam gear 54. In like manner, an hour gear 130 is positioned on the same axis as the hour cam 56 and keyed to the hour cam by means of a lug 132. The geneva gear 124 may be formed of plastics to include an integrally formed toothed gear 134 which is arranged in mesh with the hour gear 130.

With particular reference to Figs. 1 and 8, it can be appreciated that the geneva gear 124 and its integrally formed toothed gear 134 are positioned between the geneva driver 126 and the hour gear 130. It can be seen that the tens of minutes cam 54 is provided with twelve teeth and the geneva driver 126 is formed to include two lugs 136 and 138 for driving the geneva gear 124. Thus, with this low cost arrangement on every sixth incremental movement of the tens of minutes cam 54 one of the drive lugs 136 or 138 is brought into engagement with one of the six notches of the geneva gear to move the geneva gear one incremental movement to thereby advance the hour digital display indicator 6 to the next succeeding number.

A low cost arrangement is provided for indicating tens of hours. In a conventional twelve hour clock mechanism it can be appreciated that the only numeral that has to be displayed for indicating the tens of hours is the numeral 1. This numeral represents the first numeral of the three succeeding hours 10, 11 and 12. Thus, to display any of the time positions from 1 o'clock to 9 o'clock the tens of hours numeral could be a 0 or it would not be necessary to display any numeral. In the embodiment of our digital clock illustrated in Fig. 1, it is desired to display a numeral 1 or no number to indicate the tens of hours. As shown more particularly in Figs. 1, 3 and 5, in order to achieve this the tens of hours digital display indicator 8 is not provided with a slotted numeral 8, but merely includes a generally vertical slot 140 for displaying a numeral 1 and a single shutter 142 is positioned behind the slotted numeral 1 for selectively blocking it out during the time positions from 1 o'clock to 9 o'clock while leaving the slot open to display a numeral 1 for the 10 o'clock, 11 o'clock and 12 o'clock positions. The mechanism for indexing the shutter 142 from the 9 o'clock to the 10 o'clock position and from the 12 o'clock to the 1 o'clock position is achieved with the use of relatively few additional parts. To accomplish this the hours cam gear 56 is formed with an additional cam surface 144 on its outer periphery for operating the tens of hours shutter 142. As shown more particularly in Fig. 3, the tens of hours shutter 142 is formed with a 130

rightwardly extending lug 146 which is urged by gravity against the peripheral cam surface 144 of cam 56. With the arrangement illustrated it can be appreciated that on the tenth incremental movement of the geneva gear 124 and the hours cam 56, the lug 146 is moved from a high cam surface 150 of cam 144 to a low cam surface 152 of cam 144 to thereby permit shutter 142 to move from behind slot 140 in order to display a numeral 1. Thus, the numeral 1 forms the first or tens of hours numeral as the digital clock is moved to its 10 o'clock position. The lower surface 152 of cam 144 is three increments in length, and thus, the lug 146 remains on the lower surface 152 of the cam 144 during the 10, 11 and 12 o'clock positions of our digital clock. It can be appreciated that as the geneva gear 124 rapidly makes its thirteenth incremental movement the lug 146 will be rapidly moved from the low cam surface 152 to the high cam surface 150 in order to block out the numeral 1 of the tens of hours indicator. At this time it can be appreciated that no numeral would be displayed in the tens of hours position while the numeral 1 would be displayed on the hours indicator 6 to show the 1 o'clock position of the digital clock.

A low cost mechanism is incorporated with the aforescribed structure for setting or resetting the digital display indicators 2, 4, 6 and 8 to indicate the correct time of day. As shown more particularly in Figs. 2, 4 and 12, our setting mechanism is achieved by the provision of relatively few additional parts. The principal component of the setting mechanism is a push-pull knob 154 which may rotate and slide on a stud 156 which is formed on the plate 98 of the clock. As illustrated, a four-tooth sprocket or pinion 158 is integrally formed with the knob 154 for selective engagement with a ten-tooth sprocket 160 which is connected to the units cam 52 and display indicator 2, or a twelve-tooth sprocket 162 which is connected to the tens of minutes cam 54 and display indicator 4.

With particular reference to Fig. 4, it can be appreciated that the minutes sprocket 160 is readily connected to the minutes cam gear 52 by a key lug 164 which is formed on a shaft portion of the minutes cam. The sprocket 162 includes twelve teeth which are integrally formed with the geneva driver 126, and the geneva driver 126 is connected to the tens of minutes cam 54 by a key lug 128 which is formed on the tens of minutes cam. As shown in Fig. 12, the time set knob 154 is normally held by two compression springs 161 and 163 in an intermediate axial position where it engages neither the units nor the tens sprocket.

In operation when it is required or desired to set the digital clock it is merely necessary

to pull and rotate the set knob 154 in a counterclockwise direction to cause clockwise movement of the minutes pinion 160 and the minutes time display indicator 2 for setting the minutes display to its appropriate position. Then, in order to set the tens of minutes display indicator 4, the hours display indicator 6, and the tens of hours display indicator 8 to their appropriate positions, it is merely necessary to push inwardly on the set knob 154 to remove the sprocket 158 from gear 160 and place it in engagement with sprocket 162 of the tens of minutes wheel 126. In this position, rotation of the set knob 154 in a counterclockwise direction will cause clockwise rotation of the gear 162, the tens of minutes cam 54, and the geneva driver 126 which is integrally formed with the sprocket wheel 162 to set the tens of minutes display indicator 4 to its appropriate position. It can be appreciated that the hours and the tens of hours indexing mechanisms 56 and 144 are both rotatably connected to the tens of minutes indexing mechanism, and thus, rotation of the tens of minutes sprocket 162 in a clockwise direction will cause intermittent rotation of the geneva gear 124 and the combined hours and tens of hours gear 56—144.

From the foregoing discussion it will be appreciated that the preferred form of our improved digital clock has a driving mechanism and time set mechanism which may be readily formed with relatively few parts. Many of the parts are arranged and shaped to perform a plurality of functions and they may be readily formed of plastics. For example, the hours cam 56—144 functions as both an hours cam and a tens of hours cam. A cam groove is formed in its front face for moving a vertical shutter 34, a cam groove is formed in its rear surface for moving a horizontally movable shutter 50, and a cam surface 144 is formed in its outer periphery for actuating the tens of hours shutter 142. The geneva driver 126 is also formed to perform a plurality of functions. As shown more particularly in Fig. 4, a sprocket 162 is formed on the geneva driver 126 for co-operating with the time set knob 154 in order to set the digital clock.

It can also be appreciated that all of the display indicators are quickly moved from one number to the next succeeding number and those which move are moved simultaneously. The rapid advance cam surface 102 rapidly moves both the minutes cam gear 52 and the tens cam gear 54 at the same instant. During such movement at the appropriate times the geneva gear 124 actuates the hours and tens of hours cam gear 56—144.

Moreover, it can be seen that the mechanism for indexing the minutes and tens of minutes cams 52 and 54 is achieved with relatively few low cost parts. A small pawl

lever 84 is pivoted between the minutes cam and the tens of minutes cam for reliably actuating the cams. The counterweighted pawl 112 is all that is required for holding the minutes pawl in engagement with the minutes cam 52.

WHAT WE CLAIM IS:—

1. A digital clock comprising two display indicators for visually displaying numerals from 0 to 9 to indicate minutes and tens of minutes; a rotatable units cam for progressively actuating the minutes display indicator to display numerals from 0 to 9 to indicate minutes; a rotatable tens cam spaced from the units cam for progressively actuating the tens of minutes display indicator for displaying numerals to the left of the units numerals in order to indicate tens of minutes; supporting means rotatably supporting said units and tens cams on axes generally parallel to each other and spaced from each other; a drive lever pivotally mounted on said supporting means between said units and tens cams; a pawl lever comprising a central portion and two side portions, said central portion being pivotally mounted on said drive lever, said pawl lever having a units pawl formed in one of its side portions for engaging the units cam for moving the units cam one increment each minute; said pawl lever having a tens pawl formed in its other side portion for engaging and moving the tens cam an increment every ten minutes; means urging the units pawl into engagement with the units cam such that the tens pawl is normally spaced from the tens cam; and means operable to move said drive lever through one complete cycle of movement each minute for causing a corresponding single incremental movement of the units pawl and the units cam every minute; said units cam being adapted to tilt the pawl lever to engage the tens pawl with the tens cam to permit the drive lever and the tens

pawl to move the tens cam one increment every ten minutes.

2. A digital clock as claimed in Claim 1 wherein said means urging the units pawl comprises a counter weight on the pawl lever providing more weight in the vicinity of the units pawl constantly to urge the units pawl into contact with the units cam.

3. A digital clock as defined in Claim 2 wherein the units cam has ten teeth corresponding to the numerals from 0 to 9 for co-operating with the units pawl to permit the units cam to be driven through ten increments, the teeth corresponding to numerals 1 to 9 being relatively low in height so that when the units pawl is in engagement with any one of said relatively low teeth the counterweighted pawl lever is pivoted such that the tens pawl is spaced from the tens cam to thereby prevent the tens pawl from actuating the tens cam whenever the units pawl is in engagement with a tooth corresponding to numerals 1 to 9, the tooth on the unit cam corresponding to numeral 0 being substantially higher than the teeth corresponding to numerals 1 to 9 to pivot the pawl lever against the force of the counterweight to move the tens pawl into engagement with the tens cam whenever the units pawl is in engagement with the high tooth of the units cam so that when the units pawl is in engagement with said high tooth of the units cam with the tens pawl in engagement with the tens cam actuation of the drive lever causes actuation of the pawl lever to simultaneously move the units cam and the tens cam one increment.

4. A digital clock substantially as described herein with reference to the accompanying drawings.

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lever 84 is pivoted between the minutes cam and the tens of minutes cam for reliably actuating the cams. The counterweighted pawl 112 is all that is required for holding the minutes pawl in engagement with the minutes cam 52.

WHAT WE CLAIM IS:—

10 1. A digital clock comprising two display indicators for visually displaying numerals from 0 to 9 to indicate minutes and tens of minutes; a rotatable units cam for progressively actuating the minutes display indicator to display numerals from 0 to 9 to indicate minutes; a rotatable tens cam spaced from the units cam for progressively actuating the tens of minutes display indicator for displaying numerals to the left of the units numerals in order to indicate tens of minutes; supporting means rotatably supporting said units and tens cams on axes generally parallel to each other and spaced from each other; a drive lever pivotally mounted on said supporting means between said units and tens cams; a pawl lever comprising a central portion and two side portions, said central portion being pivotally mounted on said drive lever, said pawl lever having a units pawl formed in one of its side portions for engaging the units cam for moving the units cam one increment each minute; said pawl lever having a tens pawl formed in its other side portion for engaging and moving the tens cam an increment every ten minutes; means urging the units pawl into engagement with the units cam such that the tens pawl is normally spaced from the tens cam; and means operable to move said drive lever through one complete cycle of movement each minute for causing a corresponding single incremental movement of the units pawl and the units cam every minute; said units cam being adapted to tilt the pawl lever to engage the tens pawl with the tens cam to permit the drive lever and the tens

pawl to move the tens cam one increment every ten minutes.

2. A digital clock as claimed in Claim 1 wherein said means urging the units pawl comprises a counter weight on the pawl lever providing more weight in the vicinity of the units pawl constantly to urge the units pawl into contact with the units cam.

3. A digital clock as defined in Claim 2 wherein the units cam has ten teeth corresponding to the numerals from 0 to 9 for co-operating with the units pawl to permit the units cam to be driven through ten increments, the teeth corresponding to numerals 1 to 9 being relatively low in height so that when the units pawl is in engagement with any one of said relatively low teeth the counterweighted pawl lever is pivoted such that the tens pawl is spaced from the tens cam to thereby prevent the tens pawl from actuating the tens cam whenever the units pawl is in engagement with a tooth corresponding to numerals 1 to 9, the tooth on the unit cam corresponding to numeral 0 being substantially higher than the teeth corresponding to numerals 1 to 9 to pivot the pawl lever against the force of the counterweight to move the tens pawl into engagement with the tens cam whenever the units pawl is in engagement with the high tooth of the units cam so that when the units pawl is in engagement with said high tooth of the units cam with the tens pawl in engagement with the tens cam actuation of the drive lever causes actuation of the pawl lever to simultaneously move the units cam and the tens cam one increment.

4. A digital clock substantially as described herein with reference to the accompanying drawings.

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