

"An Alarm Setting Display Mechanism for an Alarm Clock"

5 The present invention relates to an alarm setting display mechanism capable of providing a digital indication of the time at which an alarm is set, the mechanism being suitable for an alarm clock capable of analogue time indication.

10 Generally, in an analogue alarm clock which indicates time by means of hands on a clock face, it has been usual to indicate an alarm setting by an analogue indication. Since such a conventional analogue alarm clock has a single alarm setting indicating needle, it has been difficult to set the alarm accurately to the minute scale.

15 To overcome such a disadvantage of a conventional analogue alarm clock, analogue alarm clocks capable of displaying an alarm setting by digital indication have been proposed. An alarm clock formed in accordance with the principles of the present invention to be hereinafter explained in detail, capable of displaying the alarm setting by digital indication comprises essentially two elements, namely, a clock movement comprising a motor, an hours detection wheel and a minutes detection wheel which are associated respectively with an hours time wheel and a minutes time wheel which are driven by the motor, and an alarm setting display unit comprising a minutes indication drum and an hours indication drum which are provided to display the alarm setting time by digital indication, and a plurality of transmission shafts interlinking the minutes indication drum and the said two detection wheels, the alarm setting display unit being disposed alongside the clock

movement and attached to the clock movement.

According to the present invention there is provided an analogue alarm clock having a clock casing provided with a clock face, hands driven by an hours time wheel and a minutes time wheel respectively, and an hours detection wheel and minutes detection wheel associated with the said hours time wheel and the minutes time wheel respectively, and adapted so that an alarm signal is actuated upon coincidence of the angular positions of the said time wheels with respective detection wheels, and an alarm setting display unit which is detachably connected to the said clock casing, the alarm setting display unit housing a mechanism comprising a minutes indication member interlinked rotatably with an alarm setting member, the minutes indication member having minute-scale alarm setting graduations marked thereon and connected through gear trains to both the said detection wheels, and an hour indication member having hour-scale alarm setting graduations marked thereon and adapted to be rotated intermittently by the said minutes indication member, the minutes indication member being connected to the detection wheels by interengaging transmission shafts.

Thus in the case of the present invention, the clock casing and alarm setting display unit may be assembled individually and interconnected thereafter. Consequently, the work of assembling the clock is facilitated and an alarm setting can be displayed with large characters as the alarm setting is indicated on the two alarm setting indication members.

It is preferred that the time indication members of the alarm setting display unit are drums and a drive shaft of the said display unit is disposed with its axis extending parallel to the shafts of both the said time indication drums, a transmission shaft included in the clock casing being disposed with its axis aligned with the axis of the display unit drive shaft, and the said two shafts being interconnected by means of a splined coupling.

Various embodiments of the present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a sectional view showing the principal parts of a first embodiment of a clock according to the present invention;

Figure 2 is a sectional view of the embodiment of Figure 1 on a different section line;

Figure 3 is a sectional view taken on the line I-I of Figure 1,

Figure 4 is a plan view of a part of the embodiment illustrated in Figure 1;

Figure 5 is an external view of an alarm clock incorporating the embodiment of Figure 1; and

Figure 6 is a back view of the clock of Figure 1.

Referring now to the drawings, a casing 1 is formed of a plastics material and is provided, in the left end thereof (as viewed in Figure 1) with internally threaded bosses 1a for fixing an intermediate plate 2 (which will be described later) and a cover 3 to the casing 1.

5 On the right end thereof the casing 1 has internally threaded bosses 1b for fixing a first side plate 20 of an alarm setting display unit to the casing 1 and, in the bottom wall thereof the casing 1 has a hole 1c for rotatably supporting an hours time wheel 11, a hole 1d

10 for rotatably supporting an alarm setting minutes indicating wheel 34 (Figure 7), a shaft 1e for rotatably supporting an alarm setting hours indicating wheel 35 (Figure 7) a shaft 1f for rotatably supporting an intermediate time wheel 10, a shaft 1g for rotatably supporting a selector spindle 16, two supporting parts 1h

15 each having a U-shaped groove for rotatably supporting an alarm setting transmission shaft 17 and two supporting parts 1i each having a U-shaped groove for rotatably supporting a detection lever 18. The intermediate plate 2 is also made of a plastics material and

20 has a hole for rotatably supporting an intermediate shaft 6, a shaft 2a for rotatably supporting the intermediate time wheel 10, a shaft 2b for rotatably supporting the alarm setting minutes indicating wheel 34, a boss 2c for rotatably supporting a minutes time wheel 8 having

25 a central hole for receiving the shaft 5 of a seconds time wheel, a boss 2d for rotatably supporting the detection lever 18 in cooperation with the supporting parts 1i and a hole for receiving the alarm setting selector

30 spindle 16. The cover 3 is also formed of a plastics material and has holes for rotatably supporting the inter-

mediate shaft 6, the shaft 5 of the seconds time wheel and the alarm setting selector spindle 16, and a side wall 3a for rotatably supporting the alarm setting transmission shaft 17 in cooperation with the supporting parts 1h of the casing 1. The intermediate plate 2 and the cover 3 are located on the bosses 1a of the casing 1 and are fixed thereto by screws 19.

The casing 1, the intermediate plate 2, the cover 3 and the gear trains housed within the casing constitute a clock movement.

The constitution of an alarm setting display unit for displaying a digital indication of the alarm setting will be described below. The alarm setting display unit has an hour indication drum 22, a minute indication drum 21 and other peripheral parts housed in a casing having a first side plate 20 made of a plastics material. The first side plate 20 has a boss 20b for rotatably supporting the minute indication drum 21, and a shaft 2c for rotatably supporting an indexing wheel 25. Internally threaded bosses 20d for fixing a second side plate 23 of the alarm display unit to the first side plate 20 thereof extend perpendicularly of the said first side plate 20 and are aligned with a transverse flange having a guide surface 20e for guiding the flange in attaching the unit to the clock movement, and two slots 20f formed in the guide surface for receiving screws for fixedly connecting the display unit to the clock movement. The second display unit side plate 23

is also formed of a plastics material and has a hole 23b for rotatably supporting the minutes indication drum 21 and a resilient detent 23c for indexing the minutes indication drum 21 incrementally by engagement with radially inwardly directed teeth 21b formed on the minutes indication drum 21. The second display unit side plate 23 is fixed to the bosses 20d of the first display unit side plate 20 by means of screws 26.

Referring now to the gear train of the clock movement, the seconds time wheel 4 is provided integrally with a pinion 4a and is fixed to the shaft 5, which latter is supported rotatably at one end thereof in a boss on the cover 3. The other end of the shaft 5 extends through and is supported rotatably by a tube 8b of the minutes time wheel 8. A seconds-indicating needle 13 (hereinafter referred to as the "seconds hand") is attached to the free end of the shaft 5. The seconds time wheel 4 is driven by a motor, not shown.

As seen in Figure 2 the intermediate shaft 6 is provided integrally with a pinion 6a which engages the minutes time wheel 8, a groove 6b for rotatably supporting the intermediate wheel 7 engaging the pinion 4a of the seconds time wheel 4, and a knob 6c for setting the time displayed by a clock movement. The intermediate shaft 6 is supported rotatably on both the intermediate plate 2 and the cover 3. The intermediate wheel 7 is connected to the intermediate shaft 6 by means of a slipping clutch arrangement of known type so that the intermediate wheel 7 will be able to slip relatively to the intermediate

shaft 6 when a predetermined torque is applied to the intermediate wheel 7. The minutes time wheel 8 engaging the pinion 6a of the intermediate shaft is provided integrally with a pinion 8a, a tube 8b and a cam groove 8c the function of which will be described in more detail below. One end of the tube 8b fits over the boss 2c of the intermediate plate 2 and is rotatably supported thereby. The other end of the tube 8b extends through and is supported rotatably in the tube 11a of the hours time wheel 11.

10 A minutes hand 9 is fixed to the free end of the tube 8b.

The minutes time wheel 8 is linked to the hours time wheel 11 by the intermediate hour wheel 10 which engages the pinion 8a, is provided integrally with a pinion 10a, and is supported rotatably on the shaft 1f of the casing and the shaft 2a of the intermediate plate 2. The pinion 10a engages the hours time wheel 11, which is provided integrally with a tube 11a and a cam groove 11b which will be described later. The tube 11a is supported rotatably in the hole 1c of the casing 1 and rotatably supports the tube 8b of the minutes time wheel 8. An hour hand 13 is fixed to the free end of the tube 11a.

The gear train of the alarm setting mechanism includes a minutes detection wheel 14 having a protrusion 14a formed integrally thereon located between the minutes time wheel 8 and the hours time wheel 11, and an hours detection wheel 15 having an integrally formed protrusion 15a disposed under the hours time wheel 11 and supported rotatably on the tube 11a of the hours time wheel, which tube extends through the central part of the hours detection wheel 15.

The alarm setting spindle 16 is integrally formed with a gear 16a engaging the minutes detection wheel 14, a pinion 16b engaging the hours detection wheel 15, and a crown gear 16c engaging a pinion integrally formed with an alarm setting transmission shaft 17. The alarm setting spindle 16 is supported rotatably on the stub shaft 1g of the casing 1 and in a hole in the cover 3. The alarm setting transmission shaft 17 the integral pinion of which engages the crown gear 16c of the said alarm setting spindle 16 is supported rotatably on the two supporting parts 1h of the casing each of which has a U-shape groove, and on the side wall 3a of the cover. One end of the alarm setting transmission shaft 17 projects out from the casing 1 and has an axial hole 17a having two grooves 17b as illustrated in Figure 3 for receiving the splined end of a display unit drive shaft 24 to connect the two shafts 17 and 24 together for rotation whilst allowing relative axial displacement to take place.

The alarm setting display unit has a knob 27 connected to a minutes indication drum 21 having minute-scale alarm setting graduations 21a (Figure 5) marked up to 60 minutes at intervals of 5 minutes. The minutes indication drum 21 is supported rotatably on the boss 20b of the first display unit side plate 20 at one end thereof and in a hole 23b formed in the second display unit side plate 23 at the other end thereof. An hours indication drum 22 adapted to be turned through a given angle once every full rotation of the minutes indication drum 21 by means of the indexing wheel 25 is supported rotatably on the central boss of the minutes indication drum 21. Hour-scale

alarm display graduations 22a are marked on the hours indication drum 22. Both the alarm display graduations 21a and 22a marked on both the minutes and the hours indication drums are visible through an alarm setting display window 29 formed beside the dial 28 of the clock as shown in Figure 5. The minutes indication drum 21 is provided internally with teeth 21b which engage a resilient detent 23c projecting from the second display unit side plate 23 to index the minutes indication drum 21 at every graduation corresponding, for example, to an interval of five minutes when the knob 27 is turned. A drive gear 21c is formed integrally with the minutes indication drum 21 at the right hand end of the minutes indication drum 21, which meshes with gear teeth formed at the right hand end of the display unit drive shaft 24. The display unit drive shaft 24 extends parallel to the common axis of the minutes indication drum and the hours indication drum. The left-hand end 24a of the display unit drive shaft 24 projects out through the first display unit side plate 20 and has two external splines 24b as shown in Figure 3, by which the display unit drive shaft 24 is connected to the alarm setting transmission shaft 17. A retainer 30 is fitted in the middle portion of the display unit drive shaft to restrict the rightward movement of the display unit drive shaft.

To attach the display unit to the clock movement the display unit drive shaft 24 is first placed in alignment with the alarm transmission shaft 17 and then the left-hand

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end 24a of the display unit drive shaft is inserted into the axial hole 17a in the alarm transmission shaft 17. Then the guide surface 20e of the flange on the first display unit side plate 20 is placed against the upper surface of the cover 3 and the screws 31 are inserted through the two slots 20f in the flange and into the bosses 1b of the casing 1 to fix the display unit to the casing. Thus the display unit drive shaft 24 and the alarm setting transmission shaft 17 are interconnected through the engagement of the internal and the external splines, and thereby the two shafts are able to rotate together. The length of the spline joint formed by the axial hole 17a of the alarm setting transmission shaft 17 and the splined end portion 24a of the display unit drive shaft is designed so that the spline joint will remain effective in whatever position the display unit is fixed to the clock movement within the longitudinal range of the slots 20f. Accordingly, the display unit can be fixed to the clock movement after selectively and appropriately deciding the spacing between the display unit and the clock movement.

The detection mechanism for detecting an alarm setting is as follows: A cam groove 8c is formed in the minutes time wheel 8, while a protrusion 14a is formed on the minutes detection wheel 14 so as to correspond to the cam groove 8c. The angular positions of the cam groove 8c and the protrusion 14a coincide for a predetermined period of time once every hour permitting axial displacement of the minutes detection wheel 14 during this period. Similarly, a cam groove 11b is formed in the hours time wheel 11, while a protrusion 15a is formed in the hours detect-

ion wheel 15 so as to correspond to the cam groove 11b.
The angular positions of the cam groove 11b and the
protrusion 15a coincide for a predetermined period of
time once every twelve hours permitting axial displacement
5 of the hours detection wheel 15 at this time. These two
sets of cam grooves and protrusions constitute a well
known alarm setting time detection mechanism. A
detection lever 18 for detecting the axial shift of
the minutes detection wheel 14 is interposed between
10 the minutes detection wheel 14 and the hours time wheel
11, supported rotatably by the supporting parts 1i of
the case and the boss 2d of the intermediate plate 2,
and provided with a pressing part 18a located in contact
with a movable contact member 32. The movable contact
15 member 32 is formed of an elastic conductive material,
disposed between the hours detection wheel 15 and the cas-
ing 1, stressed resiliently so as to shift the minutes
detection wheel 14 upward via the hours detection wheel
15 and the detection lever 18, and provided with a contact
20 32a constituting, in combination with a fixed contact
member 33 formed of a conductive material, a switch
which is closed when the minutes and the hours detection
wheels 14 and 15 both shift upwardly. A series connect-
ion of the detection switch consisting of the movable
25 contact member 32 and the fixed contact member 33, a
power source E and a buzzer B constitutes an alarm sig-
nal circuit.

When the alarm setting knob 27 is turned, the minutes
30 indication drum 21 connected to the alarm setting knob 27
makes indexed rotary movements and the minute-scale
alarm setting graduations 21a change sequentially accord-

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ing to the indexed stepping rotation of the minutes indication drum 21. The minutes indication drum 21 turns the hours indication drum 22 by means of the indexing wheel 25 and a well known (and not shown) intermittent drive mechanism by one twelfth of a full rotation every complete rotation thereof so that the hour-scale alarm setting display 22a is changed by a graduation corresponding to one hour. Thus the minute-scale and the hour scale alarm setting graduations are changed to set a desired time at which the alarm signal is to be generated. The gear teeth 21c of the minutes indication drum 21 engage the gear wheel of the display unit drive shaft 24, which is connected at its left-hand end 24a to the alarm setting transmission shaft 17 by means of the spline joint. The alarm setting transmission shaft 17 engages the crown gear 16c of the alarm setting spindle 16 the gear 16a of which engages the minutes detection wheel 14 and the pinion 16b of which engages the hours detection wheel 15. Accordingly, the minutes detection wheel 14 and the hours detection wheel 15 also rotate as the knob 27 is turned. Thus the respective angular positions of the protrusion 14a of the minutes detection wheel and the protrusion 15a of the hours detection wheel are determined at the same time as an alarm setting is determined.

The time indication gear train of the clock movement is driven by the motor, not shown, and the minutes time wheel 8 is rotated at a rate of one full rotation every hour whilst the hours time wheel 11 is rotated at a rate of one full rotation every twelve hours; the cam groove 8c of the minutes time wheel and the cam groove 11c of the hours time wheel are rotated correspondingly. As time

pases, the angular positions of the cam groove 8c of the minutes time wheel and the protrusion 14a of the minutes detection wheel, and the angular positions of the cam groove 11b of the hours time wheel and the protrusion 15a of the hours detection wheel coincide simultaneously. When this occurs the hours detection wheel 15 is shifted upwardly by the resilient force of the movable contact member 32, and the minutes detection wheel 14 is shifted upwardly by the detection lever 18 as the pressing part 18a of this latter is raised by the movable contact member 32 to be turned in a clockwise direction as viewed in Figure 2, and the movable contact member 32 comes into contact with the fixed contact member 33, so that the alarm signal circuit is closed and the buzzer B generates an alarm signal sound. The buzzer keeps sounding for as long as the angular positions of the cam groove 8c of the minutes time wheel and the protrusion 14a of the minutes detection wheel remain coincident with one another.

Figure 6, which is a back view of the structure shown in Figure 1, shows the two slots 20f which are formed in the side plate 20 for fixedly connecting the display unit to the clock movement.

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5 respective angular positions of the protrusion 14a of
the minutes detection wheel and the protrusion 15a of the
hours detection wheel are determined accordingly. The
functioning of this alarm setting display mechanism is
the same as that of the previously described embodiment.

10 As described hereinbefore, in an embodiment of the present
invention in which the alarm setting display unit has
time indication drums for indicating an alarm setting time,
these and the other associated parts can be assembled in
a unit separately from the clock movement, and hence clock
assembling works are facilitated. Furthermore, since the
15 position of the alarm setting display unit relative to
the clock movement is variable, the spacing between the
centre of the hands of the clock movement and the alarm
setting display unit can be freely varied within limits,
which enhances the freedom in the design of the housing of
the alarm clock. Still further, supports for supporting
20 alarm setting display wheels are formed on the casing
of the clock movement so that an alarm setting display
unit can be disposed inside the clock movement instead of
as a separate unit simply by supporting alarm setting
display wheels on the supports, which diversifies the
variety of products which can be produced from the basic
25 clock movement.

C L A I M S

1. An analogue alarm clock having a clock casing provided with a clock face, hands driven by an hours time wheel and a minutes time wheel respectively, and an hours detection wheel and a minutes detection wheel associated with the said hours time wheel and the minutes time wheel respectively, and adapted so that an alarm signal is actuated upon coincidence of the angular positions of the said time wheels with respective detection wheels, and an alarm setting display unit which is detachably connected to the said clock casing, the alarm setting display unit housing a mechanism comprising a minutes indication member interlinked rotatably with an alarm setting member, the minutes indication member having minute-scale alarm setting graduations marked thereon and connected through gear trains to both the said detection wheels, and an hour indication member having hour-scale alarm setting graduations marked thereon and adapted to be rotated intermittently by the said minutes indication member, the minutes indication member being connected to the detection wheels by interengaging transmission shafts.
2. An alarm clock as claimed in claim 1, in which the time indication members of the alarm setting display unit are drums and a drive shaft of the said display unit is disposed with its axis extending parallel to the shafts of both the said time indication drums, a transmission



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shaft included in the clock casing being disposed with its axis aligned with the axis of the display unit drive shaft, and the said two shafts being interconnected by means of a splined coupling.

5 3. An alarm clock as claimed in claim 2, in which
the said splined coupling joining the clock movement
transmission shaft and the display unit drive shaft is
displaceable axially of the shafts and guide means are
provided allowing adjustment of the relative position of
10 the display unit with respect to the clock movement.

 4. An alarm clock as claimed in claim 2 or 3,
in which the clock casing is provided both with an
attachment at which the said display unit is joined
to the clock casing, and with a bearing for supporting
15 the said transmission shaft.

6. An alarm clock substantially as hereinbefore
described with reference to the accompanying drawings.
