

"TIMEPIECE"

The present invention relates to a timepiece.

A wrist watch has been proposed having a seconds hand shaft which provides a mounting for a seconds hand and which is axially spaced from hour and minute hand shafts on which hour and minute hands are respectively mounted. Power is transmitted to the hour and minute hands as well as to the seconds hand through a gear train inside a single movement.

A wall clock has also been proposed in which hour and minute hands and a seconds hand are disposed in two different locations on the same dial, and separate movements are provided for driving the hour and minute hands and the seconds hand, respectively.

However, in the former structure in which the hour and minute hands and the second hands are disposed in two different locations and are driven from the gear train inside the single movement, the number of components of the gear train is considerable which makes for high cost and poor reliability. Further, because the relative positions of the hands is determined by the gear train, the degree of freedom in the design of the watch is limited.

In the latter structure in which the hour and minute hands and the seconds hand are associated with the respective movements for driving the corresponding hands, there is considerable freedom in the design of the clock. However,

costs are increased due to the need for two movements, and a discrepancy may occur in time indications because of difference in the basic frequencies of quartz crystals employed respectively in the two movements.

5           According, therefore, to the present invention, there is provided a timepiece having hands which are respectively rotatable about different axes of rotation, and a timepiece movement for driving said hands, the timepiece movement driving at least one of the hands by way of a transmission belt.

10           Thus, when the timepiece is a clock having hour, minute and seconds hands, the present invention enables the spacing between the position of hour and minute hands and the position of the seconds hand to be freely adjusted in the process of design without incurring high costs.

15           The timepiece movement may directly drive a shaft carrying one of the hands. Thus the said one of the hands may be a seconds hand, the timepiece having coaxial hour and minute hands which are driven by the said transmission belt.

20           The timepiece movement may drive a first wheel which is drivingly connected by the transmission belt to a second wheel, the second wheel driving the hour and minute hands. Thus, the second wheel may drive the minute hand by way of a minute hand wheel, the minute hand wheel having a reduction gear connection with an hour hand wheel which is provided  
25           with the hour hand.

The first and second wheels and the transmission belt may be housed in a case. The said case may be secured to a case for the timepiece movement.

5 The invention is illustrated, merely by way of example, in the accompanying drawings, in which:-

Figure 1 is an enlarged sectional view taken along the line 1-1 in Figure 2:

Figure 2 is a front view of a first embodiment of a clock according to the present invention;

10 Figure 3 is a front view showing a second embodiment of a clock according to the present invention;

Figure 4 is a vertical sectional view of the structure shown in Figure 3;

15 Figure 5 is an enlarged front view, partly sectioned, of a part of the structure shown in Figure 3, and

Figure 6 is a side view, partly sectioned, of the structure shown in Figure 5.

In Figures 1 and 2 there is shown a first embodiment of a clock according to the present invention which comprises a front frame or dial mounting member 2 and a rear frame 3 which are oppositely disposed within an outer peripheral frame 1. The front frame 2 and rear frame 3 are spaced apart by a support post portion 4a which is formed integrally with an intermediate frame 4.

25 A clock movement 5 is fixed to the back surface of the

rear frame 3, and a seconds hand 7 is fixed to the distal end of a seconds hand shaft 6 which is driven by the clock movement 5. A first rotating wheel 9 is fixed to a shaft 8 which is driven by the clock movement 5 at a reduced speed. At a position spaced by a certain distance above the gear 9, a second rotating wheel 10 is fixed to a shaft 11 which is journalled in the rear frame 3 and in the intermediate plate 4. The wheel 10 is driven at the same speed as the wheel 9 through a transmission belt 12.

A minute hand wheel 13 is fixed through a bushing 11a to the shaft 11 which is driven by the wheel 10. The minute hand wheel 13 has a minute hand shaft 13a, and a minute hand 14 is fixed to the minute hand shaft 13a. A minute gear 15 is in mesh with a minute hand pinion 13c which is formed on the minute hand wheel 13, and an hour hand gear 16b is in mesh with the minute gear 15, the hour hand gear 16b being formed on an hour hand shaft 16a of an hour hand wheel 16 which is mounted coaxially with the minute hand wheel 13. An hour hand 17 is fixed to the hour hand gear 16b.

The seconds hand 7, the minute hand 14 and the hour hand 17 are positioned over the front surface of a dial 18 which is bonded to the front frame 2.

Thus, the seconds hand 7 is driven by the clock movement 5 to provide a seconds indication. The torque of the wheel 9 is transmitted to the wheel 10 through the transmission

belt 12 so as to drive the minute hand 14 and thus provides a minutes indication. At the same time, torque is transmitted from the minute hand wheel 13 to the hour hand wheel 16, while being reduced in speed through the minute wheel 15, so as to drive the hour hand 17 and thus provide an hour indication.

In Figures 3-6 there is shown a second embodiment of a clock according to the present invention, the clock having a front cover 103 which is held between a front frame 101 and a rear frame 102 so that a time indicating section 104 is defined between the front cover 103 and the rear frame 102. A ring-like dial 105, for cooperation with hour and minute hands 107, 108, is disposed in the upper portion of the time indicating section 104, and another dial 106 for the seconds hand is disposed in the lower portion thereof and is spaced from the dial 105. The hour hand 107 and the minute hand 108, which are driven by a drive mechanism (described later), are rotatably mounted forwardly at the centre of the dial 105, a seconds hand 109 being rotatably mounted forwardly at the centre of the dial 106. The seconds hand 109 is driven by a clock movement 111, and a transmission unit 110 is provided for transmitting drive from the clock movement 111 to the hour hand 107 and the minute hand 108 as described later. The transmission unit 110 is fitted in a recessed portion 102a of the rear frame 102,

and ornamentation or decoration 102b is provided at the front edge of the tubular portion 102a.

As shown in Figures 5 and 6, the transmission unit 110 is connected to the front surface of a case 111a of the movement 111. The transmission unit 110 comprises a first case portion 110a and a second case portion 110b which are opposite to each other. The seconds hand shaft 112 and a drive shaft 113, both of which are driven by the movement 111, are disposed in the case portion 110a. The distal end of the seconds hand shaft 112 projects forwardly from the case portion 110a, and the seconds hand 109 is fitted over the projected distal end. The drive shaft 113, over which a minute hand has usually been fitted in the past, is driven by the seconds hand shaft 112 at a reduced speed. A belt wheel 114, which constitutes a first rotating wheel, is fixed onto the drive shaft 113. At a position which is disposed at a predetermined distance above the belt wheel 114, another belt wheel 115a, which constitutes a second rotating wheel, is formed integrally with a minute hand shaft 115. The minute hand shaft 115 is rotatably supported in the case portion 110a, and a minute hand pinion 115b is formed integrally on the minute hand shaft 115. An hour hand gear 116a is integrally formed with an hour hand shaft 116 and is rotatably mounted coaxially over the minute hand shaft 115.

A shaft 117 projects forwardly from the case portion 110b, and a minute wheel 118 is rotatably mounted on the shaft 117. The minute wheel 118 is in mesh with the minute hand pinion 115b, and a minute pinion 118a is in mesh with the hour hand gear 116a, thereby jointly constituting a reduction gear train. A transmission belt 119 extends between the first rotating wheel 114 and the second rotating wheel 115a, so that the minute hand shaft 115 is driven at the same rotational speed as the drive shaft 113, i.e. at a rotational speed at which the minute hand shaft 115 is rotated once every 60 minutes.

The minute hand shaft 115 and the hour hand shaft 116 have their distal ends projecting forwardly through the case portion 110a, the minute hand 108 and the hour hand 107 being fitted over the respective projected distal ends.

The lower end of the case portion 110b serves as a connecting portion 110c which is positioned in contact with the front surface of the case 111a for the movement 111. The transmission unit 110 is connected to the movement 111 by means of screws 120 which extend through the connecting portion 110c. The case portion 110b also has a portion 110d extending downwardly from the connecting portion 110c and, as shown in Figure 4, both the transmission unit 110 and the movement 111 are fixed together to the rear frame 102 by means of set screws 121 which extend through the portion

110d. A movement cover 122 for covering the movement 111 is connected to the rear frame 102.

The seconds hand 109 is driven by the movement 111 so as to provide a seconds indication. Torque of the first rotating wheel 114, which is fixed on the drive shaft 113 and which is driven by the movement 111, is transmitted through the transmission belt 119 to the second rotating wheel 115a. The latter is integral with the minute hand shaft 115 which is axially spaced from the seconds hand shaft 112. Thus the minute hand 108 is driven to provide a minute indication. At the same time, the torque is transmitted from the minute hand pinion 115b to the hour hand gear 116a, there being a speed reduction through the minute wheel 118. Thus the hour hand 107 is driven to provide an hour indication.

In this embodiment, the components of the mechanism for transmitting power from the movement 111 to the minute and hour hands 108, 107 are housed together in the case portions 110a, 110b to constitute a transmission unit which is drivingly connected to the movement 111, with the result that the construction is simplified and the efficiency of assembly is significantly improved.

In the embodiments described above, the hour and minute of the time is indicated separately from the seconds using a single movement, so that cost can be held at a reasonable level, the number of parts used is reduced, and reliability

is improved. In addition, since the position at which the seconds are indicated and the position at which the hour and minutes are indicated are related to each other by the transmission belt, the spacing between these positions can easily be altered so as to give a greater degree of freedom in clock design.

C L A I M S

1. A timepiece having hands which are respectively rotatable about different axes of rotation, and a timepiece movement for driving said hands, the timepiece movement driving at least one of the hands by way of a transmission belt.
- 5 2. A timepiece as claimed in claim 1 in which the timepiece movement directly drives a shaft carrying one of the hands.
3. A timepiece as claimed in claim 2 in which the said one of the hands is a seconds hand, the timepiece having  
10 coaxial hour and minute hands which are driven by the said transmission belt.
4. A timepiece as claimed in claim 3 in which the timepiece movement drives a first wheel which is drivingly connected by the transmission belt to a second wheel, the second  
15 wheel driving the hour and minute hands.
5. A timepiece as claimed in claim 4 in which the second wheel drives the minute hand by way of a minute hand wheel, the minute hand wheel having a reduction gear connection with an hour hand wheel which is provided with the hour hand.
- 20 6. A timepiece as claimed in claim 4 or 5 in which the first and second wheels and the transmission belt are housed in a case.



\* C L M S \*

7. A timepiece as claimed in claim 6 in which the said case is secured to a case for the timepiece movement.

8. A timepiece as claimed in any preceding claim in which the timepiece is a clock.

5 9. A timepiece substantially as hereinbefore described with reference to and as shown in Figures 1 and 2 or Figures 3-6 of the accompanying drawings.

10. A structure of a three hands type clock characterized in that:

15 a seconds hand shaft mounting thereon a seconds hand and disposed separately relative to hour and minute hand shafts respectively mounting thereon hour and minute hands;

a clock movement for driving said seconds hand shaft and provided with a first rotating wheel driven by said clock  
20 movement;

said hour and minute hand shafts respectively provided with an hour hand gear and a minute hand pinion which operatively interlock each other through a minute wheel; and



a transmission belt extending between said first rotating wheel and a second rotating wheel operatively interlocking to said minute hand shaft.

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