

DISPLAY APPARATUS FOR A TIMEPIECE

The present invention relates to an improved display apparatus for a timepiece such as a wrist watch, clock or the like.

Timepieces such as wrist watches are known in which the phenomenon of polarisation is used to enhance the display. For example, transparent material exhibiting birefringence has been employed in conjunction with the hour-hand, minute-hand and the second-hand for the purpose of varying colours thereof. Further, a wrist watch is also known in which a polarising plate is mounted rotatably so as to display the time by allowing only the relevant dial character to be displayed.

A pair of polarising plates can be arranged for rotation relative to each other, by mounting one of the polarising plates on a rotating shaft of the timepiece movement, in the case of a watch, the second-hand driving shaft, the other relative to the dial. In this connection, it is important to ensure that the plates are mounted properly, otherwise undesirable deformation or distortion is likely to occur, resulting in a lack of coincidence between the light transmissive axes of the paired polarising plates, (i.e. lack of coincidence between the vibratory plane of the linearly polarised light and the light transmissive axes of the polarising plates), which obscures or distorts the image.

An object of the present invention is to overcome the above problem and to ensure that the visual image is

displayed clearly at a predetermined periodical time interval.

In accordance with the present invention, we propose a display apparatus for a timepiece, having a dial
5 comprising ^a plate bearing an image to be displayed and a first polarising plate overlying the image and fixed relative thereto; and a second polarising plate which is disposed in a plane parallel to the first polarising plate and rotatable thereto by a second shaft of the
10 timepiece movement, said second polarising plate being mounted on said seconds shaft by a headed shank and opposite faces of said second polarising plate being held between the head of said shank and a washer cooperating therewith and thereby maintained parallel to said first polarising
15 plate.

The above and other objects, features and advantages of the present invention will become apparent from the following description by way of example of the preferred embodiments.

Reference is made to the accompanying drawings, in which:

Figure 1 is a perspective view of a wrist watch including display apparatus in accordance with the present invention;

Figure 2 is a part cross-sectional view of the wrist
5 watch shown in Figure 1;

Figure 3 is a plan view of a first polarizing plate;

Figure 4 is a plan view of a base of bottom plate;

Figure 5 is a side view partly in cross-section of a
mounting fixture; and

10 Figure 6 is a fragmentary view partly in cross-section,
showing a detail of the display apparatus.

Figure 1 shows an analogue display type wrist watch
21 having a substantially circular dial or face on which a
picture of a girl is displayed.

15 As will be seen from the part cross-sectional view of
Figure 2, the case 5 of the watch 21 is fitted with a
transparent face cover 27 and rear cover 23 and contains a
frame 22 which serves to secure the watch movement 4. A
minute hand 7 and an hour hand 8 are mounted respectively
20 on rotating shafts 28 and 29 driven by the movement 4.

The dial or face of the watch includes a circular base
plate 3 on which is disposed a thin display plate or disc 2
made of sheet material such as paper, plastics material or
metal or the like and bearing a picture, pattern, photograph,
25 symbols or any other image to be displayed. One top of the
display plate or disc 2 is a first polarizing plate or

disc 1 adapted to convert natural light to linearly polarized light. To locate the plates 1 to 3 in a desired relative position, the circular base plate or disc 3 (Figure 4) has a number of upwardly projecting lugs 16 (four shown) 5 that are equally angularly spaced around its periphery to engage with notches 10 in the first polarizing plate 1 (Figure 3) and similar notches in the display plate 2.

Radial slits 17 on each side of each of the lugs 16 serve to prevent deformation of the base plate due to forces 10 applied to the lugs 16.

The base plate 3 and first polarizing plate 1 respectively have central holes 26 and 25 and the display plate also has a central hole (not shown) enabling the dial or face assembly to be fitted over the shaft 29 in which position it is held 15 firmly against the movement 4 by an abutment 24 in the form of a downwardly projecting rim around the interior of the casing 5.

If desired, the image to be displayed may be printed directly on the base plate so avoiding the need for a separate 20 display plate or disc 2.

A second polarizing plate or disc 6 which like the plate 1 is adapted to convert natural light to linearly polarized light, is mounted above the hands by means of a mounting fixture 11. The shank 13 of the fixture which passes 25 through a central hole 9 in the disc, has a bore formed coaxially in the shank within which the second hand drive

shaft 19 is tightly received, the disc 6 being held sandwiched between a washer 14 fitted around the shank 13 and a head 12 of the fixture 11, from which it is reflected to return along the same path back toward the eyes of the user. Thus, the image on the display disc can be observed. On the other hand, when the light-transmissive axes of the discs are disposed orthogonally, the image on the display disc 2 becomes invisible. In place of a second hand an arrow 30 may be marked on the second polarizing disc 6.

10 With the structure of the watch or timepiece in more general sense implemented according to the teaching of the invention, an image in the form of a picture, photograph, or the like information provided on the display plate can be displayed periodically at a predetermined time interval, whereby the display of the dial plate of the timepiece can be

15 accentuated by the periodical variation or change thereof. Further, by virtue of such structure in which the first polarizing disc to be mounted on the dial plate is sandwiched between the base plate and the case with the

20 second polarizing disc being mounted with the aid of the mounting fixture, there arises no possibility of the polarizing plates being deformed or distorted, whereby the contents or information carried by the display disc can be clearly observed owing to the feature that the incoincidence between

25 the light transmissive axes of the pair polarizing plates as well as distortion of the image of the display or dial

plate can be positively excluded.

In operation, the second polarizing disc 6 fixely mounted on the second-hand rotating shaft 19 performs one complete rotation per minute. Consequently, the light transmission axes of the first and second polarizing plates 1 and 6 coincide with each other once every thirty seconds. When the light-transmissive axes of the two discs coincide the linearly polarized light transmitted through the second polarizing disc 6 will travel through the first polarizing disc 1 to impinge upon the display disc 2.

CLAIMS

1. A display apparatus for a timepiece, having a dial comprising a plate bearing an image to be displayed and a first polarising plate overlying the image and fixed relative thereto; and a second polarising plate which is
5 disposed in a plane parallel to the first polarising plate and rotatable relative thereto by a seconds shaft of the timepiece movement, said second polarising plate being mounted on said seconds shaft by a headed shank and opposite faces of said second polarising plate being held
10 between the head of said shank and a washer cooperating therewith and thereby maintained parallel to said first polarising plate.
2. Apparatus according to claim 1 wherein the image bearing plate comprises a display plate carried by a base
15 plate the base plate having retaining means along the peripheral edge thereof engageable in notches along the peripheral edge of the first polarising plate, respectively to thereby maintain the display plate and the first polarising plate in a superimposed structure, the peripheral
20 edge portion of the first polarising plate being pressed against the base plate by a portion of a case.
3. Apparatus according to claim 1 or claim 2, wherein the second-hand of the timepiece is replaced by a suitable indicator marked on the second rotatable polarising plate.
- 25 4. Apparatus according to claim 1, further comprising a case in which the image-bearing plate, seconds shaft



and the second polarising plate are housed and a fixing means comprising a hold-down portion formed on the inside of the case, wherein said hold-down portion abuts a top surface of the first polarising plate whereby the
5 first polarising plate and the image-bearing plate are fixedly held together on the base plate.

5. A timepiece incorporating a display apparatus as claimed in any preceding claim.

6. A timepiece constructed and arranged substantially
10 as hereinbefore described with reference to and as illustrated in the accompanying drawings.

