

"MOON PHASE DISPLAY TIMEPIECE"

This invention relates to a moon phase display timepiece.

According to the present invention, there is provided a moon phase display timepiece comprising an hour gear which drives an hour indicating member; a moon phase indicating rotary member; and a slip-permitting drive transmission for transmitting drive from the hour gear to the moon phase indicating rotary member, the said drive transmission permitting angular adjustment of the moon phase indicating rotary member without causing angular adjustment of the hour gear.

The said drive transmission preferably comprises a moon phase wheel which is driven from the hour gear by way of a gear train and which is drivingly connected to the moon phase indicating rotary member by a slip mechanism.

Preferably the moon phase indicating rotary member and the moon phase wheel are coaxially mounted on a common shaft.

Preferably, the moon phase indicating rotary member is fixed to the said common shaft and the moon phase wheel is rotatably mounted on the latter, a slip spring which engages the moon phase wheel being mounted on the said common shaft so as to transmit drive thereto from the

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moon phase wheel.

The hour gear is preferably mounted on a shaft which carries an hour hand.

5 There is preferably a reduction ratio of 118:1 between the hour gear and the moon phase wheel.

10 Preferably the number of teeth of the hour gear is 32, the number of teeth of the moon phase wheel is 59, and the reduction ratio between the hour gear and the moon phase wheel produced by means of the said gear train is 64:1.

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

15 Figures 1 to 3 show an embodiment of a moon phase display timepiece according to the present invention wherein,

Figure 1 is a side elevational view of a slip mechanism thereof;

Figure 2 is an elevational view of the timepiece;

Figure 3 is a side elevational view thereof; and

20 Figure 4 is an elevational view of the main part of a known clock.

25 A known moon phase display clock is shown in Figure 4. An hour pinion 21 is attached to an hour pipe 20 to which an hour hand (not shown) is attached, and this hour pinion 21 is engaged with an intermediate wheel 22. A pin 23 is mounted on one surface of the intermediate wheel 22 and is

engageable with teeth of a moon phase plate 24 so as to move the moon phase plate 24 through one step at every rotation of the intermediate wheel 22. A click spring 25 is engaged with the moon phase plate 24 to prevent accidental rotation of the latter. The intermediate wheel 22 rotates through one complete revolution in 24 hours, and in the course of every such complete revolution the pin 23 moves the moon phase plate 24 by one pitch. The reference numeral 26 indicates a display.

In the clock shown in Figure 4, however, since the moon phase plate 24 is moved intermittently by the pin 23, when the moon phase plate 24 needs to be corrected, it is impossible to rotate the moon phase plate 24 manually while the pin 23 is engaged with the moon phase plate 24, and this is inconvenient. Furthermore, since the indication of the moon phase changes every day in a comparatively short time period, it cannot be said that the exact moon phase for the time period is always displayed.

Accordingly, it is an object of the present invention to overcome the above-described defects in the prior art.

Referring to Figures 2 and 3, a tubular shaft, or "hour pipe" 2 is mounted on and extends from a base 1 and an hour gear or pinion 3 is fixedly mounted on the hour pipe 2, the latter being driven by a clock mechanism (not shown) so as to make two revolutions per day. The hour pinion 3

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meshes with an intermediate wheel 4 having an intermediate pinion 4a which meshes with an intermediate wheel 5 having an intermediate pinion 5a. The latter meshes with an intermediate wheel 6 having an intermediate pinion 6a which meshes with a moon phase wheel 11. The intermediate wheels 4, 5 and 6 have the same shape. The hour pipe 2 carries an hour hand (not shown).

A moon phase washer or stub shaft 8 is rotatably supported on a moon phase pipe or shaft 7 by an E ring 9. As shown in Figure 1, a moon phase indicating plate 10 is fixedly mounted on the washer 8 which freely rotatably supports the moon phase wheel 11. A slip spring 12, which is mounted on the washer 8, is inserted between the washer 8 and the moon phase wheel 11 so as to engage the latter. The use of the slip spring 12 thus permits drive to be transmitted from the hour pinion 3 to the moon phase indicating plate 10 while permitting angular adjustment of the latter without causing angular movement of the hour pinion 3.

The rotation of the hour pipe 2 is thus transmitted to the moon phase wheel 11 through the intermediate wheels 4, 5 and 6, and the rotation of the moon phase wheel 11 is ordinarily transmitted to the washer 8 by the sliding load of the slip spring 12, thereby continuously rotating the moon phase indicating plate 10. In manually correcting



the position of the moon phase indicating plate 10, however, the washer 8 and the slip spring 12 slip relatively to each other, thereby preventing any rotation of the moon phase wheel 11.

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Suppose, for example, that the moon indicating phase plate 10 is rotated completely in 59 days. Since the hour pipe 2 makes two revolutions per day, the reduction ratio between the hour pipe 2 and the moon phase wheel 11 must be 1 : 118. Therefore, the ratio of the numbers of teeth between the hour pinion 3 and the moon phase wheel 11 must be:-

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$$\frac{1}{\text{number of teeth of the hour pinion}} \times \frac{\text{number of teeth of the intermediate wheel 4}}{\text{number of teeth of the intermediate pinion 4a}} \times \frac{\text{number of teeth of the intermediate wheel 5}}{\text{number of teeth of the intermediate pinion 5a}}$$

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$$\begin{array}{l} \text{number of teeth of the intermediate wheel 6} \\ \times \end{array} \frac{\text{number of teeth of the intermediate pinion 6a}}{\text{number of teeth of the moon phase wheel 11}} = 118$$

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..... (1)

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If it is assumed that the numbers of teeth of the intermediate wheels 4, 5, 6 are the same and the numbers of teeth of the intermediate pinions 4a, 5a and 6a are the same, respectively, and the reduction ratio is $\frac{1}{n}$, then

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$$\frac{1}{mn^{3/2}} \times \frac{nx}{x} \times \frac{nx}{x} \times \frac{nx}{x} \times \frac{59m}{1} = 118 \dots\dots (2)$$

(where m, n and x are integers)

5 In order to dispense with the use of a large wheel, if the numbers of teeth of the intermediate wheels 4, 5 and 6, the intermediate pinions 4a, 5a, and 6a and the moon phase wheel 11 are arranged not to exceed 100, the ratio of teeth is limited to the following case:

$$10 \quad \frac{1}{32} \times \frac{4x}{x} \times \frac{4x}{x} \times \frac{4x}{x} \times \frac{59}{1} = 118 \dots\dots\dots (3)$$

(1 and 4 are substituted for the m and n, respectively in the formula (2)).

15 A positive integer not greater than 25 is substituted for x in the formula (3).

For example, if x = 15 in the formula (3) a formula (4) is obtained:

$$\frac{1}{32} \times \frac{60}{15} \times \frac{60}{15} \times \frac{60}{15} \times \frac{59}{1} = 118 \dots\dots\dots (4)$$

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In other words, the reduction ratio between the hour pinion 3 and the moon phase wheel 11 is 118:1.

Moreover, the number of teeth of the hour pinion is 32, the number of teeth of the moon phase wheel 11 is 59, and the reduction ratio between the hour pinion 3 and the moon phase wheel 11 produced by the gear train 4, 4a, 5, 5a, 6, 6a is 64:1.

Thus in the moon phase display clock described above, there is no time period during which manual correction of the moon phase indicating plate 10 is impossible, and the moon phase indicating plate 10 is continuously rotated, thereby enabling an exact display of a moon phase.

C L A I M S

1. A moon phase display timepiece comprising an hour gear which drives an hour indicating member; a moon phase indicating rotary member; and a slip-permitting drive transmission for transmitting drive from the hour gear to the moon phase indicating rotary member, the said drive transmission permitting angular adjustment of the moon phase indicating rotary member without causing angular adjustment of the hour gear.
2. A timepiece as claimed in claim 1 in which the said drive transmission comprises a moon phase wheel which is driven from the hour gear by way of a gear train and which is drivingly connected to the moon phase indicating rotary member by a slip mechanism.
3. A timepiece as claimed in claim 2 in which the moon phase indicating rotary member and the moon phase wheel are coaxially mounted on a common shaft.
4. A timepiece as claimed in claim 2 in which the moon phase indicating rotary member is fixed to the said common shaft and the moon phase wheel is rotatably mounted on the latter, a slip spring which engages the moon phase wheel being mounted on the said common shaft so as to transmit drive thereto from the moon phase wheel.



5. A timepiece as claimed in any preceding claim in which the hour gear is mounted on a shaft which carries an hour hand.

5 6. A timepiece as claimed in any of claims 2 to 4 in which there is a reduction ratio of 118:1 between the hour gear and the moon phase wheel.

10 7. A timepiece as claimed in any of claims 2 to 4 or in claim 6 in which the number of teeth of the hour gear is 32, the number of teeth of the moon phase wheel is 59, and the reduction ratio between the hour gear and the moon phase wheel produced by means of the said gear train is 64:1.

15 8. A moon phase display timepiece substantially as hereinbefore described with reference to and as shown in Figures 1-3 of the accompanying drawings.

9. A moon phase display clock comprising:

20 a moon phase plate; a moon phase wheel which is supported so as to be rotatable coaxially with said moon phase plate; a slip mechanism provided between said moon phase plate and said moon phase wheel; an hour pinion provided around an hour pipe, the rotation of the hour pinion being transmitted to the moon phase wheel; and an intermediate wheel train for ~~transmitting the rotation~~ of said hour pinion.