

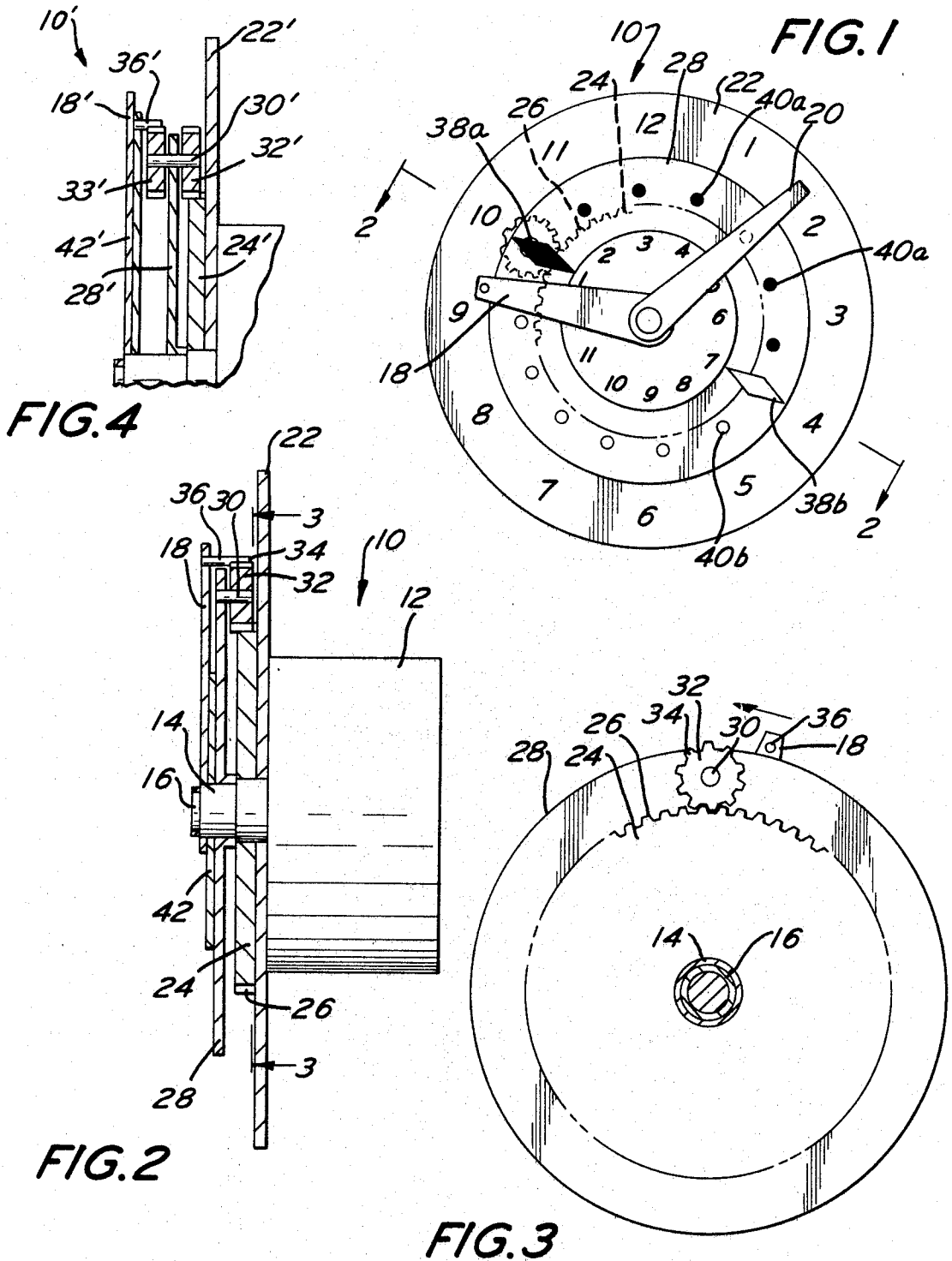
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TIDE CLOCK

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3,524,313
TIDE CLOCK

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7 Claims

ABSTRACT OF THE DISCLOSURE

A clock for indicating the time of the occurrence of the high and low tides during each day. The clock also indicates the amount of time until the next high or low tide from any point of time during the day, and the time of the occurrence of the high and low tides for several days to come.

The present invention relates to a tide clock, and more particularly to a clock for indicating the time of the occurrence of the high and low tides during each day as well as the amount of time until the next high or low tide from any point of time during a day.

BACKGROUND

To the mariner and fisherman on tidal waters knowledge of the position and changing of the tides is important information. Since the tides are controlled by the position of the moon, and the position of the moon changes each day, the time of the occurrence of the high and low tides changes each day. Therefore, it would be desirable to have a clock which indicates the time of the high and low tides for each day. It would also be desirable to have the clock indicate the amount of time until the next change of tide from any point of time during the day.

SUMMARY

The tide clock of the present invention includes a standard clock mechanism, either a wound spring or electric operated, which drives a pair of concentric shafts on the ends of which are the minute and hour arms. A standard dial is provided which indicates the time of day. A stationary gear surrounds the shafts, and a plate is rotatably supported around the shafts adjacent the gear. The plate supports a pinion gear which meshes with the teeth of the stationary gear. As the pinion gear rotates about its own axis, it rotates about the stationary gear and rotates the plate around the shafts. The hour arm or an arm or disc rotating with the hour arm has a pin or gear segment for engaging the pinion gear to rotate the pinion gear. The ratio of the teeth of the gear, the pinion gear and the pin or gear segment is such that $29\frac{1}{2}$ revolutions of the hour arm drive shaft causes the pinion gear to rotate one revolution around the gear. The plate has two marks on its face, one indicating the high tide and the other the low tide. The position of the marks on the time dial indicates the time of the next high and low tides. Upon each revolution of the hour arm the pinion gear is rotated to rotate the plate an amount equivalent to the change in the time of the next high and low tide. Thus, the clock indicates the proper time for the next high and low tides for each day.

BRIEF DESCRIPTION OF DRAWINGS

For the purpose of illustrating the invention there is shown in the drawings forms which are presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

FIG. 1 is a front plan view of the tide clock of the present invention.

FIG. 2 is a partial sectional view taken along line 2—2 of FIG. 1.

FIG. 3 is a back view taken along line 3—3 of FIG. 2.

FIG. 4 is a sectional view of a portion of a modification of the tide clock of the present invention.

DESCRIPTION OF INVENTION

Referring to FIGS. 1-3 of the drawings, the tide clock of the present invention is generally designated as 10. Clock 10 includes a standard clock movement, generally designated as 12, having a pair of concentric output shafts 14 and 16. The clock movement 12 may be any well known type of clock movement which is either operated by a wound spring or electrically operated. Since the details of the clock movement 12 are not a part of the present invention and are well known, a detailed description of the clock movement will not be given.

A pair of arms 18 and 20 are mounted on the ends of the shafts 14 and 16 respectively so as to rotate with the respective shafts, and extend radially from the shafts. The arm 20 is longer than the arm 18 so that the arm 20 is the minute indicating arm, and the arm 18 is the hour indicating arm. A face plate 22 surrounds the shafts 14 and 16 and is secured to the clock movement 12. As shown in FIG. 1, the face plate 22 has indicia on its front surface to indicate the hours and minutes. As shown, the clock 10 is a twelve hour clock in which the hour arm shaft 14 rotates at a speed of two revolutions per day (2 r.p.d.). However, as will be explained later, the clock 10 can be a 24 hour clock in which the hour arm shaft rotates at a speed of one revolution per day (1 r.p.d.).

A gear 24 having teeth 26 surrounds the shafts 14 and 16 and is fixedly secured to the clock movement 12. A tide time indicator plate 28 surrounds the shaft 14 and 16 adjacent the gear 24 and is rotatable with respect to the shafts and the face plate 22. The tide time indicator plate 28 is of a diameter greater than the diameter of the gear 24. A pin 30 projects from the back surface of the tide time indicator plate 28 adjacent the edge of the plate 28. A pinion gear 32 is rotatably mounted on the pin 30 and has teeth 34 which mesh with the teeth 26 of the gear 24. The pinion gear 32 is of a diameter so that its teeth 34 project slightly beyond the edge of the tide time indicator plate 28. A pin 36 is secured to the hour arm 18 and extends across the edge of the tide time indicator plate 28 and over the gear 24.

On the front face of the tide time indicator plate 28 are a pair of indicator indicia 38a and 38b, which, as shown, are diamond shaped with the points at the edge of the plate 28. The indicator indicia 38a, which is a shaded diamond, is located at the pinion gear supporting pin 30, and the indicator indicia 38b, which is a diamond outline, is spaced slightly over 180° (actually six hours and twelve minutes) from the indicator indicia 38a. Additional indicia are provided on the front surface of the tide time indicator plate 28 circumferentially between the indicator indicia 38a and 38b. Going clockwise from the indicator indicia 38a to the indicator indicia 38b, the additional indicia are uniformly spaced solid dots 40a, and from the indicator indicia 38b to the indicator indicia 38a, the additional indicia are uniformly spaced small circles 40b. Of course the indicator indicia and the additional indicia can take other forms, such as triangles or colored marks of any shape.

A third plate 42 surrounds the shafts 14 and 16 between the tide time indicator plate 28 and the hour arm 18. The third plate 42 is smaller in diameter than the tide time indicator plate 28 so that it does not conceal the indicia on the tide time indicator plate. The third plate 42 is secured to either the hour arm 18 or the shaft 14 so that it rotates with the hour arm. On the front face of the

third plate 42 are the numbers 1 through 11 which are arranged in consecutive order clockwise around the third plate with the hour arm 18 being between the number 1 and the number 11.

In the operation of the clock 10, the hour arm 18 makes one revolution each twelve hours. Once during each revolution of the hour arm 18, the pin 36 on the hour arm engages the teeth 34 of the pinion gear 32 so as to rotate the pinion gear. Thus, the pinion gear 32 rotates in a planetary orbit around the gear 24. The rotation of the pinion gear 32 around the gear 24 rotates the tide time indicator plate 28 with respect to the face plate 22.

The ratio between the pin 36, the number of teeth 34 on the pinion 32 and the number of teeth 26 on the gear 24 is such that $29\frac{1}{2}$ revolutions of the hour arm shaft 14 produces one revolution of the pinion 32 around the gear 24. This is accomplished by a ratio of 28.5 to 1. Since the pinion 32 is in planetary orbit, the shaft 14 is required to make one extra revolution to complete the $29\frac{1}{2}$ turn cycle. For example, if the gear 24 has 57 teeth and the pinion 32 is advanced by two teeth each time it is engaged by the pin 36, after the pinion is advanced $28\frac{1}{2}$ times the pinion will have completed one orbit around the gear 24. However, since the pinion 32 has traveled this one orbit, the pin 36 carried by the hour arm 18 must complete one more revolution to catch up with the pinion. Of course, other gear ratios can be used to achieve this same result. One such gear ratio will be described later with regard to the modification shown in FIG. 4.

Since the clock 10 shown in FIG. 1 is a twelve hour clock in which the hour arm drive shaft 14 rotates at 2 r.p.d., and the pinion 32 makes one revolution around the gear 24 for $29\frac{1}{2}$ revolutions of the shaft 14, the tide time indicator plate 28, which rotates with the pinion, completes two revolutions in $29\frac{1}{2}$ days. This period of time represents a lunar month, being the amount of time required for the moon to complete one orbit of the earth. Since the tides are controlled primarily by the position of the moon, this represents the best day to day average on which to predict the occurrences of the tides. The shaded diamond shaped indicia 38a on the front face of the tide time indicator plate 28 points to a number on the face plate 22 to indicate the time of the next high tide. The outline diamond shaped indicia 38b on the tide time indicator plate 28 points to a number on the face plate 22 to indicate the time of the next low tide. Thus, as shown in FIG. 1, the next high tide is at 10 o'clock, and the next low tide is at slightly after 4 o'clock. When 10 o'clock occurs, the hour arm 18 reaches the pinion 32 and the pin 36 engages the pinion teeth 34 causing the pinion 32 to advance around the gear 24 by two teeth. This rotates the tide time indicator plate 28 so that the indicia 38a now points to the time of the occurrence of the next high tide. Thus, at the time of each high tide, the tide time indicator plate 28 is rotated to indicate the time of the next high tide.

The solid dots 40a on the tide time indicator plate 28 are angularly spaced apart according to the differences in the time of succeeding high tides. Thus, the solid dots 40a indicate the time of the high tides for the succeeding several days. The small circles 40b are similarly spaced apart so that they indicate the time of the low tides for the next succeeding days. Thus, the clock 10 not only indicates the time of the next high and low tides, but also the time of such tides for several days to come.

The third plate 42, which rotates with the hour arm 18, is numbered to indicate the time remaining until the next high and low tides. The time remaining until the next high tide is the number adjacent the shaded diamond indicia 38a. Thus, as the clock 10 appears in FIG. 1, there is one more hour until the next high tide. Similarly, the number on the third plate 42 adjacent the outline diamond indicia 38b indicates the time remaining until the

next low tide. Thus, the clock 10 not only indicates the time of the next tides, but also the amount of time until the next tides.

Referring to FIG. 4, there is shown a modification of the tide clock of the present invention, generally designated as 10', which is identical to the clock 10 of FIGS. 1-3 except for the manner of driving the pinion gear. In the clock 10', the stationary gear 24', which is adjacent the face plate 22', is smaller in diameter than the gear 24 of the clock 10. The pinion supporting pin 30' extends through and is rotatably supported on the tide time indicator plate 28' at a point spaced radially inwardly from the edge of the tide time indicator plate. The pinion gear 32' is mounted on the back end of the pin 30' so as to rotate with the pin 30', and meshes with the gear 24'. A pinion drive gear 33' is mounted on the front end of the pin 30' so as to rotate with the pin 30'. The drive pin 36' is secured to either the hour arm 18' or the third plate 42' which rotates with the hour arm 18'. The drive pin 36' projects to the tide time indicator plate 28' at a point so as to engage the teeth of the pinion drive gear 33'.

As in the clock 10, the ratio between the pin 36', the number of teeth on the pinion drive gear 33', the number of teeth on the pinion 32' and the number of teeth on the stationary gear 24' is such that $29\frac{1}{2}$ revolutions of the hour arm shaft produces one revolution of the pinion 32' around the gear 24'. Various ratios of gear teeth will achieve this result, for example, by having a gear 24' with 38 teeth, a pinion 32' with 8 teeth and a pinion drive gear 33' with 6 teeth. The clock 10' operates in the same manner as the clock 10 previously described except that the tide time indicator plate 28' is moved during each revolution of the hour arm 18' by the pin 36' engaging and rotating the pinion drive gear 33' which in turn rotates the pinion gear 32' around the gear 24'. The clock 10' has the advantage that all of the pins and gears are hidden by the third plate 42' and the tide time indicator plate 28' so as to provide the clock with a neater appearance.

As previously stated, the clock 10 or the clock 10' can be a 24 hour clock as well as a 12 hour clock. In a 24 hour clock, the face plate 22 is numbered from 1 to 24, and the hour arm shaft 14 rotates at one revolution per day. The tide time indicator plate 28 has two indicia for indicating the high tides and two indicia for indicating the low tides. Also, a second pinion engaging pin is carried by the hour arm shaft and is located 180° from the pin on the hour arm. Thus, the pinion is moved every 12 hours as in a 12 hour clock. Otherwise the 24 hour clock operates in the same manner as described above with regard to the 12 hour clock. Of course, the entire clock 10 can be encased in a housing which has either a stand for supporting the clock on a table or means for mounting the clock on a wall, or, for a small size version, means for carrying the clock on a person.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than the foregoing specification as indicating the scope of the invention.

I claim:

1. A clock for indicating the time of the tides comprising a clock movement having a rotating output shaft for supporting a hour arm, a face plate surrounding the shaft and having indicia on its front surface indicating the hours, a gear surrounding the shaft and fixed with regard to the clock movement, a tide time indicator plate surrounding the shaft and rotatable with respect to the shaft and the face plate, pinion gear means rotatably supported on the tide time indicator plate and meshing with the teeth of the gear, said pinion gear means being rotatable in a planetary orbit around the gear, means carried by the shaft for rotating the pinion gear means once during each revolution of

5

the shaft partially around the gear and thereby rotate the tide time indicator plate, and indicia on the face of the tide time indicator plate pointing to the indicia on the face plate so as to indicate the time of the occurrence of the tides.

2. A clock in accordance with claim 1 in which the ratio of the number of teeth on the gear, the pinion gear means and the means for rotating the pinion gear means is such that the pinion gear means is rotated once around the gear for each $29\frac{1}{2}$ revolutions of the shaft.

3. A clock in accordance with claim 2 including an hour arm carried by the shaft and the means for rotating the pinion gear means is positioned at the hour arm so as to rotate the pinion gear means when the hour arm reaches the pinion gear means.

4. A clock in accordance with claim 3 including a third plate extending across the front surface of the tide time indicator plate and secured to the shaft to rotate with the shaft, and indicia on said third plate for indicating the amount of time remaining until the next change of tide.

5. A clock in accordance with claim 3 in which the means for rotating the pinion gear means comprises a

6

pin which engages the pinion gear means once during each revolution of the shaft.

6. A clock in accordance with claim 4 in which the pinion gear means includes a pair of gears secured together to rotate about the same axis, one of said pinion gears meshing with the fixed gear and the other pinion gear being engaged by the pin which rotates with the shaft.

7. A clock in accordance with claim 6 in which the two pinion gears are on opposite sides of the tide time indicator plate and are mounted on opposite ends of a pin which extends through and is rotatably supported by the tide time indicator plate.

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