

PATENT SPECIFICATION

(11)

1 345 283

1 345 283

- (21) Application No. 3535/72 (22) Filed 25. Jan. 1972 in
(31) Convention Application No. 110 500 (32) Filed 28 Jan. 1971 in
(33) United States of America (US)
(44) Complete Specification published 30 Jan. 1974
(51) International Classification G04C 5/00
(52) Index at acceptance
G3T A5B1



(54) LOW AMPLITUDE INDEXING MECHANISM FOR A TIMEPIECE

(71) We, TIMEX CORPORATION, a Corporation organized under the Laws of the State of Delaware, United States of America, of Waterbury 20, Connecticut, United States of America, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to horology and more particularly to an indexing mechanism for a timepiece.

A balance wheel when used as a slave motor in electric or electronic watches governed by a quartz crystal oscillator, oscillates at a relatively low amplitude. It is difficult with known indexing systems to convert the relatively low amplitude oscillations of the balance wheel into rotary motion.

It is an object of this invention to provide a new and improved indexing mechanism.

Another object of this invention is to provide a new and improved low amplitude indexing mechanism such as is suitable for example for use in quartz crystal oscillator governed watches.

According to the present invention there is provided an indexing mechanism for a timepiece comprising: a balance staff journaled for oscillation; an oscillator mounted on the staff and causing movement of said staff; an index wheel having a plurality of peripheral teeth and a member mounted on the balance staff comprising an index pin support plate having two arms and an index pin projecting away from the surface of each arm alternately to engage the teeth of the index wheel to cause indexing thereof upon oscillation of said oscillator and staff, the index wheel teeth being cut to a depth to permit some variation in the amplitude of oscillation of said oscillator

[Price 25p]

and staff from a normal amplitude, if the mechanism is subjected to sudden movement, before the index pins bank against the root portions of the teeth.

The indexing mechanism of the present invention is suitable as a low amplitude indexing mechanism for electric or electronic watches particularly quartz crystal oscillator governed watches. The mechanical oscillator, for example a balance wheel, may be governed by a quartz crystal oscillator and dividing circuit of the type described in our copending Patent Application No. 12630/70 (Serial No. 1,300,257). The oscillations of the balance wheel occur at relatively low amplitude and conventional indexing systems are not generally satisfactory under such conditions.

In this invention, the index wheel is directly coupled to the oscillating balance staff by a member mounted on the staff. In a preferred form, a low amplitude oscillator such as a balance wheel and a plate member are both mounted on a balance wheel staff and oscillate together. The plate member includes pins mounted thereon to engage the teeth of the index wheel. The index wheel have a predetermined deep cut configuration to permit amplitude variations while the maximum amplitude is limited by the banking of the pins on the roots of the index wheel teeth.

The present invention will now be further described by way of example with reference to the accompanying drawings, wherein:

Figure 1 is a plan view of an indexing mechanism according to the invention in a watch, further details of which are not illustrated, the movement of the low amplitude oscillator being shown in phantom; and

Figure 2 is a partially cross-sectioned side view of the mechanism shown in 90

Figure 1.

Referring to the drawings, the indexing mechanism includes a balance assembly 10 including a low amplitude oscillator 12 such as a balance member or wheel having either a coil or magnet (not shown) mounted thereon. The balance member 12 is mounted about a balance staff 13 which is journaled at one end in a bearing 14. An index pin support plate 16 is also fixedly mounted to the balance staff and spaced apart from balance member 12 by a member 17.

The index pin support plate 16 comprises a base portion 18 and two arms 19 and 21 extending outwardly therefrom at an angle. A pair of pins 22 and 23 are mounted one in each arm 19 and 21 respectively for contacting the teeth 24 of an index wheel 11. The index pins extend away from the plate 16 at right angles and alternately drive the index wheel 11 as the balance staff oscillates back and forth. The pins 22 and 23 are shown in peak position for normal amplitude in Figure 1, that is, one pin 22 being located about half way down the radial wall of a tooth 24. The motion of the staff 13 is transmitted through the movement of the plate 16 as shown in phantom in Figure 1.

The index wheel teeth 24 are deep cut to permit amplitude variations which may be caused by sudden jolts and movements. The pins 22 and 23 bank against the roots 26 of the teeth 24 whenever the amplitude is excessively disturbed. The pins 22 and 23 thereby limit the balance amplitude to an acceptable level which is a function normally performed by an index lever.

The index wheel 11 is mounted about a staff 27 which is journaled at one end in a bearing 28 in a train bridge 29 while the other end is journaled in a bearing 31 in a front frame 32. A drag disc 33 having a plurality of teeth 34 on the outer periphery thereof is fixedly mounted on the bottom of the index wheel 11. The teeth 34 of the disc 33 are engaged by one end of an elongated drag spring 36 to prevent reverse motion of the wheel 11 during indexing. The other end of spring 36 is mounted in a support 37 which is secured to the front frame 32.

In operation, the balance staff 13 oscillates under control of an electric or electronic drive means (not shown). The pins 22 and 23 alternately engage the teeth 24 of the index wheel 11 as the index pin support plate 16 is oscillated by the balance staff 13. The pin 22 rides on the surface of a tooth 24 moving wheel 11 in the indicated direction. As the pin 22 becomes disengaged from a tooth 24, the pin 23 comes into contact with another index wheel tooth 24, see illustration in

phantom. The drag spring 36 engages the disc 33 to prevent any backward movement of the index wheel 11 during operation.

The indexing mechanism of the present invention is particularly intended for timepieces such as quartz crystal watches wherein the balance wheel oscillates at a relatively low amplitude. Since such watches are intended to be extremely accurate, the indexing system must be extremely efficient and must avoid the introduction of errors. This is accomplished by means of direct coupling between the balance assembly 10 and the index wheel 11. There is no provision for the conventional index lever which would be ineffective at low balance amplitudes of oscillation.

If an index lever were to be used, the design would be unnecessarily complicated and the banking problems associated with such levers would be introduced. With the present invention, a jolt would cause the pin 22 or 23 to bank on the root 26 of the index tooth 24. The index wheel teeth are particularly deep cut to permit some amplitude variation due to a jolt before banking occurs.

The indexing mechanism described herein is an efficient means for transmitting power from the balance wheel without the use of intermediate indexing levers. Furthermore, the problems associated with indexing systems such as maintaining the lever in draw at its extreme positions, are eliminated.

Having regard to the provisions of Section 9 of the Patent Act, attention is directed to the claims of Patent No. 1 292 237.

WHAT WE CLAIM IS:—

1. An indexing mechanism for a timepiece comprising: a balance staff journaled for oscillation; an oscillator mounted on the staff and causing movement of said staff; an index wheel having a plurality of peripheral teeth and a member mounted on the balance staff comprising an index pin support plate having two arms and an index pin projecting away from the surface of each arm alternately to engage the teeth of the index wheel to cause indexing thereof upon oscillation of said oscillator and staff, the index wheel teeth being cut to a depth to permit some variation in the amplitude of oscillation of said oscillator and staff from a normal amplitude, if the mechanism is subjected to sudden movement, before the index pins bank against the root portions of the teeth.

2. An indexing mechanism in accordance with Claim 1 further including: a drag disc mounted on one side of the index wheel and having a plurality of per-



Figure 1.

Referring to the drawings, the indexing mechanism includes a balance assembly 10 including a low amplitude oscillator 12 such as a balance member or wheel having either a coil or magnet (not shown) mounted thereon. The balance member 12 is mounted about a balance staff 13 which is journaled at one end in a bearing 14. An index pin support plate 16 is also fixedly mounted to the balance staff and spaced apart from balance member 12 by a member 17.

The index pin support plate 16 comprises a base portion 18 and two arms 19 and 21 extending outwardly therefrom at an angle. A pair of pins 22 and 23 are mounted one in each arm 19 and 21 respectively for contacting the teeth 24 of an index wheel 11. The index pins extend away from the plate 16 at right angles and alternately drive the index wheel 11 as the balance staff oscillates back and forth. The pins 22 and 23 are shown in peak position for normal amplitude in Figure 1, that is, one pin 22 being located about half way down the radial wall of a tooth 24. The motion of the staff 13 is transmitted through the movement of the plate 16 as shown in phantom in Figure 1.

The index wheel teeth 24 are deep cut to permit amplitude variations which may be caused by sudden jolts and movements. The pins 22 and 23 bank against the roots 26 of the teeth 24 whenever the amplitude is excessively disturbed. The pins 22 and 23 thereby limit the balance amplitude to an acceptable level which is a function normally performed by an index lever.

The index wheel 11 is mounted about a staff 27 which is journaled at one end in a bearing 28 in a train bridge 29 while the other end is journaled in a bearing 31 in a front frame 32. A drag disc 33 having a plurality of teeth 34 on the outer periphery thereof is fixedly mounted on the bottom of the index wheel 11. The teeth 34 of the disc 33 are engaged by one end of an elongated drag spring 36 to prevent reverse motion of the wheel 11 during indexing. The other end of spring 36 is mounted in a support 37 which is secured to the front frame 32.

In operation, the balance staff 13 oscillates under control of an electric or electronic drive means (not shown). The pins 22 and 23 alternately engage the teeth 24 of the index wheel 11 as the index pin support plate 16 is oscillated by the balance staff 13. The pin 22 rides on the surface of a tooth 24 moving wheel 11 in the indicated direction. As the pin 22 becomes disengaged from a tooth 24, the pin 23 comes into contact with another index wheel tooth 24, see illustration in

phantom. The drag spring 36 engages the disc 33 to prevent any backward movement of the index wheel 11 during operation.

The indexing mechanism of the present invention is particularly intended for timepieces such as quartz crystal watches wherein the balance wheel oscillates at a relatively low amplitude. Since such watches are intended to be extremely accurate, the indexing system must be extremely efficient and must avoid the introduction of errors. This is accomplished by means of direct coupling between the balance assembly 10 and the index wheel 11. There is no provision for the conventional index lever which would be ineffective at low balance amplitudes of oscillation.

If an index lever were to be used, the design would be unnecessarily complicated and the banking problems associated with such levers would be introduced. With the present invention, a jolt would cause the pin 22 or 23 to bank on the root 26 of the index tooth 24. The index wheel teeth are particularly deep cut to permit some amplitude variation due to a jolt before banking occurs.

The indexing mechanism described herein is an efficient means for transmitting power from the balance wheel without the use of intermediate indexing levers. Furthermore, the problems associated with indexing systems such as maintaining the lever in draw at its extreme positions, are eliminated.

Having regard to the provisions of Section 9 of the Patent Act, attention is directed to the claims of Patent No. 1 292 237.

WHAT WE CLAIM IS:—

1. An indexing mechanism for a timepiece comprising: a balance staff journaled for oscillation; an oscillator mounted on the staff and causing movement of said staff; an index wheel having a plurality of peripheral teeth and a member mounted on the balance staff comprising an index pin support plate having two arms and an index pin projecting away from the surface of each arm alternately to engage the teeth of the index wheel to cause indexing thereof upon oscillation of said oscillator and staff, the index wheel teeth being cut to a depth to permit some variation in the amplitude of oscillation of said oscillator and staff from a normal amplitude, if the mechanism is subjected to sudden movement, before the index pins bank against the root portions of the teeth.

2. An indexing mechanism in accordance with Claim 1 further including: a drag disc mounted on one side of the index wheel and having a plurality of per-

ipheral teeth, and a drag spring fixedly mounted at one end and engaging the disc teeth with the other end to prevent reverse movement of the index wheel.

- 5 3. An indexing mechanism in accordance with Claim 1 or Claim 2 wherein: the oscillator comprises a balance wheel having a relatively low amplitude of oscillation.
- 10 4. An indexing mechanism in accordance with Claim 3, wherein: the balance wheel is used as a slave motor being governed by a high frequency time standard.

5. An indexing mechanism for a 15 timepiece constructed, arranged and adapted to operate substantially as hereinbefore described with reference to the accompanying drawings.

6. A watch incorporating an indexing 20 mechanism in accordance with any one of the preceding claims.

STEVENS, HEWLETT & PERKINS,
Chartered Patent Agents,
5, Quality Court,
Chancery Lane,
London, WC2A 1HZ.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1974.
Published at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

