

PATENT SPECIFICATION (11)

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DRAWINGS ATTACHED



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(54) GEARING E.G. IN A TIMEPIECE

(71) We, KABUSHIKI KAISHA SUWA SEIKOSHA, a Japanese company of 3-4, 4-chome, Ginza, Chuo-ku, Tokyo, Japan, 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:—

This invention concerns gearing and, although the invention is not so restricted, it is more particularly concerned with gearing adapted to be used in adjusting the time indication provided by a timepiece such as a watch.

According to the present invention, there is provided gearing comprising a rotatably mounted annular gear, a further gear which is mounted for rotation about an axis which is at right angles to that of the annular gear, and means for effecting relative movement between the annular gear and further gear to bring them into and out of an operative position in which they are in meshing engagement with each other, the teeth of the annular gear being chamfered to assist the said meshing engagement.

The further gear is preferably movable to and from an inoperative position in which it is disposed radially inwardly of the annular gear, the teeth of the annular gear tapering towards the centre of the latter.

The further gear is preferably a pinion, while the annular gear is preferably a crown gear.

The annular gear may have been formed by passing a cutter non-radially across the annular gear so as to form, at each pass of the cutter, faces of teeth disposed on opposite sides of the annular gear.

The invention also comprises a timepiece, e.g. a watch, provided with gearing as set forth above, the annular gear forming part of a setting gear train which enables the time indication provided by the timepiece to be adjusted, the further gear being movable into and out of the said operative position by manually operable means disposed externally of the timepiece.

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

Figure 1 is a cross-sectional view of a watch having known gearing for adjusting the time indication provided by the watch, in which:—

Figure 2 is a broken-away diagrammatic view taken on the line 2-2 of Figure 1, Figure 3 is a broken-away perspective view of part of the gearing shown in Figures 1 and 2,

Figure 4 is a broken-away plan view of gearing as shown in Figures 2 and 3, Figures 5 to 7 are views similar to Figures 2 to 4 respectively but showing gearing in accordance with the present invention, and

Figure 8 illustrates the manner in which the gearing shown in Figure 7 may be formed.

In Figure 1 there is shown a watch whose hands (not shown) are adjustable by a gear train which includes a gear wheel 10. The gear wheel 10 has teeth which mesh with teeth 11 on a setting wheel 12, the latter being rotatably mounted about a vertical axis. The setting wheel 12 is provided with an annular crown gear 13. A pinion 14, whose teeth 15 are adapted to mesh with teeth 16 of the crown gear 13, is mounted on a stem 17. The stem 17 whose axis is horizontal and thus at right angles to that of the annular crown gear 13, is axially movable by means of a manually operable knob 20 which is disposed externally of the watch.

When the stem 17 is in the inoperative position shown in Figure 1, the pinion 14 is out of meshing engagement with the crown gear 13. When, however, it is desired to adjust the hands of the watch so as to alter the time indication thereof, the knob 20 is pulled outwardly so that the pinion 14 is moved to an operative position (shown in chain dotted lines) in which the pinion 14

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is in meshing engagement with the crown gear 13. Rotation of the knob 20 then adjusts the position of the hands.

In known watches of the kind illustrated in Figure 1, the crown gear 13 is normally formed as shown in Figures 2 to 4. Thus, the teeth 16 of the crown gear 13 are formed by passing a cutter (not shown) truly radially of the crown gear so that the opposite side faces 21, 22 of each tooth 16 are also substantially radial. Consequently when the stem 17 is pulled outwardly in order to adjust the time setting, it is possible, as indicated in dotted lines in Figure 2, for the teeth 15 of the pinion 14 to strike against the inside surface 23 of the teeth 16 of the crown gear 13. If this occurs, the teeth 15, 16 are liable to become scratched or broken.

Accordingly, in the case of the embodiment shown in the drawings, the teeth of the crown gear may be formed as illustrated in Figures 5 to 7. As will be seen therefrom, the teeth 16 of the crown gear 13 are chamfered by virtue of tapering towards the centre of the crown gear 13, whereby to assist the meshing engagement between teeth 16 and the teeth 15, so as to reduce the risk of the said scratching or breakage. Thus the teeth 16, in the case of the construction shown in Figures 5 to 7, have a very narrow width at the radially inner side 23 of the crown gear 13. Accordingly when the pinion 14 is moved from the inoperative position shown in Figure 1, in which it is disposed radially inwardly of the crown gear 13, into an operative position in which it engages the latter, if the teeth 15 are not disposed in the correct angular position, they will tend to be cammed into the correct angular position as they are moved axially.

As indicated best in Figure 8, the teeth 16 may be formed by passing a cutter (not shown) non-radially across the crown gear 13 so as to form, at each pass of the cutter, the side faces of teeth disposed on opposite sides of the crown gear. Thus in order to form each tooth pair of the crown gear two passes of the said cutter are required. However, since the conventional method of forming the crown gears as shown in Figures 2 to 4 involves cutting each tooth one at a time, in fact manufacture of the crown gear of the present invention may be effected as swiftly as in the manufacture of the crown gear of the prior art, provided, of course, that the number of teeth 16 and the direction of non-radial movement of the cutter across the crown gear 13 are appropriate.

It can be arranged, if desired, that after

the cutter has passed from one side of the crown gear to the other, it moves along a path externally of the crown gear and is then once more passed non-radially across the crown gear to the opposite side thereof. In this way cutting of the teeth of the crown gear may be continuous.

In the case of the present invention, breakage of the teeth of the gears is therefore substantially reduced.

WHAT WE CLAIM IS:—

1. Gearing comprising a rotatably mounted annular gear, a further gear which is mounted for rotation about an axis which is at right angles to that of the annular gear, and means for effecting relative movement between the annular gear and further gear to bring them into and out of an operative position in which they are in meshing engagement with each other, the teeth of the annular gear being chamfered to assist the said meshing engagement.

2. Gearing as claimed in claim 1 in which the further gear is movable to and from an inoperative position in which it is disposed radially inwardly of the annular gear, the teeth of the annular gear tapering towards the centre of the latter.

3. Gearing as claimed in claim 1 or 2 in which the annular gear is a crown gear.

4. Gearing as claimed in claim 3 in which the further gear is a pinion.

5. Gearing as claimed in any preceding claim in which the annular gear has been formed by passing a cutter non-radially across the annular gear so as to form, at each pass of the cutter, faces of teeth disposed on opposite sides of the annular gear.

6. Gearing substantially as hereinbefore described with reference to and as shown in Figures 5 to 8 of the accompanying drawings.

7. A timepiece provided with gearing as claimed in any preceding claim, the annular gear forming part of a setting gear train which enables the time indication provided by the timepiece to be adjusted, the further gear being movable into and out of the said operative position by manually operable means disposed externally of the timepiece.

8. A timepiece substantially as hereinbefore described with reference to and as shown in Figures 5 to 8 of the accompanying drawings.

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Accordingly, in the case of the embodiment shown in the drawings, the teeth of the crown gear may be formed as illustrated in Figures 5 to 7. As will be seen therefrom, the teeth 16 of the crown gear 13 are chamfered by virtue of tapering towards the centre of the crown gear 13, whereby to assist the meshing engagement between teeth 16 and the teeth 15, so as to reduce the risk of the said scratching or breakage. Thus the teeth 16, in the case of the construction shown in Figures 5 to 7, have a very narrow width at the radially inner side 23 of the crown gear 13. Accordingly when the pinion 14 is moved from the inoperative position shown in Figure 1, in which it is disposed radially inwardly of the crown gear 13, into an operative position in which it engages the latter, if the teeth 15 are not disposed in the correct angular position, they will tend to be cammed into the correct angular position as they are moved axially.

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the cutter has passed from one side of the crown gear to the other, it moves along a path externally of the crown gear and is then once more passed non-radially across the crown gear to the opposite side thereof. In this way cutting of the teeth of the crown gear may be continuous.

In the case of the present invention, breakage of the teeth of the gears is therefore substantially reduced.

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2. Gearing as claimed in claim 1 in which the further gear is movable to and from an inoperative position in which it is disposed radially inwardly of the annular gear, the teeth of the annular gear tapering towards the centre of the latter.

3. Gearing as claimed in claim 1 or 2 in which the annular gear is a crown gear.

4. Gearing as claimed in claim 3 in which the further gear is a pinion.

5. Gearing as claimed in any preceding claim in which the annular gear has been formed by passing a cutter non-radially across the annular gear so as to form, at each pass of the cutter, faces of teeth disposed on opposite sides of the annular gear.

6. Gearing substantially as hereinbefore described with reference to and as shown in Figures 5 to 8 of the accompanying drawings.

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