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[54] **POSITIONING ARRANGEMENT FOR A ROTATING PART IN A TIMEPIECE**

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[58] **Field of Search**..... 58/59, 74, 139

[56] **References Cited**

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[57] **ABSTRACT**

A straight spring-wire pushing on a shoulder of an arbor of a rotating gear which engages another gear has a horizontal component and an axial component of force to position the gear.

6 Claims, 2 Drawing Figures

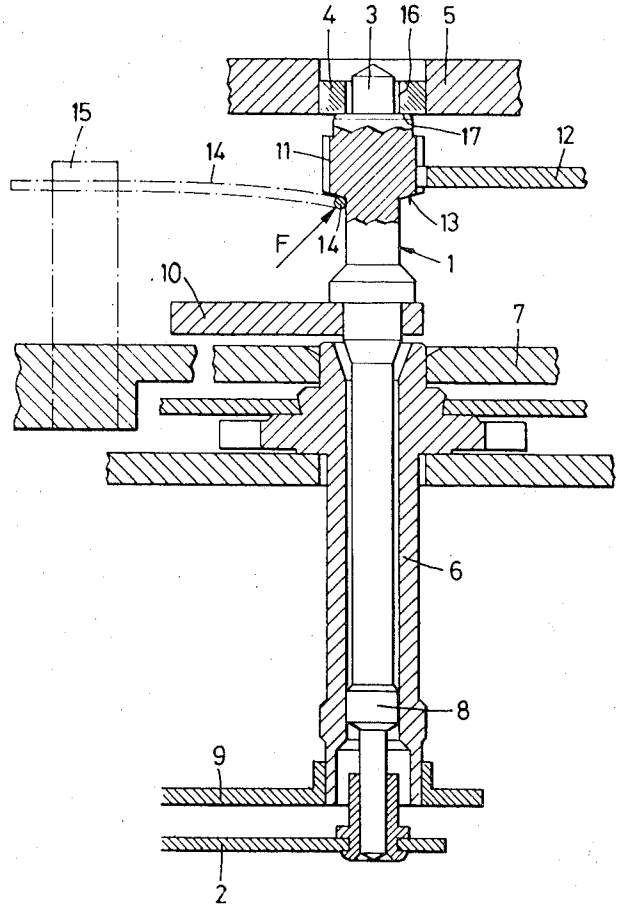


FIG. 2

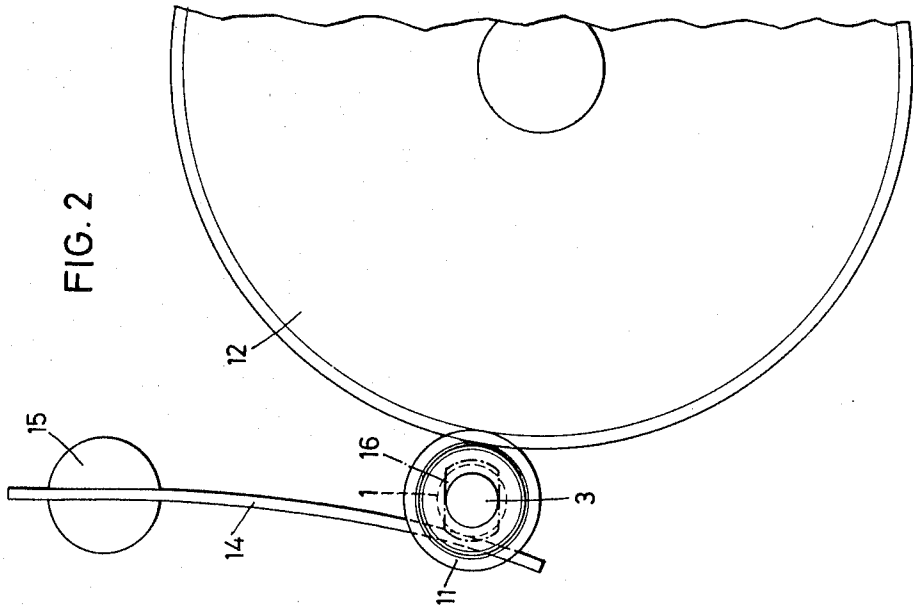
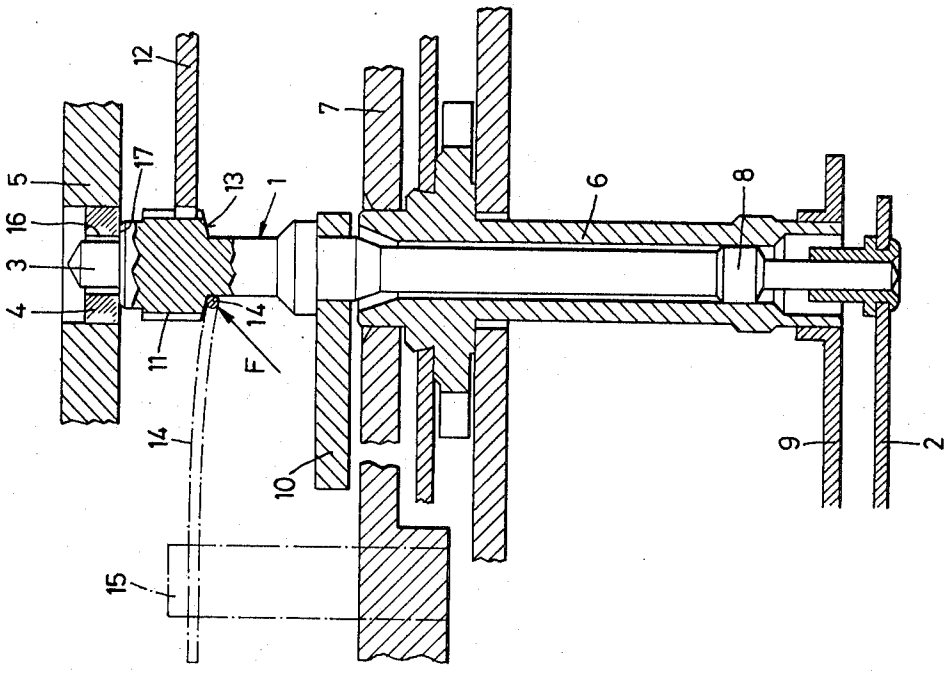


FIG 1



POSITIONING ARRANGEMENT FOR A ROTATING PART IN A TIMEPIECE

This invention relates to a positioning arrangement for a rotating part in a timepiece having a toothing engaged with a driving toothing.

It is well known that when rotating parts of a timepiece movement are driven under conditions which change periodically, and when these parts mesh with one another by means of normal toothings, the driven part may experience a delay in starting to move when the driving part changes over from one driving condition to another. This delay is due to the inevitable play tetween the toothings. This problem arises not only in certain watch movements with indirect drive of the minute-hand, but also in chronograph movements in which a driving part engages with the chronograph-hand upon starting up. It will be noted that when the chronograph-hand is set in motion, it frequently jumps owing to a slight rotation effected by the chronograph-wheel at the moment when the toothing of the driving part engages with it.

Arrangements are already known which are intended to prevent the angular play of these toothings and which comprise a hairpin-spring sunk in a recess of a frame element through which the arbor of the rotating part passes. One of the arms of the spring rests against the flank of the recess, while the other arm rests at the bottom of a groove in the arbor.

It is an object of the present invention to provide an arrangement intended to prevent the angular play of a rotating part in a timepiece which can also be used in cases where it is not possible to sink a hairpin-spring in a recess in a frame element.

A further object of the invention is to provide an arrangement which performs not only the function of eliminating play between the toothings, but also an additional function.

To this end, in the positioning arrangement according to the present invention, the rotating part pivots with play in at least one bearing and comprises a shoulder against which a resilient element presses continuously, exerting upon the rotating part a force having an axial component and a horizontal component, the horizontal component being directed towards the axis of the driving toothing.

A preferred embodiment of the invention will now be described in detail with reference to the accompanying drawing, in which:

FIG. 1 is an axial sectional view, and

FIG. 2 is a top plan view.

The drawing shows an arbor **1** which is mounted in the center of a chronograph movement and which bears at one end a chronograph-hand **2** and at the other end a pivot **3** engaged in a bearing **4** integral with a bridge **5.** Near the end bearing the hand **2,** the arbor **1** pivots in the bore of a cannon-pinion **6,** which in turn pivots in a central opening in a base plate **7** of the movement. The pipe of the cannon-pinion **6** is also guided in rotation by means not shown. A collar **8** of the arbor **1** ensures the pivoting of the arbor **1** in the bore of the cannon-pinion **6** near the end of the cannon-pinion **6** bearing a minute-hand **9.** Near the inner face of the base plate **7,** the arbor **1** bears a return-to-zero heart-piece **10,** and between the heart-piece **10** and the pivot **3,** it comprises a pinion-toothing **11** which is engaged with a driving wheel **12.** The wheel **12** forms part of a clutch (not shown), so that it is alternately immobilized or driven at a speed such that the arbor **1** rotates at the rate of one revolution per minute. Therefore, in order for the hand **2** to give accurate indications, it is necessary to eliminate all play between the toothing of the pinion **11** and the wheel **12.** This result is obtained, first of all, by a particular design of the toothings of these two elements. The shapes of the teeth will be such that the points of the teeth of one of the toothings come to rest against the bottoms of the tooth-gaps of the other toothing. One of the toothings—in the present case, that of the pinion—may be a normal involute toothing, for example, with the bottoms of the tooth-gaps being determined by arcs of a circle centered on the axis of the arbor **1.** The points of the teeth of the wheel **12,** on the other hand, will be slightly rounded, so that upon meshing, the points of the teeth of the wheel **12** come in contact with the tooth-gaps of the pinion **11.** Moreover, the arbor **1** has a frustoconical shoulder **13** between the toothed portion of the pinion **11** and the portion of the arbor immediately adjacent thereto. On this shoulder **13** there rests a spring **14** consisting of a straight wire borne by a pillar **15** set upright in the base plate **7.** The position and height of this pillar are such that the spring-wire **14** is held in an arched position both in a plane passing through the axis of the arbor **1** and in a plane perpendicular to that axis. The spring-wire **14** therefore exerts an oblique force, acting in the direction indicated by an arrow F, upon the arbor **1.** The spring **14** has a number of functions. First of all, it is a source of friction on the arbor **1.** Furthermore, it prevents any jumping or wavering of the chronograph-hand **2** at the moment of its starting up, i.e., when the toothing of the wheel **12** starts to rotate. For this purpose, the hole **16** of the bearing **4** is given a non-circular shape, slightly elongated in the direction determined by the parallel axes of the arbor **1** and the toothing of the wheel **12.** The shape of the hole **16** may be seen in FIG. **2.** The spring **14** exerts upon the arbor **1** a force of which the horizontal component acts in that direction and which consequently tends to press the pinion-toothing **11** against the toothing of the wheel **12.** The profiles of these toothings will be such that the points of the teeth of the toothing of the wheel **12** press against the bottoms of the tooth-gaps of the toothing of the pinion **11** without the upper pivot of the arbor **1** pressing against the flank of the hole **16** of the bearing **4.** The length of this hole will be such that the short-side nearest the driving wheel **12** is never in contact with the upper pivot of the chronograph-arbor **1,** while the opposite short-side offers sufficient play to absorb any eccentricity of the pinion **11** and the wheel **12,** but little enough play to furnish support for the pivot of the chronograph-pinion **11** and thus to prevent disengagement of the toothings when the chronograph-pinion **11** is returned to zero.

This function of the spring **14** therefore ensures that the chronograph-hand will start up without any jerk, besides avoiding any risk of jamming due to possible eccentricity of the toothing of the wheel **12.**

Moreover, the vertical component of the force F acting in the direction of the axis of the arbor **1** presses the shoulder **17** at the base of the upper pivot of the arbor **1** against the bearing **4,** and this ensures the axial positioning of the arbor **1.** It will be noted that this position is such that there is no risk of the heart-piece **10** coming into contact with the inner face of the base plate **7** and thereby being braked.

The principle of the arrangement described may be applied to any gearing in which the angular play must be eliminated. Thus it might also be applied if the toothing of the wheel **12** became engaged with the toothing of the pinion **11** by means of a movement directed towards the axis of the arbor upon starting up.

What is claimed is:

1. A positioning arrangement for a rotating part in a timepiece having a toothing engaged with a driving toothing, wherein said rotating part pivots with play in at least one bearing and comprises a shoulder against which a resilient element presses continuously, exerting upon said rotating part a force having an axial component and a horizontal component, said horizontal component being directed towards the axis of said driving toothing.

2. A positioning arrangement in accordance with claim **1,** wherein said resilient element is a straight spring-wire.

3. A positioning arrangement in accordance with claim **2,** wherein one end of said spring-wire is fastened to a pillar integral with a frame element, and the other end of said spring-wire presses against said shoulder.

4. A positioning arrangement in accordance with claim **1,** wherein said rotating part is a chronograph-arbor of a chronograph movement.

5. A positioning arrangement in accordance with claim **4,** wherein said chronograph-arbor comprises a pinion-toothing constantly engaged with said driving toothing, said shoulder being disposed between said pinion-toothing and the adjacent portion of said chronograph-arbor and being frustoconical in shape.

6. A positioning arrangement in accordance with claim **5,** wherein said chronograph-arbor comprises a pivot in the vicinity of said pinion-toothing, and said pivot is engaged in an elongated opening in a bearing element, the longitudinal axis of said opening being directed towards the axis of said driving toothing.

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