

SINGLE DIRECTION COUPLING DEVICE AND
CORRECTION DEVICE INCLUDING THE SAME

The present invention relates to the field of horology. It concerns more specifically a single direction coupling device. The invention also
5 concerns a correction device including such a coupling device.

Single direction coupling devices are used, in horology, for transmitting a movement of rotation in a single direction. They conventionally include two transmission members, one driving, the other being driven, which are secured to each other in a single direction of
10 rotation and are uncoupled or detached in the other direction. Numerous single direction coupling devices are known to those skilled in the art, essentially between two transmission members with parallel or coaxial axes of rotation. Reference can be made to CH Patent Nos. 347 139, 493 874 and FR Patent No. 1 491 183 for further information on this type of coupling
15 device.

Single direction couplings for transmitting a movement of rotation between two transmission members with concurrent perpendicular axes are also known. One example well known to those skilled in the art is the Breguet toothing coupling device, formed of two pinions each including a
20 saw-like contrate toothing, cooperating with each other so as to mesh in a single direction of rotation, and uncoupled or detached from each other in the other direction of rotation. The two pinions are coaxial, but, in practice, the purpose of this coupling device is in fact to transmit a movement of rotation to a wheel whose axis is perpendicular to that of the pinions. Thus,
25 the driven pinion generally includes a straight radial toothing, meshed with said wheel.

This type of coupling device is certainly highly efficient, but it is complex and expensive. In particular, the driven pinion including a Breguet toothing and a straight toothing, is a complicated part, which is difficult to manufacture.

5 It will be noted that this coupling device is mainly employed in a barrel winding device, in order to prevent activating the barrel in the opposite direction to the direction of winding. Thus, the winding device conventionally includes a sliding pinion fitted with a first Breguet toothing, mobile between a time-setting position and a winding position, and a
10 winding pinion fitted with a second Breguet toothing, meshed with the sliding pinion in the winding position, and forming therewith a single direction coupling device. The winding pinion is also fitted with a straight radial toothing meshing with a crown wheel, which itself meshes with a ratchet mounted on a barrel. When the sliding pinion is rotating in a first
15 direction of rotation, it meshes with the winding pinion, which drives the crown wheel. The latter in turn drives the ratchet, which winds the barrel. When the sliding pinion is rotating in a second direction of rotation, it is uncoupled or from the winding pinion, which is thus not driven in rotation, thus preventing improper manipulation of the barrel.

20 It is an object of the invention to propose a new single direction coupling device, for transmitting a movement of rotation from a first transmission member to a second transmission member whose axis is perpendicular to that of the first member. The design and manufacture of this coupling device is simplified compared to the Breguet type coupling
25 device. The invention also proposes a winding device including this type of coupling device.

 More specifically, the invention concerns a single direction coupling device, including a first transmission member fitted with a first saw-like contrate toothing, moving in rotation about an axis XX and axially positioned
30 by an elastic member, and a second transmission member fitted with a second saw-like toothing, moving in rotation about an axis YY, and meshed

with the first transmission member, characterized in that the XX axis is perpendicular to the YY axis.

Owing to the saw-like toothings of the first and second wheels, the coupling between the two transmission members occurs in a single
5 direction of rotation.

The invention also concerns a device for winding a barrel including a pinion mounted on a winding stem with an axis of rotation XX, fitted with a first saw-like contrate toothing, moving between a first time-setting position and a second winding position and axially positioned in the winding position
10 (B) by an elastic member, characterized in that the device further includes a crown wheel whose axis of rotation YY is perpendicular to XX, fitted with a saw-like contrate toothing in the second winding position, so as to form a single direction coupling device.

Owing to the saw-like inner toothing of the crown wheel, the pinion is
15 directly meshed with the crown wheel, without an intermediary winding pinion. The winding device is thus considerably simplified.

Other features and advantages of the present invention will appear more clearly from the following detailed description of an example embodiment of a coupling device and a barrel winding device according to
20 the invention, these examples being given purely by way of non-limiting illustration, with reference to the annexed drawing, in which:

Figure 1 is a perspective view of a coupling device according to the invention, and

Figures 2 and 3 are respectively perspective and cross-sectional views of a
25 barrel winding device according to the invention.

The coupling device illustrated in Figure 1 includes a pinion 10 fitted with a Breguet toothing 12, moving in rotation about an axis XX. Pinion 10 is, for example, a sliding pinion, or any other pinion for a timepiece movement. The Breguet toothing 12 is well known to those skilled in the art:
30 it is an axially cut toothing, or saw-like contrate toothing. Each tooth 13

includes a straight flank 13a substantially parallel to axis XX of pinion 10, and an oblique flank 13b forming an angle α with straight flank 13a.

Pinion 10 is mounted on a fixed or sliding pinion, for example on a winding stem. In both cases, it is held in the axial position by an elastic member that is not shown, so that it can perform slight axial movements and return to its position.

Pinion 10 is meshed with a wheel 14 typically forming the first element of a timepiece gear train or of a correction device, symbolised by the reference 15. The gear train or correction device 15 are formed of various elements that are not shown, and are characterized by their friction force and, where necessary, the positioning force of one of the elements by a positioning element.

Wheel 14 is mobile in rotation about an axis YY. It is fitted with a saw-like toothing 16, formed of teeth 17 including a substantially radial straight flank 17a and an oblique flank 17b forming an angle β with straight flank 17a. Toothings 12 and 16 are formed and sized to be able to mesh with each other. In particular, angles α and β are substantially equal. Moreover, according to the invention, axes XX and YY are perpendicular. Advantageously, axes XX and YY are concurrent.

When sliding pinion is driving in a first clockwise direction of rotation, straight flanks 13a and 17a cooperate so as to transmit a substantially tangential force T to wheel 14. If force T is greater than the friction and positioning forces of the gear train or correction device 15, wheel 14 is driven in rotation, and the movement of rotation is transmitted from pinion 10 to wheel 14.

When pinion 10 is driving in a second clockwise direction of rotation, flanks 13b and 17b cooperate such that a force F, including a radial component R and tangential component t, is applied to wheel 14. In reaction, a force F' opposite to F, whose intensity depends upon the friction and positioning forces of gear train or correction device 15, is applied to

pinion 10. Force F' includes an axial component A' and a tangential component t' . The axial and radial components A' and R are greater, the larger the angles α and β . If tangential component t is less than the friction or positioning forces of gear train 15 and axial force A' is greater than the
5 axial positioning force of pinion 10 due to the elastic member, pinion 10 moves slightly on its axis XX , and wheel 14 is not driven in rotation.

The assembly of pinion 10 – wheel 14 thus described forms a single direction coupling device, for the transmission of a movement of rotation from an axis XX to a an axis YY perpendicular to axis XX .

10 It will be noted that in the described embodiment, pinion 10 is driving and wheel 14 is being driven. Conversely wheel 14 could be driving and pinion 10 being driven. The forces in play are identical and generate a symmetrical result: pinion 10 in driven in rotation in a direction of rotation of wheel 14 and moves axially in the opposite direction of rotation.

15 It will be noted that, in a variant of the embodiment described, a crown with an inner toothing could replace wheel 14. The operation of the coupling device remains unchanged.

Reference will now be made to Figures 2 and 3, which illustrate schematically a barrel winding device using the single direction coupling
20 device according to the invention.

The winding device according to the invention conventionally includes a sliding pinion 20, slidably mounted on a winding stem 22 between a time-setting position A and a winding position B. The changeover between time-setting position A and winding position B occurs
25 conventionally using a mechanism formed of a pull-out piece 24 and a lever 26.

Sliding pinion 20 is fixedly mounted in rotation on the winding stem 22 with an axis of rotation XX . It includes a first straight contrate toothing 28 and a second saw-like contrate toothing 30. In the time-setting position A,
30 the first contrate toothing 28 cooperates with an intermediate wheel that is

not shown, meshed with a second intermediate wheel, which is itself meshed with a motion work wheel. This arrangement is well known to those skilled in the art and will not be described further.

5 The winding device further includes a crown wheel 32 including an inner saw-like toothing 34, and a straight external toothing 36. The crown wheel 32 is mounted to rotate freely about an axis YY perpendicular to axis XX, for example on a gear train bar 38. Crown wheel 32 is therefore fitted with a protruding cylindrical portion 40 engaged in a circular groove 42 made in gear train bar 38. The straight toothing 36 meshes with a ratchet
10 44 mounted on a barrel 46. Ratchet 44 is held fixedly in rotation by a click spring 48. In a variant of this embodiment, the crown wheel is indirectly meshed with ratchet 44, via intermediate wheel 50.

In the winding position, sliding pinion 20 cooperates with inner toothing 34 of crown wheel 32, and forms therewith a single direction
15 coupling device of the type described above. In a first direction of rotation, crown wheel 32 is driven in rotation so as to wind barrel 46. In a second direction of rotation, the friction and positioning forces of the various elements, and the angles of toothings 28 and 34 are calculated such that sliding pinion 20 is moved slightly axially, without driving crown wheel 32.

20 The winding mechanism thus described does not include a winding pinion, an intermediate part between sliding pinion 20 and crown wheel 32. The winding pinion is a complicated and expensive part, and the omission thereof constitutes a considerable saving in space and complexity.

Of course, the coupling device and winding device according to the
25 invention are not limited to the embodiments that have just been described and various simple alterations and variants could be envisaged by those skilled in the art without departing from the scope of the invention defined by the annexed claims.

CLAIMS

1. Barrel winding device including a pinion (20) mounted on a winding stem (22) with an axis of rotation XX, fitted with a first saw-like contrate toothing (30), mobile between a first time-setting position (A) and a
5 second winding position (B) and axially positioned in said winding position (B) by an elastic member, characterized in that said device further includes a crown wheel (32) whose axis of rotation YY is perpendicular to XX, fitted with a saw-like inner toothing (34) meshed with said first saw-like contrate toothing (30) in said second winding position (B) so as to form a single
10 direction coupling device.
2. Winding device according to claim 1, characterized in that said crown wheel (32) further includes an external toothing (36) meshed at least indirectly with a ratchet (46).
3. Winding device according to claim 1 and 2, characterized in that
15 said pinion (20) further includes a second straight contrate toothing (28) cooperating with a first intermediate wheel in said first position (A), said first intermediate wheel being kinematically connected to a motion work wheel.