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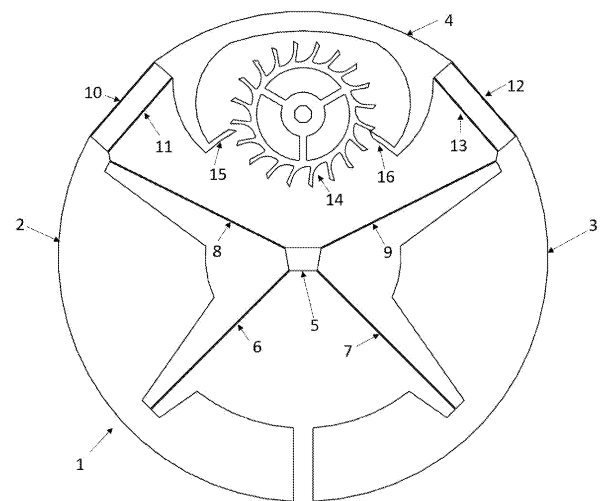
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(54) **A MECHANICAL WATCH**

(57) The invention relates to a mechanical watch comprising an oscillator (1) embodied with a frame (5) supporting a vibratory mass or masses (2, 3), wherein each vibratory mass (2, 3) connects to at least one flexural member (6-13), the watch further comprising an escape wheel (14), and anchor teeth (15, 16) that are indirectly connected with the vibratory mass or masses (2, 3), which anchor teeth (15, 16) cooperate with the escape wheel (14), wherein motions of the anchor teeth (15, 16) depend on motions of one or more of the flexural members (10, 11, 12, 13) that provide connections between the vibratory masses (2, 3) without said flexural members (10, 11, 12, 13) connecting directly to the frame (5). Said flexural members (10, 11, 12, 13) provide connections between the vibratory masses (2, 3) without connecting directly to the frame (5) are free from rigid sections and support a movable rigid portion (4) of the oscillator (1) that is separate from the flexural members (10, 11, 12, 13), which movable rigid portion (4) is suspended from the movable masses (2, 3) through said flexural members (10, 11, 12, 13) that are free from rigid sections.



**Fig. 2**

## Description

**[0001]** The invention relates to a mechanical watch comprising an oscillator embodied with a frame supporting a vibratory mass or masses, wherein each vibratory mass connects to at least one flexural member, the watch further comprising an escape wheel, and anchor teeth that are indirectly connected with the vibratory mass or masses, which anchor teeth cooperate with the escape wheel, wherein motions of the anchor teeth depend on motions of one or more of the flexural members that provide connections between the vibratory masses without said flexural members connecting directly to the frame.

**[0002]** Such a mechanical watch is disclosed by NL 2024076 in the name of the applicant.

**[0003]** Although the known mechanical watch operates quite satisfactory, the inventors have strived for further simplification, without compromising qualities such as robustness against shocks, and accuracy of the mechanical watch.

**[0004]** According to the invention a mechanical watch is now proposed with the features of one or more of the appended claims.

**[0005]** Although different embodiments according to the invention are feasible, a joint feature of all embodiments is that

said flexural members that provide connections between the vibratory masses without connecting directly to the frame are free from rigid sections and support a movable rigid portion of the oscillator that is separate from the flexural members, which movable rigid portion is suspended from the movable masses through said flexural members that are free from rigid sections. This movable rigid portion adds a mass to the mechanical watch, which mass of the rigid portion together with the said flexural members can be entirely tailored to a desired operational frequency of movement of the anchor teeth, together with an improved robustness against external shocks.

**[0006]** The invention opens a window of possibilities in the design of the mechanical watch.

**[0007]** In one embodiment the anchor teeth are directly provided on the movable rigid portion supported by said flexural members that provide connections between the vibratory masses without connecting directly to the frame. In this embodiment it is preferable that the flexural members that provide connections between the vibratory masses without said flexural members connecting directly to the frame, comprise parallel flexural members. This provides better rotational stiffness for accuracy and may also save space.

**[0008]** In another embodiment the anchor teeth are directly provided on said flexural members that provide connections between the vibratory masses without connecting directly to the frame.

**[0009]** Desirably in the latter embodiment the anchor teeth are provided on separate flexural members.

**[0010]** The invention will hereinafter be further elucidated with reference to the drawing of exemplary em-

bodiments of elements of a mechanical watch according to the invention that is not limiting as to the appended claims.

**[0011]** In the drawing:

- figure 1 schematically shows different parts of a mechanical watch according to the prior art in a top view; and
- figures 2-4 schematically show different parts of three different embodiments of a mechanical watch according to the invention in a top view.

**[0012]** Wherever in the figures the same reference numerals are applied, these numerals refer to the same or similar parts.

**[0013]** Having deleted parts that are not essential to understanding of the prior art or the invention, the figures 1-4 depict features of the watch of the prior art and according to the invention.

**[0014]** For a good understanding of the invention, hereinafter first a brief discussion of the prior art mechanical watch will be provided with reference to figure 1. Figure 1 depicts a mechanical watch comprising an oscillator 1 embodied with vibratory masses 2, 3 mounted on a frame 5, wherein each of the masses 2, 3 connects to at least one flexural member 6-13. Figure 1 shows the application of two masses 2, 3, but this number is arbitrary; there should at least be one vibratory mass.

**[0015]** The watch further comprises an escape wheel 14, and anchor teeth 15, 16 that are indirectly connected with the vibratory mass or masses 2, 3. The anchor teeth 15, 16 cooperate with the escape wheel 14, wherein motions of the anchor teeth 15, 16 depend on motions of one or more of those flexural members 10, 11, 12, 13 that provide connections between the vibratory masses 2, 3 without said flexural members 10, 11, 12, 13 connecting directly to the frame 5. In order to realize that the motions of the anchor teeth 15, 16 depend on motions of one or more of said flexural members 10, 11, 12, 13, the anchor teeth 15, 16 of the prior art mechanical watch are directly mounted on flexural members 11, 12 that form part of the flexural members 10, 11, 12, 13 that provide connections between the vibratory masses 2, 3 without said flexural members 11, 12 connecting directly to the frame 5.

**[0016]** Some of the above features discussed with reference to the prior art mechanical watch shown in figure 1, are also applied in the mechanical watch of the invention as depicted in figures 2-4. In particular, with reference to the embodiments shown in figures 2-4, this relates to features that the watch of the invention comprises an oscillator 1 embodied with a frame 5 supporting a vibratory mass or masses 2, 3, wherein each vibratory mass 2, 3 connects to at least one flexural member 6-13, and that the watch further comprises an escape wheel 14, and anchor teeth 15, 16 that are indirectly connected with the vibratory mass or masses 2, 3. The anchor teeth 15, 16 cooperate with the escape wheel 14, wherein motions

of the anchor teeth 15, 16 depend on motions of a selection of one or more of the flexural members 10, 11, 12, 13 that provide connections between the vibratory masses 2, 3 without said flexural members 10, 11, 12, 13 connecting directly to the frame 5.

**[0017]** Common to all three embodiments of the invention shown in figures 2-4, is that the selection of said flexural members 10, 11, 12, 13 that provide connections between the vibratory masses 2, 3 without connecting directly to the frame 5 are free from rigid sections and support a movable rigid portion 4 of the oscillator 1 that is separate from the flexural members 10, 11, 12, 13, which movable rigid portion 4 is suspended from the movable masses 2, 3 through said flexural members 10, 11, 12, 13 that are free from rigid sections. This is depicted in figure 2, figure 3 and figure 4.

**[0018]** In the embodiments of figure 2 and figure 4 the anchor teeth 15, 16 are directly provided on the separate movable rigid portion 4.

**[0019]** In the embodiment of figure 2 the movable rigid portion 4 is supported by parallel flexural members 10, 11 and parallel flexural members 12, 13 that provide connections between the vibratory masses 2, 3 through the movable rigid portion 4 without said flexural members 10, 11, 12, 13 connecting directly to the frame 5.

**[0020]** In the embodiment of figure 4 the movable rigid portion 4 is supported by single flexural members 11, 12 that provide connections between the vibratory masses 2, 3 through the movable rigid portion 4 without said flexural members 11, 12 connecting directly to the frame 5.

**[0021]** In the embodiment of figure 3 the anchor teeth 15, 16 are directly provided on the single flexural members 11, 12 that provide connections between the vibratory masses 2, 3 through the movable rigid portion 4 without said flexural members 11, 12 connecting directly to the frame 5. In this embodiment the anchor teeth 15, 16 are provided on separate flexural members 11, 12.

**[0022]** Although the invention has been discussed in the foregoing with reference to exemplary embodiments of the mechanical watch of the invention, the invention is not restricted to these particular embodiments which can be varied in many ways without departing from the invention. The discussed exemplary embodiments shall therefore not be used to construe the appended claims strictly in accordance therewith. On the contrary the embodiments are merely intended to explain the wording of the appended claims without intent to limit the claims to these exemplary embodiments. The scope of protection of the invention shall therefore be construed in accordance with the appended claims only, wherein a possible ambiguity in the wording of the claims shall be resolved using this exemplary embodiment.

**[0023]** Aspects of the invention are itemized in the following section.

1. A mechanical watch comprising an oscillator (1) embodied with a frame (5) supporting a vibratory mass or masses (2, 3), wherein each vibratory mass

(2, 3) connects to at least one flexural member (6-13), the watch further comprising an escape wheel (14), and anchor teeth (15, 16) that are indirectly connected with the vibratory mass or masses (2, 3), which anchor teeth (15, 16) cooperate with the escape wheel (14), wherein motions of the anchor teeth (15, 16) depend on motions of one or more of the flexural members (10, 11, 12, 13) that provide connections between the vibratory masses (2, 3) without said flexural members (10, 11, 12, 13) connecting directly to the frame (5), **characterized in that** said flexural members (10, 11, 12, 13) that provide connections between the vibratory masses (2, 3) without connecting directly to the frame (5) are free from rigid sections and support a movable rigid portion (4) of the oscillator (1) that is separate from the flexural members (10, 11, 12, 13), which movable rigid portion (4) is suspended from the movable masses (2, 3) through said flexural members (10, 11, 12, 13) that are free from rigid sections.

2. The mechanical watch according to claim 1, **characterized in that** the flexural members (10, 11, 12, 13) that provide connections between the vibratory masses (2, 3) without said flexural members (10, 11, 12, 13) connecting directly to the frame (5) comprise parallel flexural members (10, 11 and 12, 13).

3. The mechanical watch according to claim 1 or 2, characterized in that the anchor teeth (15, 16) are directly provided on the movable rigid portion (4) supported by said flexural members (10, 11, 12, 13) that provide connections between the vibratory masses (2, 3) without connecting directly to the frame (5).

4. The mechanical watch according to the preamble of claim 1, **characterized in that** the anchor teeth (15, 16) are directly provided on said flexural members (11, 12) that provide connections between the vibratory masses (2, 3) without connecting directly to the frame (5).

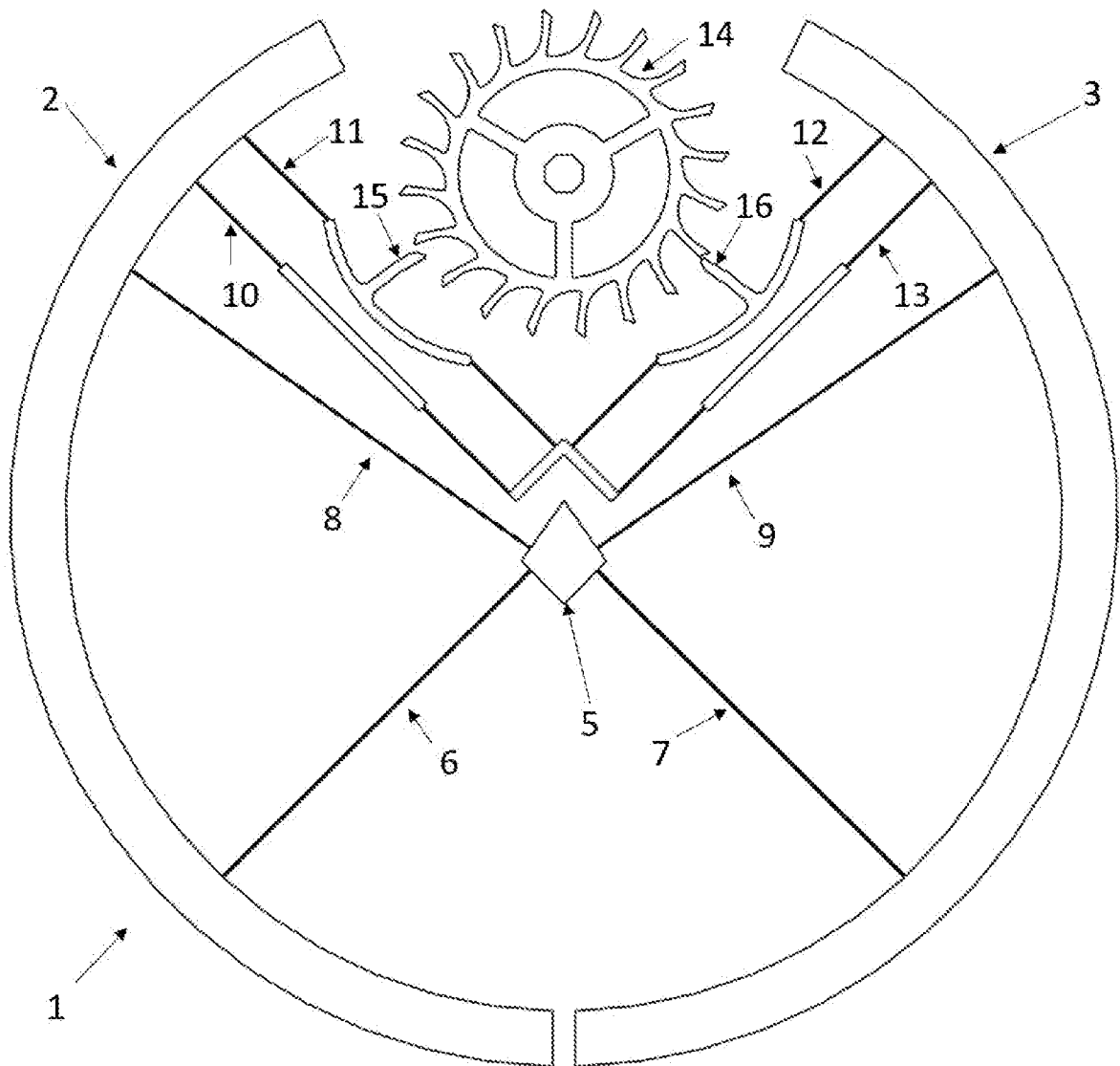
5. Mechanical watch according to claim 4, **characterized in that** the anchor teeth (15, 16) are provided on separate flexural members (11, 12).

## Claims

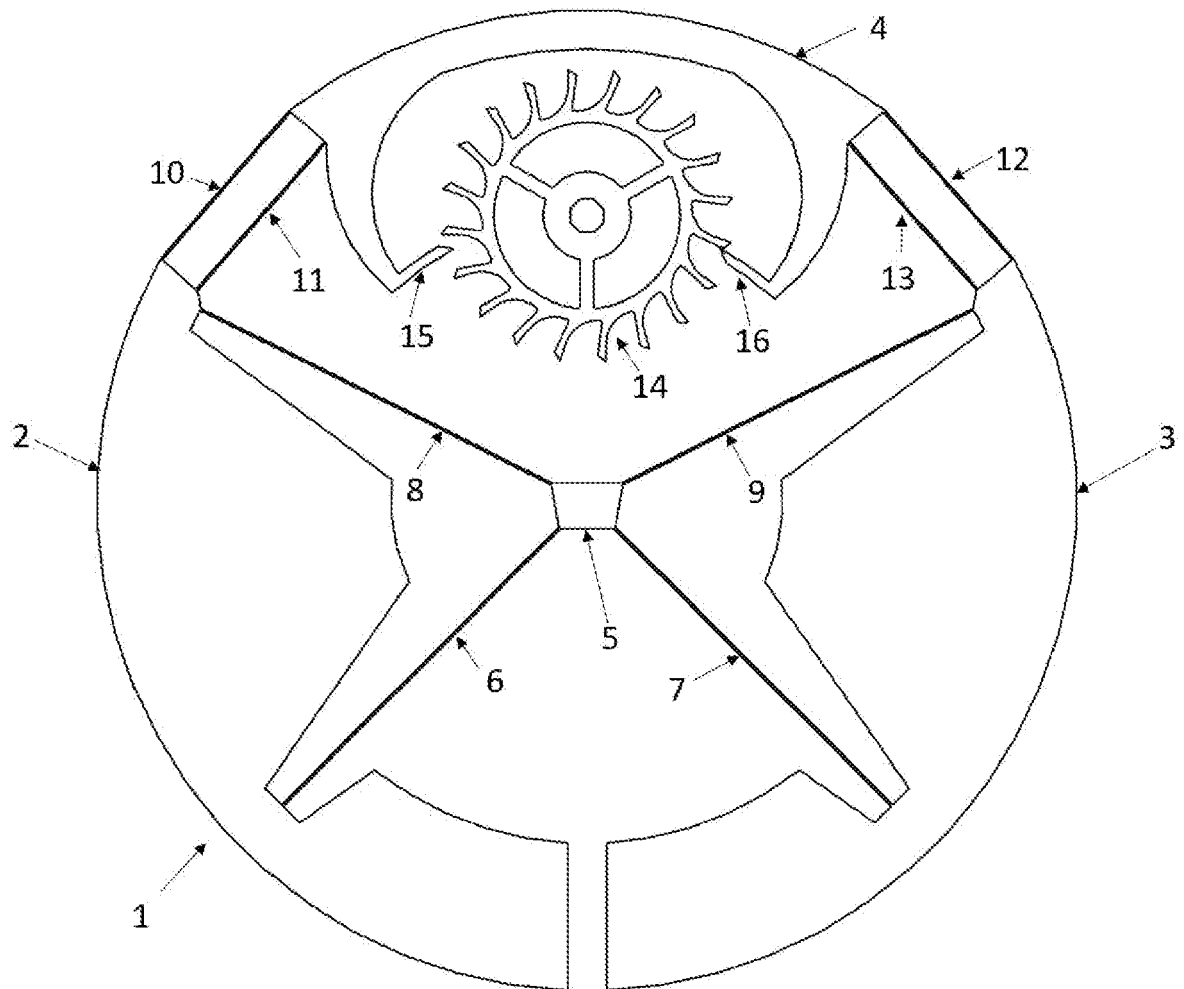
1. A mechanical watch comprising an oscillator (1) embodied with a frame (5) supporting a vibratory mass or masses (2, 3), wherein each vibratory mass (2, 3) connects to at least one flexural member (6-13), the watch further comprising an escape wheel (14), and anchor teeth (15, 16) that are indirectly connected with the vibratory mass or masses (2, 3), which anchor teeth (15, 16) cooperate with the escape wheel (14), wherein motions of the anchor teeth (15, 16) depend on motions of one or more of the flexural members (10, 11, 12, 13) that provide connections between the vibratory masses (2, 3) without said flexural members (10, 11, 12, 13) connecting directly to

the frame (5), **characterized in that** said flexural members (10, 11, 12, 13) that provide connections between the vibratory masses (2, 3) without connecting directly to the frame (5) are free from rigid sections and support a movable rigid portion (4) of the oscillator (1) that is separate from the flexural members (10, 11, 12, 13), which movable rigid portion (4) is suspended from the movable masses (2, 3) through said flexural members (10, 11, 12, 13) that are free from rigid sections.

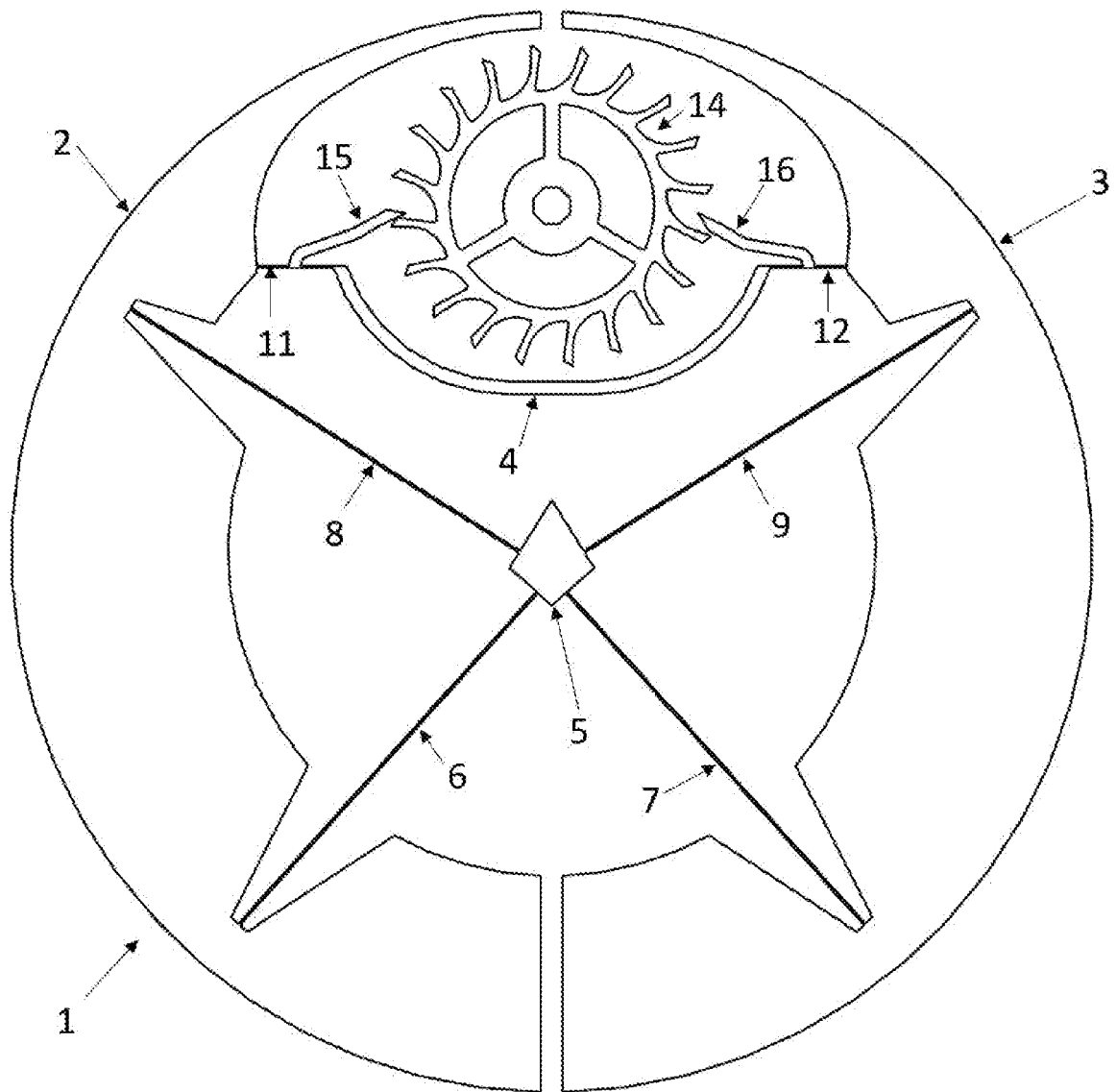
2. The mechanical watch according to claim 1, **characterized in that** the flexural members (10, 11, 12, 13) that provide connections between the vibratory masses (2, 3) without said flexural members (10, 11, 12, 13) connecting directly to the frame (5) comprise parallel flexural members (10, 11 and 12, 13) .
3. The mechanical watch according to claim 1 or 2, **characterized in that** the anchor teeth (15, 16) are directly provided on the movable rigid portion (4) supported by said flexural members (10, 11, 12, 13) that provide connections between the vibratory masses (2, 3) without connecting directly to the frame (5).
4. The mechanical watch according to the preamble of claim 1, **characterized in that** the anchor teeth (15, 16) are directly provided on said flexural members (11, 12) that provide connections between the vibratory masses (2, 3) without connecting directly to the frame (5).
5. Mechanical watch according to claim 4, **characterized in that** the anchor teeth (15, 16) are provided on separate flexural members (11, 12).



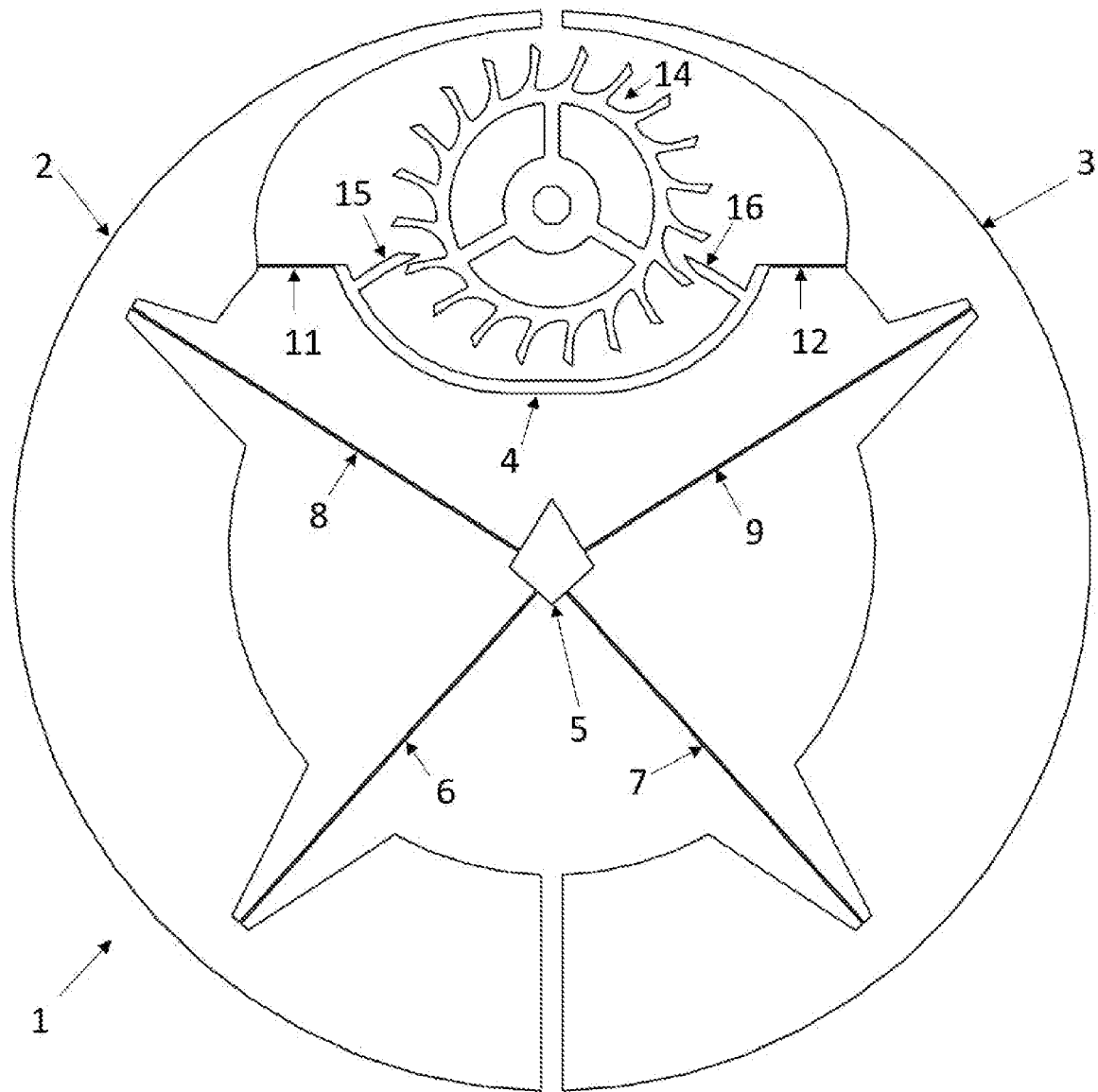
**Fig. 1**



**Fig. 2**



**Fig. 3**



**Fig. 4**





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Application Number

EP 22 19 4238

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EPO FORM 1503 03.82 (P04C01)

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CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

# ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

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