Feb. 8, 1927. 1,616,465

E. S. OSTLER

NOISELESS CLOCK MECHANISM

Filed May 11, 1925

Fig. 4.

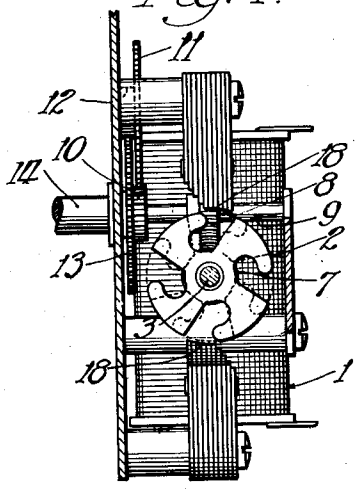


Fig. 3.

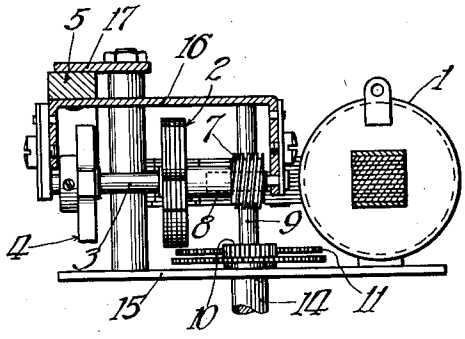


Fig. 2.

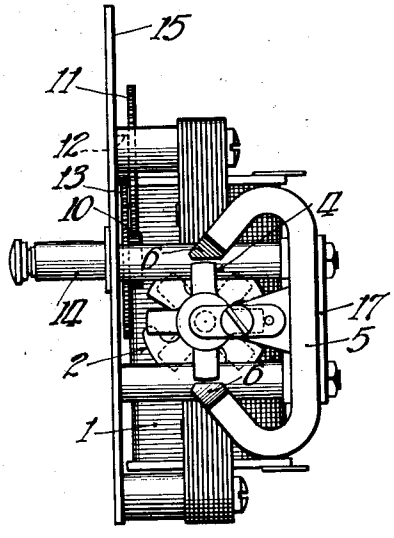
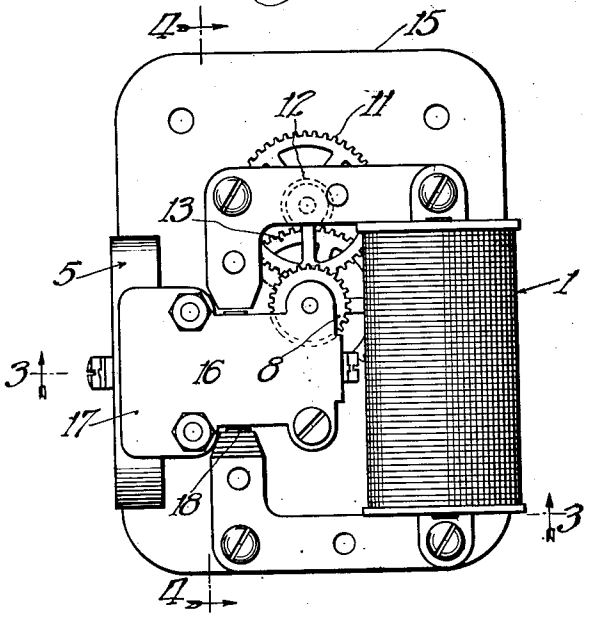


Fig. 1.



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UNITED STATES PATENT OFFICE.

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NOISELESS CLOCK MECHANISM.

Application filed May 11, 1925. Serial No. 29,315.

My invention relates to noiseless clock mechanism.

One of the objects of my invention is to provide a simple and efficient noiseless clock mechanism controlled by an intermittently energized electromagnet.

Further objects will appear from the description and claims.

In the drawings, in which an embodiment of my invention is shown—

Figure 1 is a rear view of a noiseless intermittent movement mechanism which may be used in a secondary clock;

Fig. 2 is a view from the left of Fig. 1;

Fig. 3 is a section on the line 3—3 of Fig. 1; and

Fig. 4 is a section on the line 4—4 of Fig. 1.

Referring to the drawings in detail, the construction shown comprises an intermittently energizable electromagnet 1, a four point revoluble armature 2 therefor, a shaft 3 on which the armature 2 is mounted, another four point armature 4 mounted on the same shaft as the first armature, and a permanent magnet 5, the poles 6 of which are located on opposite sides of the armature 4.

A clock train is driven from the shaft on which the armatures are mounted which may be of any suitable construction and as shown comprises a worm 7 on the shaft 3, a worm gear 8 meshing with the worm 7, a shaft 9 on which the worm gear 8 is mounted, a pinion 10 mounted on the shaft 9, a gear 11 meshing with the pinion 10, a pinion 12 rotatable with the gear 11, and a gear 13 meshing with the pinion 12. The minute hand may be mounted on the shaft 9 and the hour hand may be mounted on the sleeve 14 rotatable with the gear 13.

The step by step mechanism and the clock train may be mounted in any suitable manner on the front supporting plate 15. The shaft 3 on which the armatures 2 and 4 and worm 7 are secured is mounted on a U-shaped bearing bracket 16 suitably supported from the front plate 15. The shaft 9 on which the pinion 10 is secured is mounted in bearing openings in the bracket 16 and front plate 15. The permanent magnet 5 is secured on the bracket 16 by means of the clamping plate 17.

The core of the electromagnet is made up of laminated plates, the poles 18 being located on opposite sides of the revoluble armature 2, the plates being made of varying length, to form a stepped formation to provide a sort of taper for the poles 18, to provide a concentration of the magnetic lines of force at the ends of the poles.

In operation, the electromagnet 1 is periodically energized and deenergized, usually once per minute. When the electromagnet is energized it moves the revoluble armature 2 from the position in full lines in Fig. 4 to the position shown in dotted lines, this movement being a little more than a 45° movement and causing the armature for the permanent magnet also to be moved a little more than 45° to the position shown in dotted lines in Fig. 2. When the electromagnet is deenergized the permanent magnet causes the step movement of 90° to be completed. The next energization of the electromagnet again moves the rotatable armatures through a little more than 45° in the same direction as in the preceding step, so that each cycle of operation, including the energization and deenergization of the electromagnet causes the rotatable armatures to be rotated 90°. This step by step movement of the armatures in the same direction causes the step by step movement of the clock train and clock hands.

In practice I find that there is a slight overthrow of the rotatable armatures when acted on by the electromagnets. That is to say, the armature, when acted on by the electromagnet, will move slightly past the position which it finally assumes, due to its momentum. This results in a slight reverse movement of the worm 7, causing a slight noise caused by the engagement and disengagement of the threads on the worm with the teeth of the worm gear 8. In order to reduce this noise as much as possible, I make one or the other of the members of the worm gearing (preferably the worm gear 8) of fibrous material, such as fiber impregnated with bakelite.

In the claims the term "non-reversing" used in describing the electromagnet means that in the operation of the electromagnet the current through its coils is not reversed.

While I have described the movement in connection with a secondary clock it is obvious that this use is not confined to secondary clocks.

I claim:

1. A step by step movement mechanism comprising an intermittently energizable non-reversing electromagnet, a revoluble armature therefor, rotated a partial step when said magnet is energized, and means for completing the step when said magnet is deenergized, comprising a permanent magnet.

2. A step by step movement mechanism comprising an intermittently energizable stationary electromagnet, a revoluble armature therefor, rotated a partial step when said magnet is energized, and means for completing the step when said magnet is deenergized, comprising a permanent magnet.

3. A step by step movement mechanism comprising an intermittently energizable stationary non-reversing electromagnet, a revoluble armature therefor, rotated a partial step when said magnet is energized, and means for completing the step when said magnet is deenergized, comprising a permanent magnet.

4. A step by step movement mechanism comprising an intermittently energizable electromagnet, a revoluble armature therefor rotated a partial step when said magnet is energized, and means for completing the step when said magnet is deenergized comprising a second revoluble armature and a permanent magnet therefor.

5. A step by step movement mechanism comprising an intermittently energizable electromagnet, a revoluble armature therefor rotated a partial step when said magnet is energized, and means for completing the step when said magnet is deenergized comprising a second revoluble armature and a permanent magnet therefor, said permanent magnet having its poles on opposite sides of its armature.

In witness whereof, I have hereunto subscribed my name.

ERNEST S. OSTLER.