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TIMEPIECE REGULATOR

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Fig. 1.

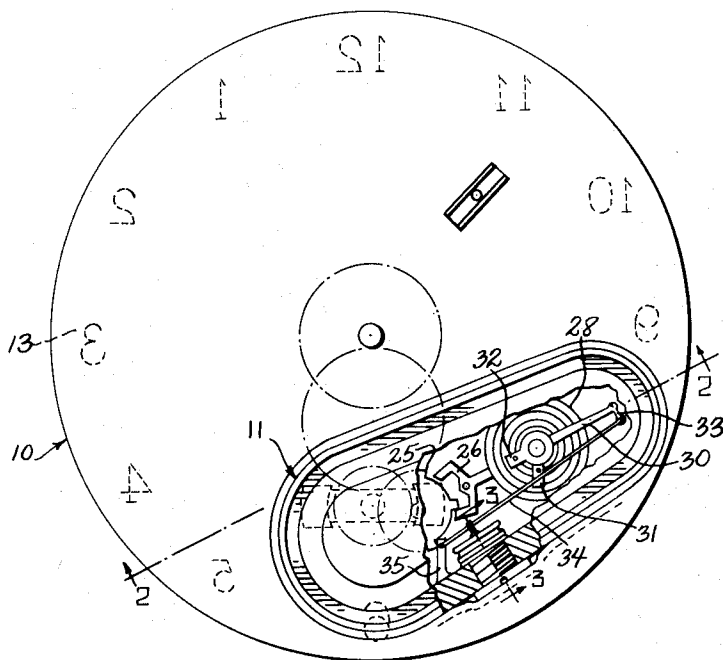


Fig. 2.

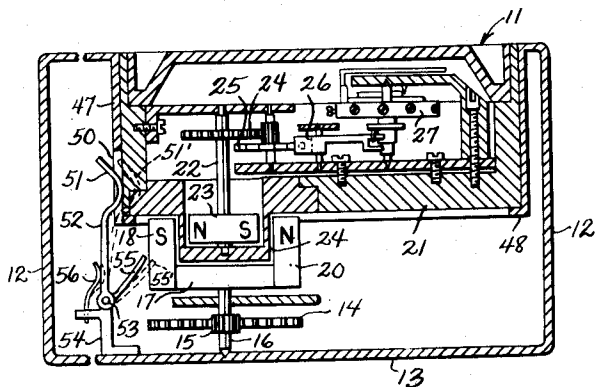
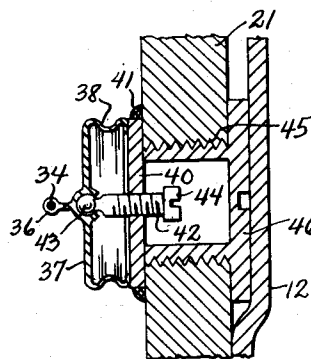


Fig. 3.



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TIMEPIECE REGULATOR

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6 Claims. (Cl. 58—109)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

This invention relates to a timepiece regulator for a timepiece of the nature which depends upon mechanical escapements or other sensitive regulators or control mechanism.

A further object of this invention is to provide a timepiece regulator so enclosed that it will be absolutely free from being affected by atmospheric change, including pressure, moisture or dust.

A further object of this invention is to provide a timepiece regulator which is absolutely sealed off from the atmosphere or from any outside influence so that it may be used in timing devices which may be required to operate accurately when immersed in water at varying depths.

Still a further object of this invention is to provide a timepiece regulator which may have the necessary lubrication sealed permanently therein, which lubrication may be a type of oil having a wide temperature range, and due to being sealed in a vacuum in the control mechanism will be without danger of evaporation, oxidation, or contamination.

Still a further object of this invention is to provide a timepiece regulator which will be less susceptible to shock, due to gun-fire, vibration, etc., than the usual control mechanism.

A further object of this invention is to provide a waterproof, dustproof and moistureproof time piece regulator sealed in a vacuum or a gas yet easily available for mechanical adjustment thereof without the possibility of any leakage through the mechanical adjusting means.

Still a further object of this invention is to provide a timepiece regulator which may be easily removed from or replaced in a timepiece, and provided with automatic means for preventing the stored energy in the mainspring of the timepiece from being wasted while the regulator is absent therefrom.

Still a further object of this invention is to provide a timepiece regulator sealed within a vacuum chamber and exerting its control on the timepiece solely through a magnetic connection and without any direct mechanical connection thereto.

With the foregoing and other objects in view, the invention consists in the construction, combination and arrangement of parts hereinafter described and illustrated in the drawing, in which:

Fig. 1 is a plan view through the back of a timepiece showing the regulator of this invention, partly broken away, applied thereto; and

Figs. 2 and 3 are sectional views on lines 2—2 and 3—3 of Fig. 1.

There is shown at 10 a representative timepiece to which the regulator 11 of this invention has been applied. The timepiece 10, which may be a clock, watch, chronometer, fuse, or any other type, includes a case 12 having the usual face 13 and containing the usual gross mechanism including the usual power mechanism, such as a main spring or other equivalent mechanism and which delivers its power through the usual gearing via the gear 14 to the shaft of the hands. This gear 14 is shown as being in mesh with a pinion 15 on a shaft 16, on one end of which is a U-shaped drive magnet 17 having a south pole 18 at one end and a north pole 20 at the other end.

Normally, in a timepiece mechanism the shaft 16 would be connected through a gear train to the usual balance wheel and escapement mechanism. In this case, however, the shaft 16 is provided with a magnetic clutch connecting it to the axially aligned shaft 22. The regulator or escapement mechanism 11 is enclosed within a vacuum sealed chamber 21 within which is located the shaft 22 having at one end a follower or slave bar magnet 23, this slave magnet 23 being mounted within a boss 24 of the regulator chamber 21 which extends within the bight between the south and north poles 18 and 20 of the drive magnet 17, thus bringing the north and south poles of the slave magnet 23 under the influence of the south and north poles 18 and 20 of the drive magnet 17, the U-shaped drive magnet 17 and the bar magnet 23 thus providing the magnetic clutch.

It will be understood, of course, that the chamber 21 of the regulator 11 must be made of non-magnetic metal or other material capable of having a permanent vacuum formed therein. By means of the magnetic clutch consisting of the drive magnet 17 and slave magnet 23 the shaft 16 is constrained to act as though it were a rigid piece with the aligned shaft 22. This shaft 22 within the regulator chamber 21 is connected by the usual gear train 24 through the escapement wheel 25 and the pallet 26 to the balance wheel 27 controlled by the hair spring 28. This hair spring 28 is adjustable by a lever 30, this adjustment lever 30 being provided with the usual hair spring control fingers 31 and 32 so that movement of the lever 30 about its pivot at the center of the hair spring will adjust the hair spring 28 to speed up or slow down the operation of the timepiece. The end of the lever 30 is provided

with a toe 33 to which is pivoted one end of a link 34 whose other end is pivoted to a fixed finger 35 extending from the inner side of the regulator chamber 21. This link 34 passes through an eyepiece 36 mounted on a rigid base plate 37 of a bellows 38 which is sealed to a plate 40, the plate 40 in turn being sealed at 41 to an inner wall of the regulator chamber 21. A regulator screw 42 is threaded through the plate 40 and is provided with a ball and socket connection 43 to the inner side of the bellows base plate 37, thus preventing any outside pressure from affecting the rate.

The regulator screw 42 has its head 44 located in a threaded opening 45 through the regulator chamber 21, this threaded opening 45 being sealed off by the bellows mechanism just described. A threaded cap 46 serves to protect the regulator screw 42 from accidental movement. The regulator 11 is adapted to be placed in a well 47 of the timepiece case 12, the regulator 11 resting on a shoulder 48 at the bottom of the well 47.

This well 47 is provided with a side opening 50 through which may extend a reversely bent finger 51 of a bellcrank 52 pivoted as at 53 on a base 54. The other finger 55 of bellcrank 52 is adapted to move into the path of the drive magnet 17 as at 55' when the regulator chamber 21 has been removed from within the well 47. A spring 56 pressing against the bellcrank 52 normally urges the finger 51 to the position 51'.

In operation, the regulator 11 is completely sealed in a vacuum or gas with all the regulator mechanism therein sealed off from the atmosphere, suitable lubrication having been placed within the chamber 21 before it is sealed. When the regulator 11 is inserted into operative position within the well 47 of the timepiece case 12 the bellcrank 52 is moved by the action of the regulator chamber wall to push against the bellcrank finger 51 and move it from the broken line position at 51' to the full line position at 51. This simultaneously removes the finger 55 from the broken line position at 55' to the full line position at 55, and releases the drive magnet 17 for operation. However, the drive magnet 17 is now magnetically connected through the slave magnet 23, thus connecting the shaft 16 to the shaft 22 and causing the balance wheel 27 to regulate the mechanism of the timepiece.

If it is found necessary to adjust the regulator 11 to cause it to regulate the timepiece to operate at a faster or slower rate, the regulator is removed from the timepiece well 47, thus allowing access to the regulator screw 42 after the cap 46 is removed. A screw driver inserted in the screw head 44 through the eyepiece 36 and the pallet link 34 may be operated to shift the pallet lever 30 to regulate the action of the hair spring 28, there being no possibility of leakage of the vacuum, due to the fact that the absolute seal is not disturbed thereby.

Other modifications and changes in the number and proportions of the parts may be made by those skilled in the art without departing from the nature of this invention within the scope of what is hereinafter claimed.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

Having thus set forth and disclosed the nature of this invention, what is claimed is:

1. A readily removable vacuum sealed regulator for a timepiece, an adjustable bellows extending into said vacuum sealed regulator, said bellows being connected to the regulator, and means exterior of the vacuum sealed regulator for adjusting said bellows to thereby adjust said regulator.

2. For use in a timepiece, a readily removable hermetically sealed chamber, a timepiece regulator mechanism within said chamber, said mechanism including an escapement mechanism, and means for adjusting said escapement mechanism, said adjusting means including a bellows sealed to one side of said chamber, and means exterior of said bellows for adjusting said bellows to thereby adjust the escapement mechanism.

3. In combination, a timepiece mechanism and a regulator mechanism therefor, a hermetically sealed chamber in which said regulator mechanism is enclosed, a casing in which said timepiece mechanism is contained, a well in said casing in which said chamber is receivable, a magnetic clutch extending through the bottom wall of said well connecting said regulator mechanism to said timepiece mechanism, and automatic means extendable through a side wall of said well into the space normally occupied by said sealed regulator chamber for stopping said timepiece mechanism from operating when said regulator chamber is absent from said casing well.

4. In combination, a timepiece mechanism and a regulator mechanism therefor, a hermetically sealed chamber in which said regulator mechanism is enclosed, a casing in which said timepiece mechanism is contained, a well in said casing in which said chamber is receivable, a magnetic clutch connecting said regulator mechanism to said timepiece mechanism, automatic means for stopping said timepiece mechanism from operating when said regulator chamber is absent from said timepiece casing well, said automatic means including a bellcrank in said timepiece casing, one arm of said bellcrank being extendable through a side of the well into the path of the regulator chamber and the other arm of the bellcrank being extendable into the path of operation of the timepiece mechanism, yieldable means urging said bellcrank into said paths when said regulator chamber is absent from said well to prevent the operation of the timepiece mechanism but permitting said bellcrank to be moved by said chamber entering said well to move the timepiece mechanism finger out of the path of operation of the timepiece to permit operation of the timepiece.

5. Means for regulating a mechanism through a hermetically sealed wall, said means including a bellows sealed to said hermetically sealed wall, means connecting one side of said bellows to the mechanism, and means on the other side of said bellows for positively controlling its motion, said latter means comprising an adjustable screw and a ball and socket connection between said adjustable screw and the adjacent side of said bellows.

6. In combination, a timepiece mechanism and a regulator mechanism therefor, a hermetically sealed chamber in which said regulator mechanism is enclosed, a casing in which said timepiece mechanism is contained, means for attaching said chamber to said casing, a magnetic clutch connecting said regulator mechanism to said timepiece mechanism, and automatic means for stopping said timepiece mechanism from operating when said regulator chamber is absent from said casing.

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