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C. H. H RODANET
DEVICE FOR EXERTING A CONSTANT RETURNING TORQUE ON A ROTATIVELY MOVABLE UNIT
Filed Oct. 22, 1940

Serial No.
362,229
2 Sheets-Sheet 1

Fig. 1.

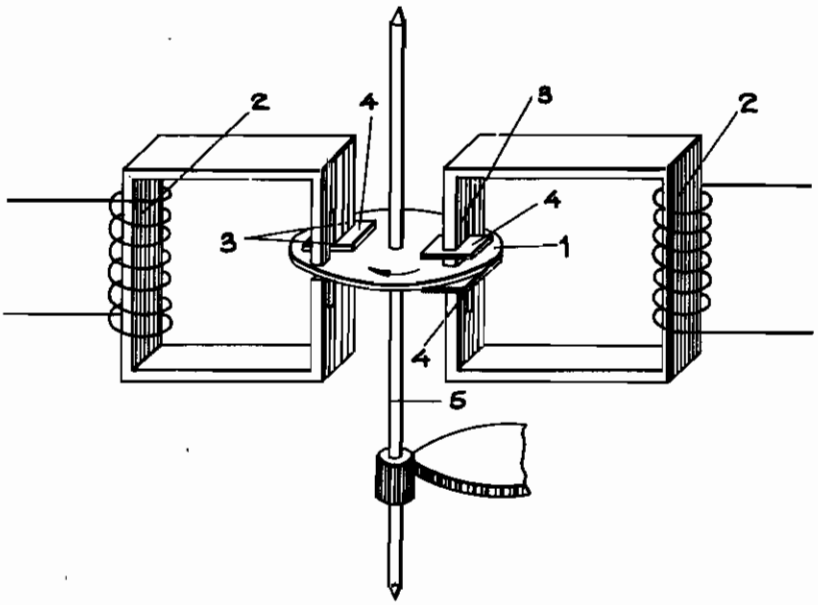
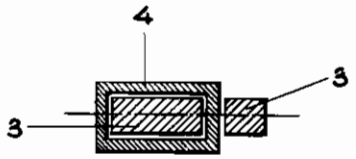


Fig. 2.



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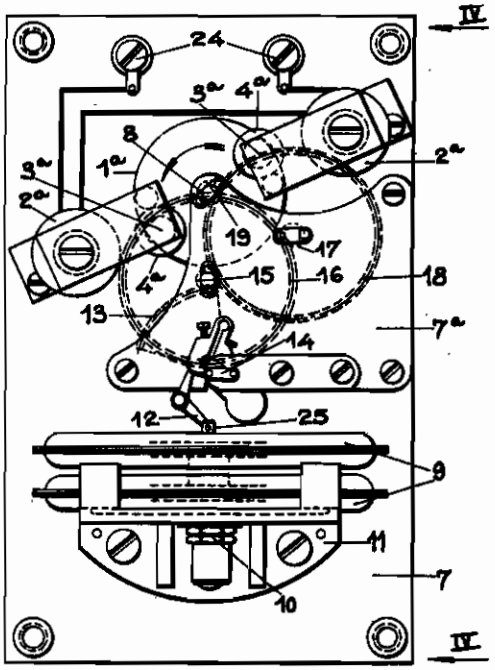
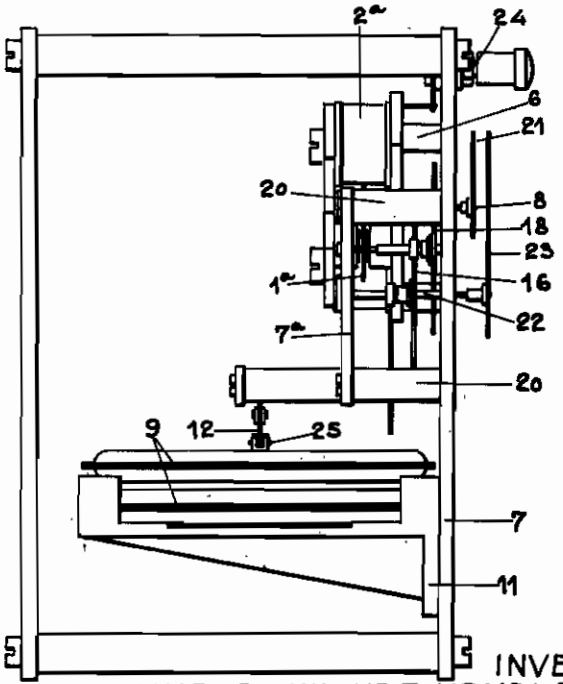
.Fig.3.



.Fig.4.



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ALIEN PROPERTY CUSTODIAN

DEVICE FOR EXERTING A CONSTANT RETURNING TORQUE ON A ROTATIVELY MOVABLE UNIT

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Application filed October 22, 1940

Numerous apparatus exist which comprise a rotatively movable unit, as is the case for instance for most measuring apparatus, and in which it is necessary to permanently exert on said movable unit a returning torque as constant as possible. This problem has been solved up to now, by the use of springs, which are tensioned by the movable unit when the latter moves away from its zero abutment, and which, consequently, always tend to restore said unit towards said abutment. But the returning torque exerted by such springs is not constant, as it increases in proportion with the rotation of the movable unit; and this inconvenience is so much the more intense as the rotation of the movable unit can take place through a larger angle.

The present invention is intended to solve the problem of exerting a constant returning torque on a rotatively movable unit. For that purpose, it consists in the new application, to movable units of this type, of all known devices, used up to the present, as prime-movers, capable of exerting on a rotor the desired constant torque, without however preventing said rotor from having a movement, under another influence, different from that which must be imparted thereto by the aforementioned constant torque. Torque generators of this type can be electric, hydraulic or pneumatic generators; they are characterised, as regards their function, by the double property of exerting on the rotor a constant torque and of allowing the positive or negative sliding of the rotor.

Whereas, up to now, torque generators of this kind were used as prime-movers, that is to say for rotatively driving the rotor, they are on the contrary, according to the invention, applied to the production of a returning torque (therefore an antagonistic torque) on a rotor belonging to another driving system, which can, for instance, be that of a measuring instrument.

The constant torque generator can be of any type whatever as well as the driving system actuating the rotor; the invention does not reside, in fact, in either of these two known means, but in the new application of the first of said means, by combining it with the second in such a manner that its function is reversed. Whereas, in fact, up to now, said first means (the torque generator) served to rotatively drive a rotor, it is now antagonistic to said rotation, and this in order to produce the new industrial result which consists in obtaining the constancy of the returning torque exerted on a movable unit, whatever may be the amplitude of the rotation of said unit.

By way of example, the combination of a definite type of torque generator will be described, which is already known in electric meters, with a measuring instrument such as an altimeter of very high gearing-up ratio, and in which, consequently, the amplitude of rotation of the last element of the movable unit is considerable. It is moreover to be noted that, in cases of this kind, it is important that the constant returning torque should be exerted on the last movable element; by this means, in fact, the influence of play is completely eliminated, said play being constantly taken up by the action of the returning torque.

The accompanying drawings illustrate, by way of example only, a form of construction of an altimeter improved according to the invention.

Fig. 1 is an explanatory diagram of the invention, in perspective view.

Fig. 2 is a cross section of one pole of the diagram of Fig. 1.

Fig. 3 is a front view seen from the rear of the improved altimeter.

Fig. 4 is a side view made according to line IV—IV of Fig. 3.

It is known that in certain electric meters (Figs. 1 and 2) the driving member is constituted by a conducting disc 1 preferably of high conductibility, for instance made of red copper or aluminium, arranged between the poles of one or more electromagnets 2.

The flux of each electromagnet is rendered asymmetric owing to the fact that a part of each pole 3 is embraced by a conducting ring or small plate 4, for instance made of red copper, which has the effect of offsetting, in the corresponding parts, the magnetic flux.

It is known that in these conditions the direction of rotation of the movable disc 1 is such that it drives the current elements induced in said disc, from the normal flux towards the out-of-phase flux.

Such a device comprising no sliding contact allows, without causing braking, of obtaining a constant returning torque exerted on the shaft 5, and consequently, of taking up all the play of the elements of a transmission connected to said shaft.

For preventing the inducing device from exerting any magnetic attraction on the movable magnetic members of the apparatus, it is advantageous to construct this inducing system symmetrically, by providing for instance two elec-

tromagnets 2 symmetrical relatively to the shaft 5 as shown in Fig. 1.

This device is applied, in the embodiment of Figs. 3 and 4, to an altimeter of high gearing-down ratio. Both electromagnets 2^a, corresponding to the electromagnets 2 of Fig. 1, are supported by small columns 6 on a plate 7 which constitutes the visible front face of the frame of the apparatus. They are arranged, with their poles 3^a, provided with small plates or discs 4^a, as in the general arrangement of Figs. 1 and 2, symmetrically relatively to the spindle 8 which carries the conducting disc 1^a corresponding to disc 1 of Figs. 1 and 2. The disc 1^a constitutes the last gear of the gearing-up train interposed between the aneroid capsules 9 of the altimeter. These capsules, combined in the known manner, are secured at 10 on a bracket 11 carried by the plate 7. The last capsule or free capsule is centrally connected to a bell-crank lever 12 which controls a toothed segment 13 pivotally mounted at 14. The transmission of the angular displacements of the segment 13 to the disc 1^a takes place through the pinion 15, gear 16, pinion 17, gear 18 and pinion 19, the spindles being pivoted, on the one hand, on the plate 7, and on the other hand, on an inner plate 7^a connected to the first one by small columns such as 20. The spindle 8 extends forwardly of the plate to receive an indicating pointer 21. The spindle 22 carries likewise, in this embodiment, a pointer 23. The pointers can indicate different orders of the same units or different units (pressures and altitudes). The detail arrangement of the altimeter is moreover of no importance for the invention.

The coils 2^a are fed with alternating current by connecting them to a suitable source through terminals 24 accessible from the front face of plate 7 which carries the dials or graduations over which move the indicating pointers 21 and 23. The constant returning torque is exerted, for instance, in the direction of the arrow (Fig. 3) on the disc 1^a, constantly taking up the play in the kinematic connection between the spindle 8 and the point 25 of the capsules.

This entirely electric solution appears at first to be the most advantageous for an apparatus of the altimeter type. But, as already explained, the constant returning torque, without friction, might be produced by pneumatic or hydraulic means. The invention is defined in its main characteristic feature in the preamble to the present specification and includes in its scope all means and combinations of means capable of allowing said characteristic feature to be carried into practice.

The invention particularly concerns, by way of new industrial products, all apparatus and especially measuring apparatus comprising a rotor subjected to a constant returning torque, but free to have, under another influence, a movement different from that which must be imparted thereto by said constant returning torque.

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