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Date of Application, 15th Nov., 1912

Complete Specification Left, 15th May, 1913—Accepted, 13th Nov., 1913

PROVISIONAL SPECIFICATION.

Improvements in and relating to Electric Secondary Clocks.

I, THOMAS RUSHTON, of 24, Salisbury Road, Upper Holloway, London, N., Watch and Clock Repairer, do hereby declare the nature of this invention to be as follows:—

This invention relates to the sub-dials or secondary clocks in electric clock systems, that is dials which are controlled from a master clock, and its purpose is to facilitate the adjustment of such secondary clocks backward as well as forward. To this intent a backward driving mechanism is provided which can be operated electrically through the ordinary controlling circuit or through a special circuit.

In a preferred construction according to the invention two operating electromagnets are mounted upon one of the frame plates of the dial train. These have cores to which end plates are attached projecting towards each other and having their ends bent parallel to the axis of the winding. The ends of these plates are shaped to an arc to form pole pieces closely fitting the armatures of the magnets. Each armature consists of a flat bar almost filling the gap between the end plates of its magnet. The two bars are joined by a brass plate and are pivoted in about the middle of their length upon a spindle which has bearings in brass brackets fastened to the end plates of the electromagnets. The armatures are loose upon the spindle which carries midway between the two electromagnets a worm meshing with a worm wheel upon the hour spindle of the clock train.

Adjacent each armature, preferably between it and the winding of its electromagnet, is arranged a ratchet with fairly broad teeth. This is engaged by a spring-pressed pawl pivoted on the end of the armature and also by another spring-pressed check pawl mounted upon the framing of the clock train. Beside the ratchet there is mounted fast upon the shaft a disc carrying a pin which can engage with any one of a number of holes in the ratchet wheel arranged opposite the respective teeth. The two armatures and their ratchet wheels can move longitudinally upon the shaft of the worm. When one ratchet is engaged by the pin of the disc adjacent to it, the armature on its other side is directly in the line of the pole pieces of the electromagnet, while the remaining armature is drawn slightly out of the field of its electromagnet. The ratchet wheels are arranged in opposite ways upon the shaft so that the one drives in one direction of rotation and the other in the opposite direction. The windings of the electromagnets are joined to three terminals, one of which is common to both, and through these terminals by three leads to a battery at any suitable position, for example near the master clock. In such position suitable pushes or other switches are provided by which the circuit of either electromagnet can be closed at will.

The device is mounted so that the worm shaft is horizontal and the armatures when attracted are in approximately a vertical position. The armatures are so cut or weighted, for instance by the brass piece which joins them together, that when not attracted by their magnets they tend to fall into an

[*Price 8d.*]

inclined position in which they no longer completely bridge between the electromagnet poles. Stops, preferably of cork, are provided to limit their motion in either direction, the range of motion being equal to the space occupied by one tooth of the ratchet.

When a current impulse is passed through either electromagnet the field which is produced tends not only to draw the armature into a vertical position but also to draw it longitudinally along the worm shaft into the field of the electromagnet if it is not already completely in that field. Such longitudinal motion engages the ratchet wheel with the pin on the disc beside it and so connects the ratchet wheel with the worm shaft. The repeated rocking of the armature by repeated depression of the controlling push then causes the ratchet wheel, and hence the worm, to be stepped on in one direction. If the other electromagnet should be excited the armatures move longitudinally as they rock, so disengaging the one ratchet wheel and engaging the other, and repeated closing of the circuit then causes the worm shaft to rotate in the opposite direction.

If desired, the sub-dial could be operated in either direction by the aid of a single circuit only and with the use of a polarized armature. For example, two electromagnets could be arranged in series in the circuit and with their pole pieces evenly spaced in a circle about the pivot of the polarized armature. By suitable weighting or the like the armature would normally be held in a vertical position and would rock from this central position to the one side or the other according to the direction of the current in the magnet windings. It could carry two pawls each guided by suitable stops so as to be operative upon its ratchet only when the armature rocked to one side of the mid position.

Again the two different operations required might be brought about by the use of currents of different strength but always in the same direction.

Dated this 14th day of November, 1912.

W. P. THOMPSON & Co.,
285, High Holborn, London, W.C., and at
Liverpool and Bradford,
Patent Agents for the Applicant.

COMPLETE SPECIFICATION.

Improvements in and relating to Electric Secondary Clocks.

I, THOMAS RUSHTON, formerly of 24, Salisbury Road, Upper Holloway, London, N., now of 84, Tytherton Road, Tufnell Park, Watch and Clock Repairer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to electromagnetic apparatus for adjusting backward or forward the sub-dials or secondary clocks of electric clock systems. According to the invention the armature (or armatures) of the apparatus, which by its rotation upon its axis adjusts the sub-dial mechanism, is made also longitudinally movable on its axis, under the action of the operating electromagnet, and the longitudinal movement is utilised to reverse the direction of rotation imparted to the sub-dial mechanism. Preferably the motion is communicated to the sub-dial mechanism through a worm so that the apparatus is self-locking.

Examples of construction according to the invention are illustrated in the accompanying drawings, in which

Fig. 1 is a front elevation of one form.

Fig. 2 a cross section on the line II—II of Fig. 1.

Fig. 3 is a front elevation of a modification, and

Fig. 4 a cross section on the line IV—IV of Fig. 3.

In the construction shown in Fig. 1 the electromagnetic device drives the motion work of the dial which is mounted on the back of the plate 1 through the medium of a worm shaft 2, a worm 3 and a worm wheel 4, which has the advantage of being self-locking. The shaft 2 may be rotated in either direction, the rotation in one direction being effected by the electromagnet 5 and in the opposite direction by the electromagnet 6. Each of these electromagnets has an armature 7, 8 respectively loosely rotatable on the shaft 2, and the two armatures are joined by a brass strip 9 the weight of which normally tilts the armatures when unattracted into an inclined position. Upon bosses secured to the armatures 7 and 8 respectively are loosely mounted ratchet wheels 10, 11 having their teeth set in opposite directions. These with the armatures 7 and 8 are slidable on the shaft 2 as well as rotatable relatively thereto. Each armature carries a pivoted pawl 12, 13 engaging the teeth of the adjacent ratchet wheel. On its outer face each ratchet wheel is pierced with a number of flared holes 14.

Beside each ratchet wheel there is mounted fast upon the shaft 2 a disc 15, 16 and each disc carries on its inner face a rounded pin 17, 18 adapted to enter the holes 14. The space between these discs is slightly greater than that between the outer faces of the ratchet wheels 10, 11 so that only one ratchet wheel can be engaged with its disc at one time. In the same way the pole pieces of the electromagnets 5 and 6 are a little further apart than the armatures 7 and 8.

In order to turn the sub-dial in one direction, one only of the electromagnets is to be excited. The position of the parts shown in the drawings is that assumed when the electromagnet 6 is excited. Its armature 8 is attracted and has at the beginning two movements. It rotates about the shaft 2 towards the vertical position, and as soon as one of the holes in the ratchet wheel 11 comes opposite the pin 18 it moves longitudinally along the shaft 2 into the position shown in which its armature is substantially in line with the pole pieces. Any further current impulses sent through the winding of the electromagnet 6 cause the armature 8 to operate upon the shaft 2, its pawl 13 stepping round the ratchet wheel 11 on each oscillation. On account of the engagement of the ratchet wheel with the pin 18 this movement results in the shaft 2 being rotated.

If it is desired to operate the sub-dial in the opposite direction, electromagnet 5 is excited when the armatures move over to the left so as to disengage pin 18 and engage pin 17.

In the alternative construction shown in Figs. 3 and 4 use is made of a polarized armature so that it is only necessary to have two conductors proceeding to the sub-dial instead of the three employed with the construction of Figs. 1 and 2. This polarized armature 19 is common to two electromagnets 20, 21 which are set at right angles so that their pole pieces form arcs of one cylinder. As may be seen from Fig. 3, however, the poles are not in the same plane. On either side of the armature on a boss carried by it there is loosely mounted a ratchet wheel 22 having recesses in its outer surface similar to the ratchet wheels 10, 11 of Figs. 1 and 2. These with the armature are loosely revoluble on a spindle 23 through which the clock train is driven. Fast on this spindle are two discs 24 carrying pins which alternately engage one of the ratchet wheels 22. The armature 19 is normally held in the horizontal position by a light spring 25 or by a weight or like means.

The electromagnets are so wound that a current passing in series through their windings makes the upper poles of the two electromagnets alike, as is indicated in Fig. 4 by the markings on the poles. When current is sent in one direction through the two electromagnet windings the upper poles become

say N. and the lower poles say S. As a result the S. pole of the armature 19 moves upward, being attracted by the upper pole of electromagnet 20 and repelled by the lower pole of electromagnet 21. Also as soon as the pin on the left hand disc 24 is in register with one of the holes in the left hand ratchet wheel 22, the armature moves to the left so as to lie substantially in the plane of the poles of the electromagnet 20, as shown in Fig. 3. In the remainder of its movement the electromagnet armature rotates with it the ratchet wheel 22 on the left in Fig. 3 & turns the shaft 23. When the impulse ceases spring 25 returns the armature to the position shewn in Fig. 4.

If the direction of the exciting current through the windings is reversed, the upper poles become S. poles, with the result that the armature oscillates in the opposite direction and also moves to the right so as to lie in the plane of the poles 21, thereby disengaging its left hand ratchet wheel from the left hand disc 24 and engaging the right hand ratchet wheel with the right hand disc 24.

These examples of construction are not the only ways in which the invention can be carried into effect. For instance the two different operations required might be brought about by the use of currents of different strength though always in the same direction. Normally the armature would be pressed towards one end of its longitudinal travel by a spring and weak impulses would serve only to rotate it on its axis. A stronger impulse would not only effect a similar rotation but would suffice to attract the armature longitudinally against the action of a spring. The longitudinal movement could be used as in the constructions illustrated to reverse the driving connection between the armature and shaft.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. Electromagnetic apparatus for the rotation of the hands of sub-dials in electric clock systems backwards or forwards, in which the electromagnet armature (or armatures) is adapted to be moved longitudinally upon its axis for the purpose of reversing the direction of the drive imparted by its rotary movement to the dial mechanism, both longitudinal and rotary motion being brought about electromagnetically.

2. A construction according to Claim 1 in which the electromagnetic apparatus rotates in one direction or the other the spindle which operates the dial mechanism through a worm, so that the apparatus is self-locking.

3. The improved electromagnetic sub-dial mechanisms, substantially as described with reference to Figs. 1 and 2, or Figs. 3 and 4.

Dated this 15th day of May, 1913.

W. P. THOMPSON & Co.,
285, High Holborn, London, W.C., and at
Liverpool and Bradford,
Patent Agents for the Applicant.

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RUSHTON'S COMPLETE SPECIFICATION.

(1 SHEET)

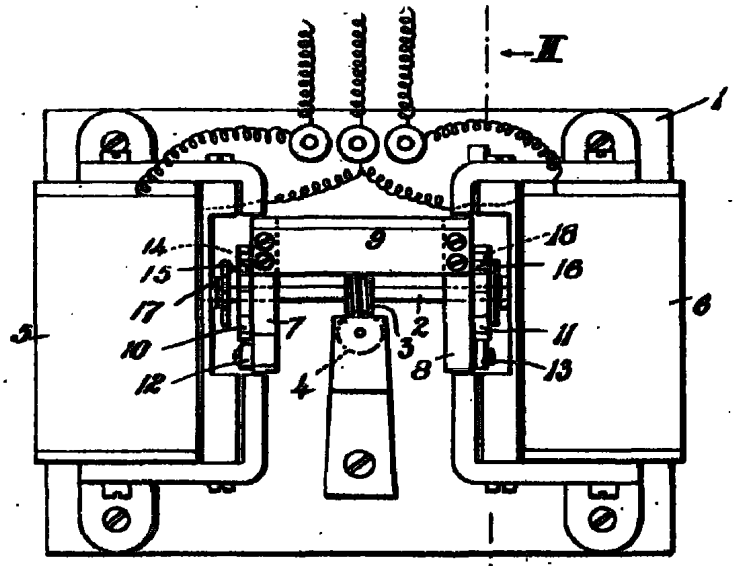

Fig:1.

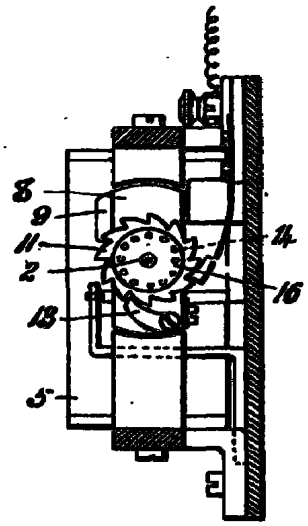

Fig:2.

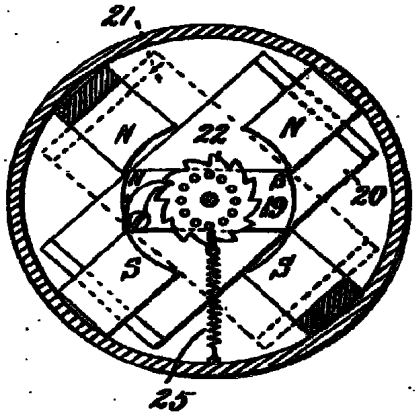

Fig:4

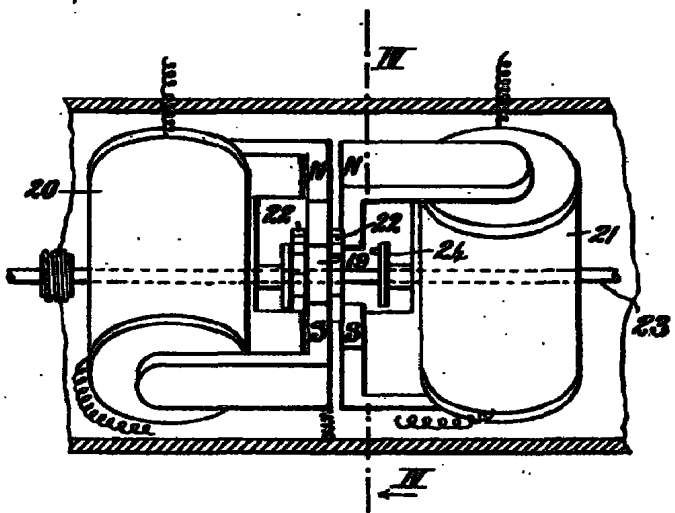

Fig:3.

Malby & Sons, Photo-Litho.