June 29, 1943. R. NORDENSWAN 2,323,235

ELECTROMAGNETIC COUNTING DEVICE

Filed Nov. 7, 1940

FIG. 1

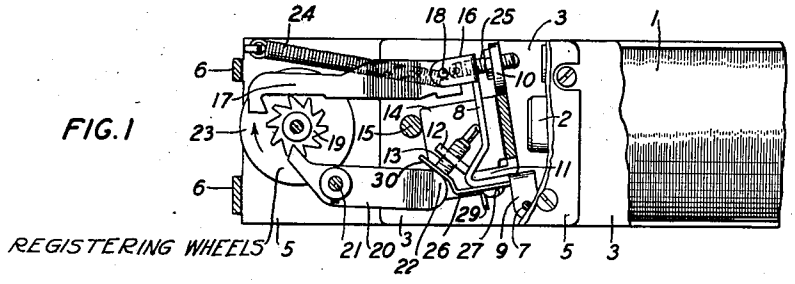



FIG. 2

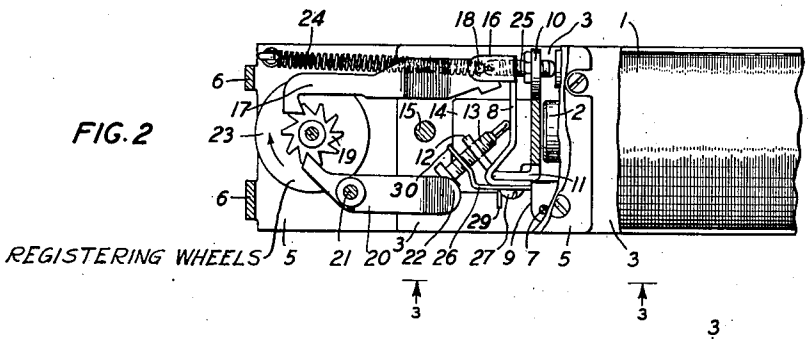
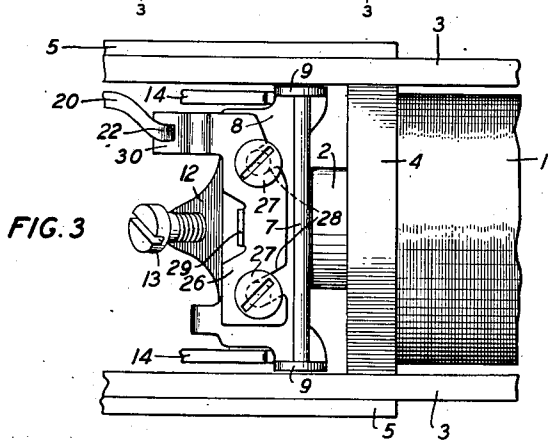



FIG. 3




INVENTOR
R. NORDENSWAN
BY
M. V. C. McKenney
ATTORNEY

Patented June 29, 1943

2,323,235

# UNITED STATES PATENT OFFICE

2,323,235

## ELECTROMAGNETIC COUNTING DEVICE

Robert Nordenswan, New York, N. Y., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Application November 7, 1940, Serial No. 364,640

3 Claims. (Cl. 235—92)

This invention relates to electromagnetic counting devices, and the object is to improve the structure and operation of such devices.

Heretofore registers or other counting devices have been provided in which the registering wheels are controlled by a stepping mechanism comprising an electromagnet and a ratchet mechanism for advancing the registering wheels when the electromagnet is energized. The electromagnet may control an armature to which is attached an actuating pawl which acts on a ratchet wheel associated with the unit registering wheel to advance said wheel one step for each operation of the armature. A holding pawl is provided for holding the registering wheels in the position to which they have been advanced by the actuating pawl. This holding pawl may engage a tooth in the ratchet wheel and hold it in its advanced position by having a weighted end so arranged that the weight of this end will maintain the holding pawl in engagement with the tooth.

It is a feature of the present invention to provide a holding pawl locking arrangement for such service registers or counting devices which consists of a spring member adjustably attached at one end to the armature near the pivotal point thereof. The free end of this spring member engages the weighted free end of the holding pawl, when the armature is in released position, to urge the holding pawl into engagement with the tooth in the ratchet wheel so that in case the ratchet wheel should move slighly out of alignment after it has been advanced one step, it will be brought back into alignment by the holding pawl. By this means therefore the unit registering wheel is always adjusted in perfect alignment after each step.

Referring now to the drawing, the invention has been illustrated in the accompanying drawing in which:

Fig. 1 shows a side view of a service register, partly in section, to which the applicant's invention has been applied;

Fig. 2 shows a similar side view of the register with the armature and actuating pawl in operated position; and

Fig. 3 shows a partial bottom view of the register taken between the lines 3—3 in Fig. 2.

Referring now to the drawing, Fig. 1 shows the operating electromagnet 1 having a core 2 and a U-shaped frame 3 in which the electromagnet is mounted, this frame serving as a return polepiece for the magnet. The magnet is secured in this frame by means of the usual spoolheads. The spoolhead at the left-hand end of the core is shown as 4. On the frame 3 is mounted a U-shaped frame member 5 which is cut out at the bottom portion to form two connecting strips 6 between which the number wheels may be viewed from the front of the register. Between the two sides of the frame 3 is secured a pin 7, on which an armature assembly is mounted consisting of a bracket 8 of non-magnetic material which is rotatably secured to the rod 7 through ears 9 bent downwardly at right angles to the main portion of the member 8. To this member 8 is fastened a member 10 of magnetic material. This member 10 is bent at right angles into a bottom portion at 11 which is fastened to the member 8. Member 10 also extends at an oblique angle from this bottom portion 11 into an extension 12 to which the screw 13 is threaded to engage the member 8 to adjust it in relation to member 10. The member 10 also is provided with opposite angular extensions 14 so that in the normal position of the armature assembly said extension will rest against the pin 15 inserted between the two sides of the frame 13 and provide a backstop for the armature assembly. At the upper end of member 8 are two ears 16 between which the actuating pawl 17 is pivoted on pin 18. The hook-shaped end of actuating pawl 17 will when the armature member 10 is attracted by the core 2 engage a tooth in the ratchet wheel 19 to rotate this wheel one step for each operation of the armature assembly. On the underside of the ratchet wheel 19 a tooth is engaged by a holding pawl 20 pivoted on rod 21 secured between the side members of the frame 5. The opposite end 22 of the holding pawl 20 extends some distance towards the right looking at Figs. 1 and 2 and is of sufficient mass to cause the holding pawl by gravity to engage the tooth in the ratchet wheel 19. To the ratchet wheel 19 are attached the usual registering wheels 23 which cooperate with each other as in any ordinary counting wheel structure in which a number of wheels operate so that a succeeding wheel will take one step after a preceding wheel has taken ten steps as is well known in the art. The ratchet wheel 19 is attached to the unit wheel and this wheel in turn is associated with the succeeding registering wheels. Screw 13 adjusts the position of the operating pawl 17 in relation to the ratchet wheel 19 and in relation to the armature member 10, so that for each attraction of the member 10 the operating pawl will actuate the ratchet wheel 19 exactly one step which is, of

course, the distance between two adjacent teeth of the ratchet wheel.

In Fig. 2 the armature structure is shown in the attracted position and the operating pawl has advanced the ratchet wheel 19 one step. While the ratchet wheel rotates in this step-by-step manner the holding pawl will slide in and out of succeeding teeth due to the end 22 of the holding pawl being weighted. The armature assembly is caused to return to the normal position shown in Fig. 1 by spring 24 which is attached at one end to the frame member 5 and at the other end to a screw 25 which is locked by a nut in armature member 10 and may be adjusted to provide the desired air-gap between the armature 10 and core 2.

On the under-side of the member 8 is attached spring member 26 by means of screws 27. This member 26 is provided with oblique slots 28 so that it may be adjusted in relation to the member 8. To facilitate the mounting and adjusting of the member 26, an angular projection 29 extends down inwardly looking at Figs. 1 and 2, from the member 26. It should be noted that this spring member 26 is provided with a projection 30 bent at an oblique angle to the main portion of the spring member. When the parts are in normal position as shown in Fig. 1, this projection will engage the weighted end 22 of the holding pawl 20 to hold this pawl in firm engagement with a tooth in the ratchet wheel 19. When the armature is operated as shown on Fig. 2 this projection 30 leaves the weighted end 22 of the holding pawl 20 to permit the pawl to function to engage a succeeding tooth. By this means, therefore, in case the ratchet wheel when advanced one step is not brought to occupy a perfectly aligned new position by the operating pawl, the projection 30 on the spring member 26 would engage the holding pawl and cause this pawl to adjust the ratchet wheel into the new position, and thereby always bring the unit registering wheel into a perfect alignment after each step.

What is claimed is:

1. In an electromagnetic counting mechanism having a counting wheel, an electromagnet, an armature therefor, a spring for returning the armature to a normal position after it has been actuated and released by said magnet, a ratchet wheel attached to said counting wheel, a pawl attached to said armature and engaging the teeth in said ratchet wheel for rotating it and said counting wheel one step equal to the distance between two adjacent teeth of said ratchet wheel for each attractive movement of the armature to realign the counting wheel in a new position, a pivoted holding pawl having a holding end engaging and fitting snugly between opposite surfaces of two teeth in said ratchet wheel and having its opposite end weighted to maintain said holding end in said position normally and means cooperating with said weighted end and operative under control of said spring and armature on the return of the armature to its normal position for actuating said holding pawl to cause its holding end to engage one or the other of the two opposite surfaces of two adjacent teeth and to force the ratchet wheel to rotate to occupy a position where the said holding end engages both said surfaces so as to align the counting wheel in said new position in case it has not been so aligned by the preceding attractive movement of the armature.

2. In an electromagnetic counting mechanism having a counting wheel, an electromagnet, an armature therefor, a spring for returning the armature to a normal position after it has been actuated and released by said magnet, a ratchet wheel attached to said counting wheel, a pawl attached to said armature and engaging the teeth in said ratchet wheel for rotating it and said counting mechanism wheel one step equal to the distance between two adjacent teeth of said ratchet wheel for each attractive movement of the armature to realign the counting wheel in a new position, a pivoted holding pawl having a holding end engaging and fitting snugly between opposite surfaces of two teeth in said ratchet wheel and having its opposite end weighted to maintain said holding end in said position normally, and a flexible spring member having one end adjustably attached to the armature so that the other free end will normally engage the weighted end of the holding pawl when the armature is restored and the holding pawl has its holding end in its normal non-actuated position between two teeth of the ratchet wheel and operative on the return of the armature to normal position under control of the restoring spring for engaging said weighted end of the holding pawl to cause the holding end thereof to engage and operate on one side surface or the other between two adjacent teeth of the ratchet wheel in case this wheel was not rotated to accurately align the counting wheel into the normal new position and to thereby force the ratchet wheel to occupy the new position to accurately align the counting wheel.

3. In an elecromagnetic counting mechanism, a magnet, an armature therefor, a spring for returning the armature to a normal position after it has been attracted and released by the magnet, a ratchet wheel having a small number of teeth making the opposite side surfaces of the teeth of large areas, a driving pawl attached to said armature engaging the teeth in said ratchet wheel for rotating it one complete step equal to the angular distance between two teeth on each attractive movement of the armature, a pivoted holding pawl having its holding end engaging the opposite surfaces of two adjacent teeth in said ratchet wheel and having the opposite end of said pawl weighted and located so as to hold said holding end in said position after each advance of the ratchet wheel of a complete step, an extension on said armature so located that in case the ratchet wheel has not been advanced a complete step by said driving pawl and the holding end of the holding pawl therefor engaging only one of the two opposite surfaces between two adjacent teeth, said extension will under pressure of the return spring, as the armature is returning to normal, engage and act on the weighted end of the holding pawl so as to press the holding end of this pawl against one or the other of the two opposite surfaces which it engages and thereby force the ratchet wheel to rotate to a corrected position where the holding end of the holding pawl will engage both surfaces.

ROBERT NORDENSWAN.