Nov. 30, 1926. 1,608,500

H. W. GOFF

SWITCHING DEVICE

Filed June 8, 1922 2 Sheets-Sheet 1

Fig. 1.

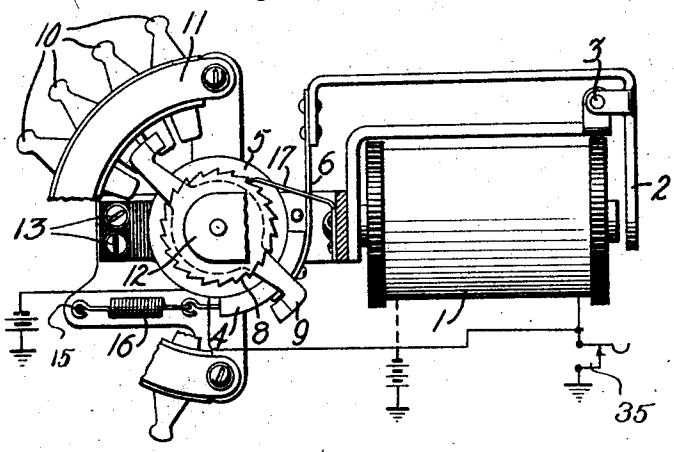


Fig. 2

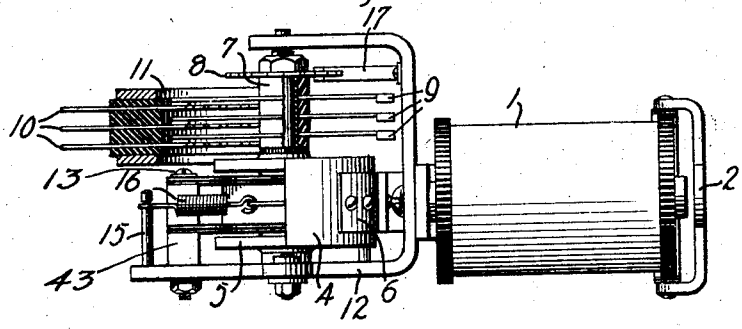
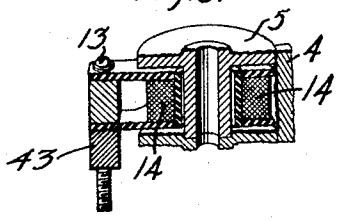


Fig. 3.



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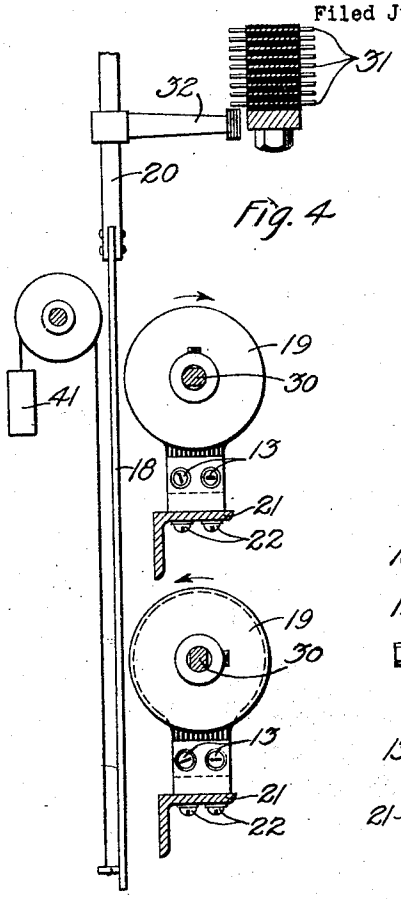


Fig. 4

Fig. 5

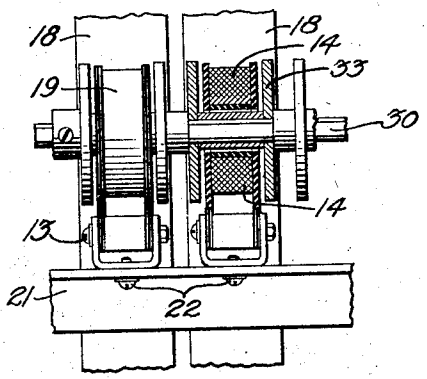


Fig. 6

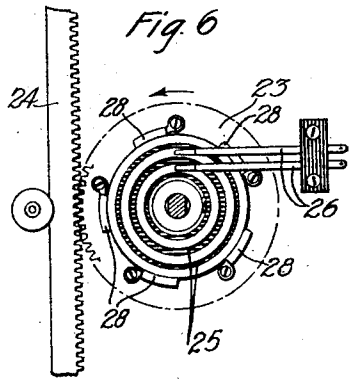
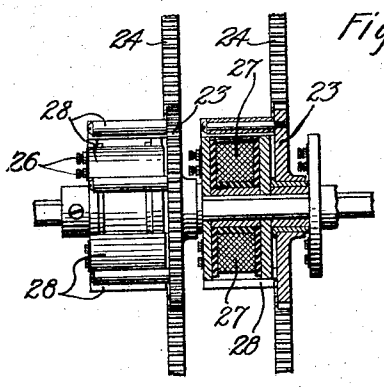


Fig. 7



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Patented Nov. 30, 1926. 1,608,500

UNITED STATES PATENT OFFICE.

HAROLD W. GOFF, OF NEW YORK, N. Y., ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

SWITCHING DEVICE.

Application filed June 8, 1922. Serial No. 566,916.

This invention relates to power transmission devices, and more particularly to magnetic clutches wherein a magnetic engagement is effected between a driving and driven member.

The present invention provides improvements in switches of the type employed in automatic telephone systems and wherein brushes are permanently secured to a driven member and operated to make contact with the stationary terminals such as in sequence switches, rotary stepping switches and in other similar devices.

In switches of the step-by-step type the contact making brushes are ordinarly mounted on a ratchet wheel which is adapted to be driven by a pawl associated with the armature of a driving magnet, so that when the magnet is intermittently energized the movement of the armature is imparted to the ratchet wheel through the pawl, the brushes thereby experiencing a stepping movement.

The principal object of this invention is to provide a driving mechanism for the brushes associated with rotary and panel type switches, wherein the driving and driven members are adapted to impart motion to one another without the intervention of ratchet wheels and pawls.

Another object of this invention is to effect a magnetic short circuit which causes a high degree of saturation in the gripping surfaces thereby insuring against lost motion or slip between the driving and driven members.

In accordance with the foregoing objects this invention consists essentially, of a magnet comprising a spool of a magnetic material, a coil for energizing the magnet and an armature bridging the edges of the spool head and adapted to grip the spool upon energization of the magnet.

In the accompanying drawings various modifications of the invention are shown and several adaptations thereof disclosed.

Fig. 1 shows the preferred form of the invention as applied to a rotary stepping switch. Fig. 2 is a side view of Fig. 1. Fig. 3 is a sectional view of the magnet showing how the windings thereof may be mounted so as to permit the rotation of the spool independently of the windings. Fig. 4 shows the application of the magnetic clutch to a panel type switch. Fig. 5 is a side view of a section of Fig. 4. Figs. 6 and 7 show another application of the clutch to a panel type switch. In this case a plurality of shoes are secured to a rotatable gear wheel and are adapted to be magnetically engaged by the spool heads of the magnet.

A complete understanding of the invention will be had from the following detailed description and by reference to the accompanying drawings:

Referring to Figs. 1 and 2, an operating magnet 1 is provided with an armature 2 pivotolly mounted on the spool head at the point 3. The operating magnet 1 may be provided with a circuit such as is indicated in which key 35 may be a contact operated by the magnet itself in the well-known manner or by any outside agency. The armature 2 is L-shaped and extends along the length of the magnet. A reed 6 connects one end of armature 2 to a magnetic shoe which serves as an armature for the clutch magnet 5. The shoe 4 is shaped to coincide with the edges of the spool heads of magnet 5 and effects a magnetic short-circuit between the spool heads upon energization of the magnet 5.

Permanently mounted on a shaft 7, on which the spool of magnet 5 is mounted, are a ratchet 8 and a set of brushes 9. Upon rotation of the spool of magnet 5, the brushes 9 experience a similar movement and make contact with the switch terminals 10 which are mounted in sets on a semicircular framework 11.

An auxiliary mounting member 12, to which the shaft 7 is pivotally secured, provides means for mounting a projecting member 43 on which the windings 14 for magnet 5 are mounted as shown in Fig. 3 by bolts 13. By this method the spool of magnet 5 can rotate free of its windings 14 thereby obviating the necessity for slip rings to feed the windings. A pin 15 projecting from the member 12 has permanently secured to it a spring 16 which serves to keep the shoe 4 in constant engagement with the spool of magnet 5 and also to return the shoe to its normal position upon deenergization of magnets 5 and 1 and the subsequent release of armature 2. A pawl 17 communicating with the ratchet wheel 8 holds the brushes 9 in their operated positions after magnet 5 is deenergized and the shoe 4 returned to its normal position under the influence of spring 16.

The operation of the switch is as follows: Magnets 1 and 5 are simultaneously energized from any suitable source of current. The magnetic shoe 4, bridging the spool heads of magnet 5, completes the magnetic circuit for this magnet and is magnetically gripped by the spool heads. At the same time the magnetic shoe 4 engages the spool heads of magnet 5, the armature 2 is actuated by the energization of magnet 1 and its movement is transmitted to the shoe 4 by the reed 6, so that the spool of magnet 5 is rotated through a small arc. The brushes 9 being secured to the spool of magnet 5, also travel through a similar arc and wipe over the switch terminals 10. Upon the deenergization of magnets 1 and 5, the armature 2 and the shoe 4 are released, the spring 16 serving to return them to their normal positions while the pawl 17 retains the brushes 9 in their operated positions.

Figs. 4 and 6 show modified forms of the invention and demonstrate the utility of such magnetic clutches to panel type switches. Referring first to Figs. 4 and 5 the magnetic shoe 18 is made in the form of an elongated bar and is adapted to operate with a plurality of magnets 19 as shown. Permanently mounted on the shoe 18 and insulated therefrom is a member 20 on which the brush arm 32 is mounted. The upper magnet 19 being energized attracts the shoe 18 which is moved upwards due to the clockwise rotation of the spool 33 of magnet 19. This rotation is effected by the constantly operating shaft 30 to which the spool 33 is secured. By the upward movement of shoe 18 the brush associated with brush arm 32 is caused to wipe over the switch terminals 31. The lower magnet 19 acts to operate the shoe 18 in a direction reverse to that effected by the upper magnet 19. Means for mounting the magnet clutches is provided by the member 21 and bolts 13 and 22. The moving parts are counterbalanced by the weight 41.

In Figs 6 and 7 the clutch magnet having windings 27 is provided with a plurality of shoes 28 which are permanently secured to a gear wheel 23 which meshes with a toothed member 24 on which a brush arm may be mounted. The windings 27 in this case are not mounted independently of the spool as heretofore described and are provided with slip rings and feeders 25 and 26, respectively, so that they may be energized while rotating with the magnet spool. The operation of this modification of the invention is fundamentally the same as the other forms heretofore described.

What is claimed is:

1. In a switching device, two operating members, a magnet having a rotatable spool and a shoe bridging the flanges of said spool, one of said operating members being connected to said shoe, whereby upon energization of said magnet propulsive energy may be transmitted from one of said members to the other of said members.

2. In a switching device, a magnet having a rotatable spool and a shoe bridging the edges of said spool, and a second magnet having an armature fixed to the shoe of said first magnet whereby the spool of said first magnet is rotated upon the energization of both of said magnets.

3. In a stepping device, a plurality of electromagnets, armatures associated therewith, one of said armatures bridging the poles of its associated magnet and acting as a clutch, another of said armatures adapted to oscillate upon the intermittent energization of its associated magnet, and means joining both of said armatures whereby the oscillatory movement of said second armature is imparted to said first armature, the magnet associated therewith experiencing a stepping rotary motion.

4. In a stepping mechanism, a magnet spool, means for rotatably mounting a winding on said spool, a shoe bridging the heads of said spool, and a driving member associated with said shoe and intermittently actuated, whereby said magnet spool is stepped around, subsequent to the energization of the winding thereon.

5. In a switching device, a driving member, a driven member, a magnet having a rotatable spool connected with said driven member, a shoe bridging the flanges of said spool, and means for connecting said shoe with said driving member, said magnet when energized being effective to transmit propulsive energy from said driving member to said driven member.

6. In a switching device, a brush carriage, a magnet having a rotatable spool, means comprising a shoe bridging the edges of said spool for advancing said carriage, and means for retaining said carriage in its advanced position.

In witness whereof, I hereunto subscribe my name this 5th day of June A. D., 1922.

HAROLD W. GOFF.