Jan. 25, 1944. G. R. EATON 2,339,919

DIAL WITH MAGNETIC GOVERNOR

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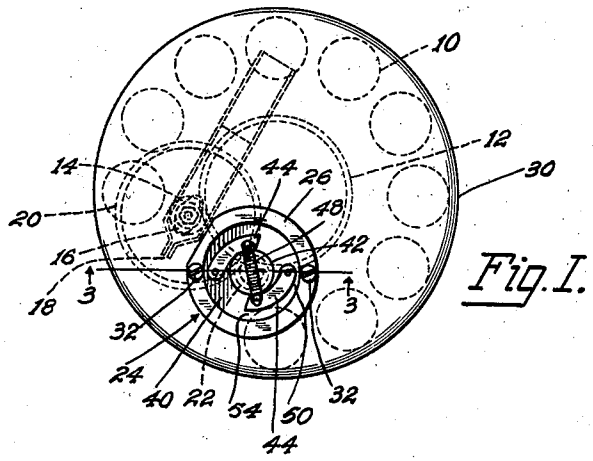

Fig. 1.

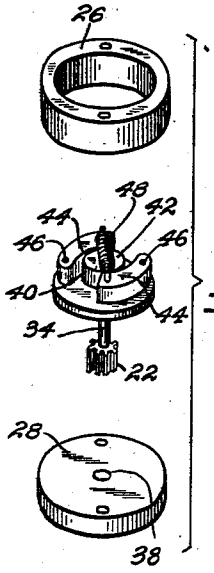

Fig. 2.

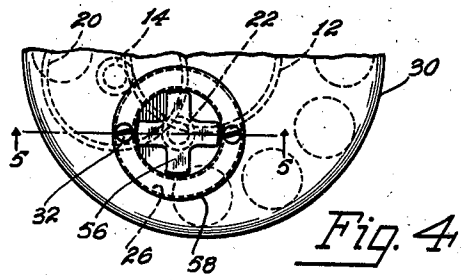

Fig. 4.

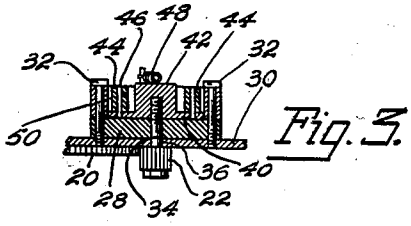

Fig. 3.

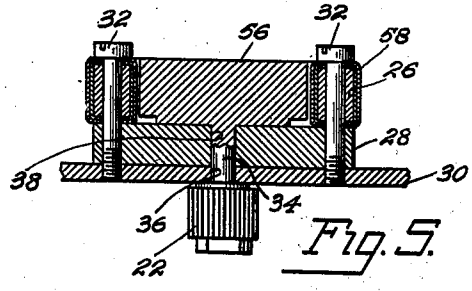

Fig. 5.

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UNITED STATES PATENT OFFICE

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DIAL WITH MAGNETIC GOVERNOR

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Application January 15, 1941, Serial No. 374,432

3 Claims. (Cl. 188—182)

This invention relates to calling devices, and has to do more particularly with calling devices such as are commonly used in telephone substations for controlling, by directive impulses, automatic switches which are located at the central office to extend a connection from the calling substation to a called substation, through the agency of said switches at said central office.

The object of this invention is to provide a calling device which shall be certain, quiet and efficient in operation, simple in construction, economical to manufacture, and effective in controlling, forced as well as normal, dialing operations.

One feature of the invention resides in the use of a magnetic governor which controls the normal dialing action by electromagnetic induction effects. Another feature resides in the arrangement of the magnetic governor whereby the action of a calling subscriber in forcing the dialing through the impulse sending cycle is, definitely controlled by a marked increase in the magnetic braking action of the governor, and may also include mechanical braking action as well.

The many features and advantages of this calling device will be better understood in view of the following description taken in connection with the accompanying drawing.

In the drawing wherein like reference characters indicate corresponding parts in the various figures:

Fig. 1 is a bottom plan view showing the magnetic governor applied to a calling device;

Fig. 2 is an exploded view of the governor;

Fig. 3 is a partial section through the governor mechanism on the line 3—3 in Fig. 1;

Fig. 4 shows a variation in governor construction; and

Fig. 5 has a large sectional view on the line 5—5 in Fig. 4.

Referring now to the illustrated construction, the calling device is shown as comprising a manual actuating means in the form of an apertured disc or dial 10 having ten openings or finger holds normally positioned adjacent to a card disc bearing numerals or letters. The disc 10 is connected through the medium of the usual one-way clutch or ratchet means (not shown) to a shaft upon which is mounted a gear wheel 12 which latter forms the initial member of an accelerating gear train. The relatively large diameter gear wheel 12 meshes with a pinion 14 which in turn is mounted upon a rotatable shaft carrying a cam member 16 for operating the impulse sending or transmitting contacts 18, and also another gear wheel 20 in the accelerating gear train. The periphery of the gear wheel 20 engages a second pinion 22 secured to a shaft which carries a magnetic governor having relatively movable parts for controlling the impulse transmitting contacts.

The dialing disc 10 is normally rotatable forward and backward to, respectively, set up a series of impulses, and to then send the impulses. The magnetic governor means regulates the speed of the sending of these impulses within determinate limits, and if the subscriber forces the dial during its backward or impulse sending movement, the governor means also restricts the speed so that the impulse transmission will be limited to that which the automatic exchange is capable of properly utilizing.

The selective rotation of the dialing disc 10 sets up a dialed digit, and its subsequent release causes the impulse sending means 18 to be actuated. At the same time, the gear train causes a rapid rotation of the magnetic governor means.

The governor means 24 shown generally in Fig. 1 is shown in more detail in the exploded view of Fig. 2. This device in its preferred embodiment comprises an annulus 26 of soft iron, i. e., of relatively low permeability, which is supported upon a non-magnetic disc 28 of brass or the like, interposed between it and the cup-shaped member 30, the latter forming the support and a part of the housing of the gear train. The annulus and disc are secured to the cup member by two machine screws 32. Shaft 34, to which the pinion 22 is secured, extends through appropriate apertures 36 and 38 of the metal cup and disc, respectively. At the upper end of the shaft is mounted a non-magnetic disc 40 having an upwardly extending boss 42.

Permanent magnets 44, of relatively high permeability, are pivotally supported at 46 near the periphery of this disc, and have their opposite ends interconnected by means of a spring member 48. The pivoted ends 46 of the permanent magnets are preferably designed to provide a constant air gap 50 between them and the annulus. The free ends are designed so that they provide a relatively large air gap 54 between them and the annulus when stationary. During normal operation of the calling device, the permanent magnets will be rotated and moved by centrifugal forces to reduce the air gaps 54, with a consequent increase in the drag or braking action of the governor. The movement of the permanent magnets adjacent to the soft iron annulus also sets up induced currents in the latter which in turn set up magnetic fields which

react upon the magnets. In the preferred operation of the governor, the permanent magnets are relatively movable with respect to the annulus, and spaced from it at all times.

These magnets can also be arranged so that when a subscriber forces the dial during the impulse sending period, the magnets and spring will, at a designed critical speed, throw the permanent magnets into actual, mechanical or frictional engagement with the annulus, as well as magnetic. Such action sets up a markedly increased braking effect to restrict the sending of the transmitted impulses to a frequency within the normal operating range of the automatic telephone system. It is preferred to utilize this last type of governor action only for abnormal operations since the magnetic action of the governor, as first described, is highly satisfactory in all normal conditions of use.

A variation in operation and construction is illustrated in Figs. 4 and 5 wherein the permanent magnet is shown in the form of a salient pole rotor element **56** having four poles. In this construction, the soft iron annulus **26** is also shown covered by a copper sheathing **58**. This arrangement can be designed to increase the governor action. It entails a somewhat greater cost from the commercial view-point. In this arrangement, the magnetic means **56** is always spaced from the copper sheathed, or plated, annulus, but is relatively rotatable with respect to it. The speed of the device does not vary the air gap but the induced field is of course in proportion to the speed of cutting the lines of force. In the construction of Figs. 1 to 3, the air gap changes and, consequently, the number of lines of force being passed through the annulus. The closer the free ends of the magnets get to the annulus, the greater becomes the magnetic attraction and, consequently, the greater the retarding effect.

During operation with the preferred construction, the governor magnets are always spaced at least a small distance from the ring or magnetic body **26**.

Although a preferred embodiment of the invention is illustrated and described, variations within the true spirit and scope of the same are to be determined by the appended claims.

Having thus described my invention, what I claim is new and desire to secure by United States Letters Patent is:

1. In a magnetic governor, an annular member of magnetic material, a shaft rotatably supported substantially axially of said annular member, a pair of magnetized members pivotally supported on said shaft on opposite sides thereof and arranged to rotate therewith in the plane of said annular member and resilient means engaging said magnetized members to resist their movement outwardly toward said annular member, said resilient means being tensioned to permit engagement of said magnetized members with said annular member incident to a predetermined speed of rotation of said shaft.

2. In a magnetic governor, an annular member of magnetic material, a shaft rotatably supported substantially axially of said annular member, a mounting plate carried by said shaft in substantially the plane of said annular member, a pair of magnetized members pivotally supported on said plate at opposite sides thereof and arranged to rotate therewith in the plane of said annular member and resilient means engaging said magnetized members to resist their movement outwardly toward said annular member, said resilient means being tensioned to permit engagement of said magnetized members with said annular member incident to a predetermined speed of rotation of said shaft.

3. In a magnetic governor, an annular member of magnetic material, a shaft rotatably supported substantially axially of said annular member, a mounting plate fixed with said shaft, a pair of magnetized members each pivotally supported adjacent to one end on said plate at opposite sides thereof and arranged to rotate therewith in the plane of said annular member and resilient means joined to said magnetized members adjacent to their non-pivoted ends to resist their movement outwardly from said shaft upon rotation thereof, said resilient means being so tensioned as to permit engagement of said magnetized members with said annular member incident to a predetermined speed of rotation of said shaft.

GEORGE R. EATON.