

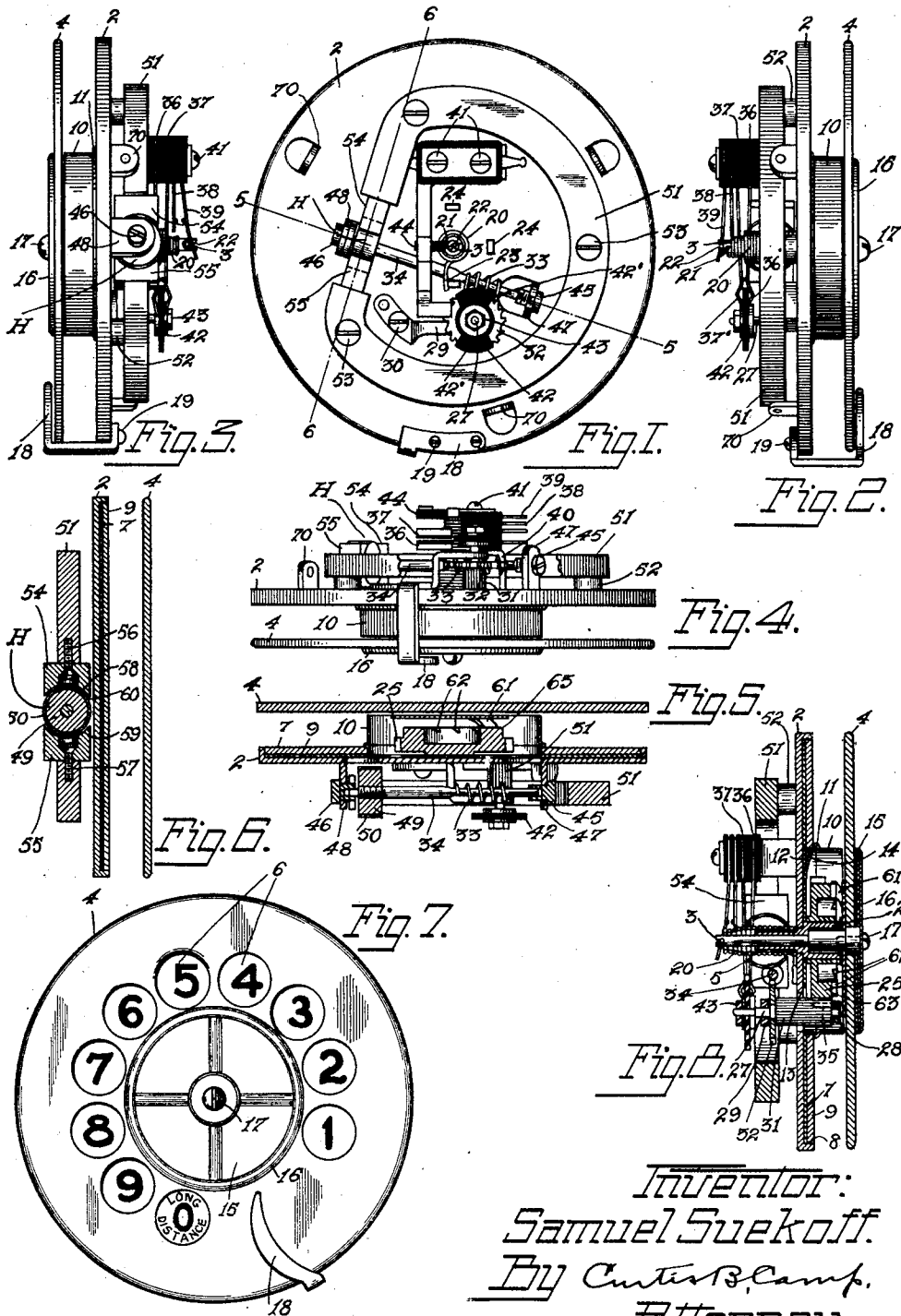
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S. SUEKOFF

CALLING DEVICE

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Inventor:
Samuel Suekoff.
By Curtis B. Camp.
Attorney.

UNITED STATES PATENT OFFICE.

SAMUEL SUEKOFF, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

CALLING DEVICE.

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To all whom it may concern:

Be it known that I, SAMUEL SUEKOFF, a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Calling Devices, of which the following is a specification.

My invention relates to governors and has to do more particularly with governors for use in connection with automatic calling devices, such devices as are commonly employed in automatic and semi-automatic telephone systems for controlling the automatic switches which are located at the central office by directive impulses.

In the present automatic telephone systems in use, especially those commonly known as two-wire systems, it is necessary to maintain the speed of the calling device constant as a slight change in the speed of the calling device will affect the operation of the relays at the central exchange, causing an incorrect operation of the same. One of the objections that is commonly found with the governors of the prior art is that the governor does not maintain the speed of the device to be governed constant for the first few rotations of the device, that is, mechanical governors will operate to satisfactorily govern the speed of a device after it has once started rotating, but they do not operate as efficiently to govern the speed of a device that is continually starting and stopping.

It is an object of my invention to provide a governor that is equally as effective at the start of the device to be governed as at the time that the device has gained momentum and is rotating at full speed.

The governor of my invention is in the form of a magnetic governor and includes a permanent magnet which is utilized in association with a rotatable metallic hub, which hub rotates in the magnetic field of the said permanent magnet when the calling device is operated to govern the same. Governors as now most universally used are of the mechanical type and are of more or less complex structure, and in which the parts from continued usage, wear so that the speed of the device is constantly changing. More or less adjustment from time to time is required of the mechanical type of governor in order to keep the speed of rota-

tion constant. With the governor of my invention, all complicated mechanical mechanism is eliminated, so that when the proper timing of the calling device equipped with a governor of my invention is obtained, the speed of the device will remain constant and will not be affected by changes in temperature or particles of foreign material. My invention embodies all of the desirable features and advantages of an improved governing device in a simple, efficient and economical manner, and these features and advantages will be more fully described in the ensuing specification and claimed in the appended claims.

Referring now more particularly to the accompanying drawing in which I illustrate a calling device equipped with a governor of my invention, and in which like reference characters in the several views denote like parts, and in which:

Fig. 1 is a rear plan view of a calling device with the governor of my invention applied thereto;

Fig. 2 is a right side view of Fig. 1;

Fig. 3 is a left side view of Fig. 1;

Fig. 4 is a bottom view of Fig. 1;

Fig. 5 is a sectional view along the line 5-5 of Fig. 1;

Fig. 6 is a sectional view along the line 6-6 of Fig. 1;

Fig. 7 is a face view of the calling device, and

Fig. 8 is a sectional view to more clearly show the structure of the device.

Referring now more in detail to my invention as illustrated in the accompanying drawing, it comprises a main mounting plate 2 of non-magnetic material, which supports the mechanism. A main shaft 3 is provided, having its one end fastened to a finger hold actuating member 4 in any suitable manner. The shaft 3 passes through a suitable bearing 5, which bearing 5 is secured to the mounting plate 2 in any suitable manner. The finger hold actuating member 4 is provided with a plurality of openings or finger holds 6, preferably ten in number. A number indicating disk 7 is placed with its indicating numerals below the finger hold actuating member 4, and rests in a circular depression 8 in the mounting plate 2. The indicating disk 7 has a protective disk 9 of transparent material, such as a glass placed in front of it so as

to protect the same. A ring shaped member or collar 10 is provided, which has a beaded portion 11 and also a flanged portion 12, a circular plate 13 is fastened to the mounting plate 2 and is provided with radially extending arms 14, which arms are under tension and engage the flanged portion 12 of the ring 10 to hold the said ring in place. The bead 11 rests upon the protective disk 9 when the ring 10 is in place and thus holds the indicating disk 7 and protective disk 9 against displacement in the depression 8 of the mounting plate 2.

The ten openings which from the finger holds 6 are numbered 1, 2, 3, etc., to 10 and the calling device is adapted to transmit from 1 to 10 impulses. The actuating member 4 is provided with a card 15 and is held in place by means of a clamping ring 16 which is fastened to the finger hold actuating member 4 by means of a clamping screw 17, which has screw threaded engagement with the shaft 3. A stationary finger stop 18 is secured to the plate 2 by means of a screw 19 and when the finger hold actuating member 4 is advanced in a clockwise direction, the advancing finger of the operator engages the stop 18 to arrest the movement of the finger hold actuating member 4.

Referring now more particularly to the operating mechanism, the main shaft 3 extends through the bearing 5, and the spiral motor spring 20 is coiled around the bearing 5 and a portion of the shaft 3 which extends through the bearing 5. One end 21 of the spring 20 is inserted in a slot 22 cut into the portion of the shaft 3 which extends beyond the bearing 5 and the other end 23 of the spring 20 engages one of a plurality of lugs 24 which are suitably secured to the mounting plate 2. The spring 20 restores the finger hold actuating member 4 to normal after the same has been advanced and then released. To secure the proper tension of the spring 20, the end 23 of the said spring 20 is moved in a clockwise direction, as viewed in Fig. 1 over the lugs 24 until the proper adjustment or tension is secured, the end 23 of the spring 20 is then placed so that it engages one of the plurality of lugs 24 to thus hold the spring 20 under its proper tension and also hold the finger hold actuating member 4 in its normal position.

Positioned between the mounting plate 2 and the finger hold actuating member 4 is a gear wheel 25 which has an orifice centrally located and of a size to fit over the portion 26 of the bearing 5 which extends up from the plate 2. The gear wheel 25 fits loosely over the portion 26 which serves as a bearing for the said gear wheel 25 and about which the said gear wheel 25 rotates. A pinion-carrying shaft 27 is provided which is journaled at its one end in the rear

28, the said ear being struck up from the mounting plate 2 and being preferably formed integral with the said mounting plate 2, and at its other end in an angular bracket 29, which bracket is secured to the mounting plate 2 in any suitable manner, as by means of screws 30. The shaft 27 is provided with a pinion 31, preferably formed integrally with the said shaft 27, the said pinion 31 meshing with the gear wheel 25. The shaft 27 also carries a worm gear 32 fastened to the shaft 27 in any suitable manner. The worm gear 32 meshes with a worm 33 which is preferably formed integrally with the horizontal governor shaft 34, associated with the governor mechanism, which mechanism is adapted to retard the return movement of the finger hold actuating member 4 at a pre-determined speed.

To retain the finger hold actuating member 4 in its normal position against the tension of the motor spring 20, the member 4 carries a lug 35 (shown dotted in Fig. 8) secured to it in any suitable manner, which lug engages the pinion 31 upon the shaft 27 when the finger hold actuating member 4 is resting in its normal position. Should the member 4 be advanced in a clockwise direction against the tension of the motor spring 20, the lug moves with the finger hold actuating member 4 away from pinion 31 and when the member 4 restores in a counter clockwise direction, its return movement is arrested by the lug 35 engaging the teeth of the pinion 31.

A pair of impulse springs 36 and 37 and a pair of shunt springs 38 and 39 are insulatively mounted upon an angular bracket 40 which bracket is struck up from the mounting plate 2, the said impulse springs 36 and 37 and shunt springs 38 and 39 are secured to the bracket 40 by means of screws 41, which screws 41 have screw threaded engagement with the bracket 40. A wing shaped member or cam 42 is secured to the shaft 27 and held in place thereon by means of a nut 43 which has screw threaded engagement with the threaded portion of the shaft 27. This wing shaped member is operatively associated with the impulse springs 36 and 37 and operates the same in a manner to be more fully hereinafter described. The end 21 of the motor spring 20 which is inserted in the slot 22 in the end of the main shaft 3 protrudes at right angles to the said shaft 3 and is fitted with a sleeve of insulation 44 and when the finger hold actuating member 4 is at normal, the sleeve 44 engages the shunt spring 39 of the pair of shunt springs 38 and 39 to lift it from engagement with spring 38.

The governor mechanism of my invention is of the magnetic type and comprises a horizontal shaft 34 supported in bearings 45 and 46, the said bearings 45 and 46 having

screw threaded engagement with ears 47 and 48. The ears 47 and 48 are integrally formed with the mounting plate 2. The bearings 45 and 46 having screw threaded engagement with the lugs 47 and 48 permits them to be adjusted longitudinally. The shaft 34 also supports a metallic hub H which is formed of a soft iron core 49 covered by an aluminum shell 50, which core 49 and shell 50 are secured to the said shaft 34 in any suitable manner. The soft iron core 49 is provided to form a better magnetic path for the lines of force, that is, to draw the magnetic flux which passes from one pole of the magnet to the other through the rotary armature. A permanent U shaped magnet 51 is supported upon brass studs 52, which studs 52 are secured to the mounting plate 2 in any suitable manner. The U shaped magnet 51 is secured to the studs 52 by means of screws 53 which have screw threaded engagement with the studs 52. Soft iron pole pieces 54 and 55 are secured to the poles of the U shaped magnet 51 by means of screws 56 and 57, and the screws 56 and 57 have screw threaded engagement with the respective poles of the U shaped permanent magnet 51. The pole pieces 54 and 55 have their opposite faces 58 and 59 concave to form a cylindrical opening 60 between them and of a size slightly larger than the diameter of the metallic hub H supported by the shaft 34. The metallic hub H is located upon the shaft 34 so that when the said shaft 34 is supported in its bearings 45 and 46, the said hub H is suspended in the cylindrical opening 60 in close proximity with the concave faces of the pole pieces 54 and 55.

Now when the finger hold actuating member 4 is rotated in a clockwise direction to set the calling device to transmit a certain number of impulses, the gear wheel 25 being loosely mounted upon the bearing 26 remains stationary while the shaft 3 which is secured to the member 4 is also rotated in a clockwise direction. A dial ratchet spring 61 is fastened to the under face of the member 4 and notches 62 are cut in the face portion 63 of the gear wheel 25 to co-operate with the said spring 61. The face portion 63 of the gear 25 with its plurality of notches forms a ratchet to permit the impulse mechanism to always rotate in one direction and backward and forward oscillatory movement of the setting member 4. The ratchet spring 61, as before mentioned, is fastened to the member 4 and the nose of the spring 61 rides over the notches 62 of the face portion 63 of the gear 25 until the nose of the spring 61 rests in the desired notch 62 at the time that the finger of the operator engages the finger stop 18. The end 21 of the motor spring 20 is secured to the shaft 3 and is placed under further tension due to the

rotation of the shaft 3. Upon the return movement of the finger hold actuating member 4, the nose of the spring 61 engages the notch 62 in which it is resting causing the gear 25 to be rotated with it. This motion is transmitted to the pinion 31 which rotates the shaft 27. The rotation of the shaft 27 causes the worm gear 32 to rotate the governor shaft 34 through the medium of the worm 33 on the shaft 34. The metallic hub H being secured to the governor shaft 34 rotates therewith and as it rotates in the magnetic field, extending between the pole pieces 54 and 55, cuts the lines of force in this magnetic field, thus causing the hub to lag. The faster the hub is rotated, the greater the braking force applied to the governor shaft will be owing to the fact that the faster the hub rotates the greater will be the number of lines of force cut by the said hub. The cutting of the lines of force sets up current that tends to oppose the rotation of the governor shaft. The aluminum shell 50 around the core 49 which rotates in the magnetic field is used to reduce the weight of the hub so that it may be as light as possible and still perform its functions efficiently. In a governor of the class described, it is essential that the governor starts up quickly and that its speed be constant so that the impulses are timed properly. With a hub of comparatively light weight, this quick starting is accomplished. Were the hub heavy, the starting of the hub would be slow and after the speed had increased the inertia would be great enough to cause the governor mechanism to stop with a heavy blow when the member 4 reaches normal and this continual pounding would soon cause the mechanism to get out of adjustment. With the light weighted hub H, this quick starting is accomplished and when the member 4 reaches normal, the governor mechanism comes to rest without a heavy blow as would be the case were the hub heavy.

In order to operate the impulse springs 36 and 37 of the device, I provide the wing shaped member 42 as already described. The springs 36 and 37 are provided with angular extensions 36' and 37' which extend in proximity with the wing member 42. The impulse springs 36 and 37 are normally closed and are interrupted according to the number of impulses to be sent. Now, if the actuating member 4 is rotated in a clockwise direction, the spring 61 rides over the notches 62 and the shaft 3 rotates, causing the spring 20 to be wound up, but on the return movement the spring 61 engages a notch 62 corresponding to the number of impulses to be sent. The gear 25 is then rotated in a counter-clockwise direction when the member 4 is released, due to the spring 20, thereby transmitting power to the pinion

31 which rotates the shaft 27 upon which the wing member 42 is mounted, bringing about the opening and closing of the impulse springs 36 and 37 according to the number of impulses to be transmitted.

I also provide shunt springs 38 and 39 by which the subscriber's apparatus may be short circuited while the impulses are being transmitted. The shunt springs 38 and 39 are insulatingly secured to the bracket 40 by means of screws 41. When the calling device is at normal, the insulation buffer 44 attached to the spring extension 21 rests between springs 38 and 39 and engages spring 39 to hold the shunt springs normally disengaged. Now, when the actuating member 4 is moved off normal the shaft 3 rotates carrying the buffer 44 with it permitting the shunt springs 38 and 39 to close. The springs remain in such position until the buffer 44 again engages the spring 39 to open the contacts of shunt springs 38 and 39 upon the completion of the return movement of the member 4. I provide lugs or ears struck up from the mounting plate which form means for fastening the calling dial to a telephone or instrument.

I will now describe briefly the operation of the device. Let us assume that the operator wishes to effect four operations of the impulse springs 36 and 37, that is to transmit four impulses. The operator will insert his finger in the finger hold 6 before the numeral 4 and then rotate the member 4 in a clockwise direction until the finger engages the stationary stop 18. The rotation of the member 4 causes the rotation of the main shaft 3 and causes spring 61 to ride over the notches 62, permitting shafts 27 and 34 of the governor mechanism to remain at normal. As the shaft 3 leaves normal the buffer 44 disengages shunt spring 39, allowing shunt springs 38 and 39 to close their contacts to short circuit the substation apparatus. The movement of the member 4 winds up the motor spring 20 so that when the finger of the operator is removed from the finger hold 6 of the member 4, the spring 20 restores the apparatus to normal. The spring 61 now engages the notch 62 in which it is resting and the gear 25 is rotated with the member 4 in a counter-clockwise direction to transmit motion to the shaft 27 and governor shaft 34 through the agency of the gearing. The shaft 27 is rotated, due to the motion transmitted from the gear 25, to bring about the rotation of the winged member 42 causing the impulse springs 36 and 37 to be interrupted four times to transmit the four impulses to the central office to operate the central office switches. The rotation of the shaft 34 causes the hub H to cut the magnetic flux or lines of force that are threading across from pole 54 to pole 55 through the hub H, thereby causing the

shaft 34 to oppose the rotation of the calling device above a certain pre-determined speed that the device is set to operate at. The fact that the hub H cuts a very few lines of force until the shaft 34 gains considerable speed permits the shaft 34 to practically immediately gain its full speed. Upon the return to normal of the device, the stop 35 engages the pinion 31 thereby immediately arresting further rotation of the impulse wings 42' and 42² and the buffer 44 again engages the shunt spring 39 interrupting shunt springs 38 and 39. The device is now at normal, and is again ready to be adjusted to effect the transmission of another set of impulses.

In illustrating my invention, I have shown it operating in connection with a certain form of calling device, but I do not wish to be limited to this form of device as the governor of my invention is adapted for other uses. Neither do I wish to be limited to the exact structure as shown, as many modifications and changes may readily suggest themselves, and I therefore aim to cover all such changes and modifications as come within the spirit and scope of the appended claims.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. A device of the character described including spring-restored mechanism, a worm-gear mechanism, a rotatable shaft connected to said mechanism by said worm-gear mechanism, a rotatable cylindrical member comprising a core provided with securing means to secure the same to said rotatable shaft and a cylindrical ring of a size to fit over said core, a permanent magnet having soft iron pole-pieces secured to its ends by means of screws resting in countersunk openings in said pole-pieces and enlarged in relation with the thickness of said permanent magnet, said thickness of said pole-pieces at right angles to the axis of said cylindrical member being substantially the same as the diameter of said cylindrical member, concave faces for said pole pieces forming an opening of a size to receive said cylindrical member, whereby the said member as a whole may be rotated in said opening by means of said spring-restored mechanism to cut the magnetic flux of said magnet to regulate the speed of operation of said spring-restored mechanism through the medium of said worm-gear mechanism.

2. A device of the character described including spring-restored mechanism, a supporting plate for said mechanism, a pair of lug bearings integrally formed with said plate, a worm-gear mechanism, a rotatable shaft connected to said spring-restored mechanism by means of said worm-gear and rotatably supported at its ends in said lug

bearings, manually operated means for effecting the operation of said mechanism in a rotatable direction, a cylindrical member comprising a core provided with a tapped orifice for permitting the said core to have threaded engagement with said shaft to secure the same upon said shaft intermediate of its ends, and a cylindrical ring of the size to fit over said core, a permanent magnet secured to said supporting plate, soft iron blocks of a thickness greater than the thickness of said permanent magnet and secured to the ends thereof to form pole-pieces for the same, concave faces for said pole-pieces to form an opening of a size to secure said cylindrical member whose diameter is substantially the same as the thickness of said pole-pieces, said spring-restored mechanism when in motion rotating the shaft thereby rotating the cylindrical member in said opening to cut the magnetic lines of force to retard the rotation of the shaft and thus regulate the speed of the spring-restored mechanism, through the medium of said worm-gear mechanism.

Signed by me at Chicago, Illinois, this 1st day of October, 1918.

SAMUEL SUEKOFF.