Dec. 8, 1936. H. W. GOFF 2,063,308

CALL TRANSMITTER

Filed Jan. 31, 1935 2 Sheets-Sheet 1

FIG. 1

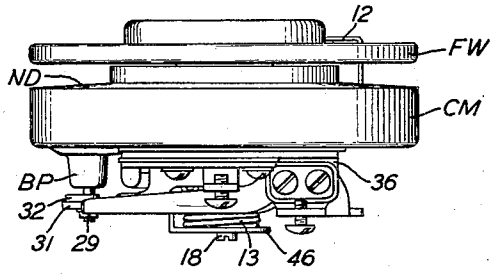

FIG. 2

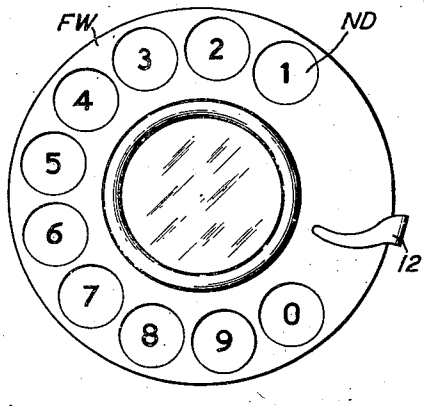

FIG. 3

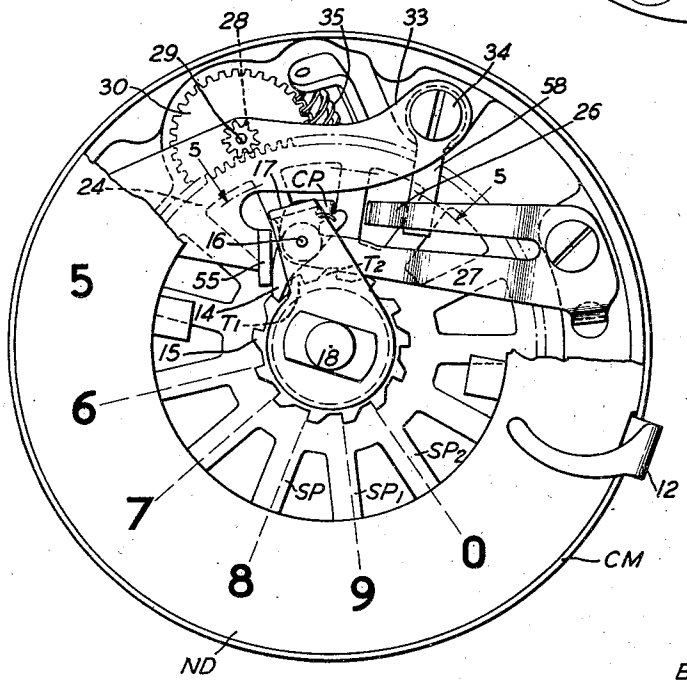

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FIG 4

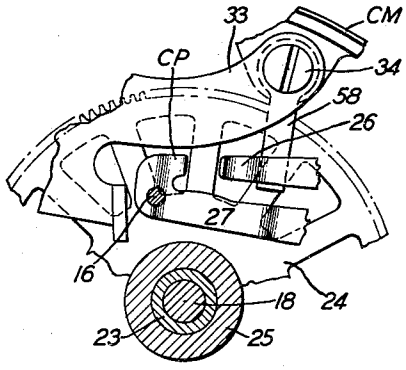


FIG. 5

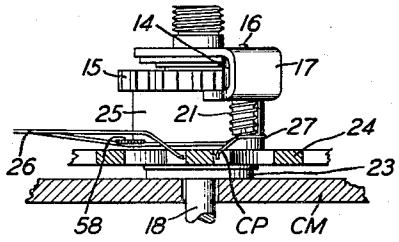


FIG. 7

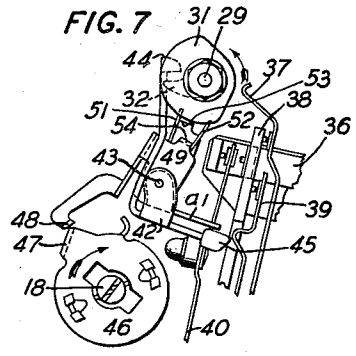
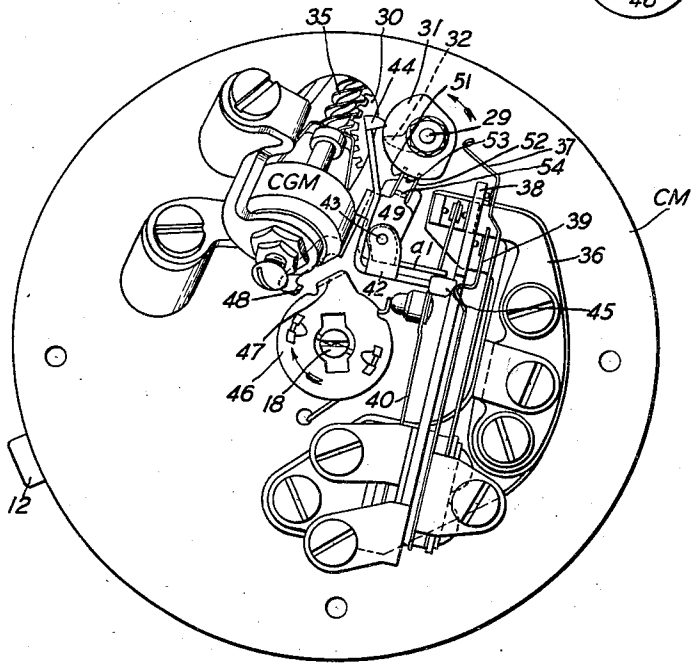


FIG 6



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UNITED STATES PATENT OFFICE

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CALL TRANSMITTER

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Application January 31, 1935, Serial No. 4,223

4 Claims. (Cl. 179—90)

This invention relates to call transmitters of the type known as calling dials used in automatic telephone systems, for example, for establishing telephone connections.

In automatic telephone systems as is well-known, sets or trains of impulses corresponding to a predetermined telephone number are impressed in the subscriber's circuit by the operation of a call transmitted at a definite and fixed rate of speed for controlling the operation of so-called selector and connector switches in the telephone exchange for establishing the desired connection.

In such a system it has been found that the proper operation of these selector and connector switches was not only dependent upon the time interval between each pulse, but also upon the time interval between each set of pulses which may comprise the telephone number, and that faulty operation of the switches was due (1) to hurried operation of the call transmitter, particularly in transmitting the lower digits of a number and (2) due to the fact that the pulsing cam was accidentally rotated beyond its normal position owing to the inertia of the gearing mechanism when operating under the tension of the motor spring together with the forcing of the finger wheel toward its normal position by the operator.

The object of this invention is to improve the construction and operation of such call transmitters and according to this invention means is provided whereby the impulse cam is rotated one turn in excess of each of the numerals indicated on the number disc, with means whereby a shunt spring is operated for negativing the pulse corresponding to the first turn of the impulse cam, the lapse of time thus obtained added to the fastest operation of the call transmitter, as above mentioned, being effective to assure the proper operation of the switches. Means is provided whereby the shunt spring is disengaged from the pulsing contact at the end of the first turn of the cam as to render the successive turns of the cam effective for the transmission of pulses corresponding to the adjusting movements of the finger wheel with means whereby the relative movement or so-called overthrow of the gearing mechanism with respect to the finger wheel and the consequent faulty operation of the call transmitter and the switches controlled thereby is effectively prevented.

Other features of the invention and advantages will appear from the following description and from the claims appended thereto, reference being had to the accompanying drawings in which

Fig. 1 is a side view of the call transmitter;

Fig. 2 is a top view;

Fig. 3 is a top enlarged view shown with the finger wheel removed from its supporting shaft and showing the number disc with portions cut away;

Figs. 4 and 5 are partial views showing the gear locking mechanism;

Fig. 6 is a rear assembly view showing the impulse shunting spring operating mechanism; and

Fig. 7 is a partial view showing the impulse shunting spring operating mechanism in its operated position.

The finger wheel FW of the call transmitter of this invention as shown in Fig. 2 is provided with ten holes spaced one-thirteenth of the circumference apart and these holes register with numerals 1 to 0 inclusive appearing on a number disc ND. A finger stop 12 is secured to a cup-shaped mounting CM and is provided for limiting the adjusting movement of the finger wheel FW in the well-known manner during the tensioning operation of a motor spring 13 shown in Fig. 1. Spring 13 has one of its ends hooked in a slot in the lower end of the finger wheel supporting shaft 18 and its other end to the underside of mounting CM, the operation of the finger wheel FW and its supporting shaft 18 being effective to move a pawl 14 around the normally stationary ratchet wheel 15 also divided into thirteen equal parts.

The pawl 14 is pivoted on a stud 16 carried by an arm 17 in turn keyed on the finger wheel supporting shaft 18 and a spring 21 shown in Fig. 5 is provided for holding this pawl in engaged relation with the ratchet wheel 15, the finger stop 12 being spaced two divisions away in a clockwise direction from the center of the finger wheel hole through which numeral 1 appears as to move the pawl 14 over the tooth T_1 and in engagement with the tooth T_2 upon the movement of finger wheel FW from the position 1 as indicated by the number disc to stop member 12.

The mounting CM is provided with a centrally located bearing portion 23 shown in Figs. 4 and 5 in which the finger wheel shaft 18 is journaled and the outside diameter of this bearing is machined for rotatably receiving the hub portion 25 of ratchet wheel 15, this hub portion being provided for securely mounting a gear 24 having thirteen spokes, SP, SP_1, SP_2, etc. disposed at equal distances apart for engagement with spring members 26 and 27 as to prevent relative movement between this gear and the finger wheel FW as will be hereinafter described in detail.

The gear 24 meshes with a pinion 28 shown in Fig. 3 formed integrally with a spindle 29 journaled at one end in a bracket 33 held securely in the cup-shaped mounting CM by screws, such as 34, the other end of this spindle extending through a bearing portion BP shown in Fig. 1 for mounting a pulsing cam 31 of insulating material and a metallic cam 32, the latter being shown in Figs. 1, 6 and 7.

On spindle 29 adjacent pinion 28 is securely mounted a worm gear 30 for engagement with a worm 35 of a centrifugal governor mechanism CGM provided for controlling the operation of pulsing cam 31 when rotated under the tension of motor spring 13, the gear ratio of gear 24 and pinion 28 being of the order of thirteen to one.

The adjusting movement of finger wheel 10, for example, from the position indicated at 1 on the number disc to the position as determined by the finger stop 12 and therefore the engagement of pawl 14 with tooth T_2 of ratchet wheel 15 will cause the pulsing cam 31 to rotate two turns through the thirteen to one ratio of gear 24 with pinion 28. Similarly, the movement of finger wheel 10 from the position indicated at 2 on the number disc to the finger stop is effective to rotate the cam 31 three turns, that from the position 3 four turns, or one turn in addition to the number indicated on the number disc ND from 1 to zero, inclusive, in order to make possible the negativing of one turn of the pulsing cam for every adjusting movement of the finger wheel while making possible to transmit ten pulses in response to the adjusting movement of finger wheel FW from zero to the finger stop 12, as in ordinary call transmitters.

The bracket 33 shown in Fig. 3 is provided with an upwardly extending lug 55 disposed in engageable relation with the pawl 14 and cooperates therewith to form a stop for limiting the movement of the finger wheel FW while preventing the so-called overthrow of the gear 24 due to the lock afforded by any one of the teeth of the ratchet wheel 15 and the pawl 14 abutting against the stop 55. The gear 24 is also prevented from relative movement with respect to the finger wheel by the spring pawl 27 shown in Figs. 3, 4 and 5 which is moved in engaged relation with one of the spokes of this gear wheel through the engagement of the lower disposed end portion of stud 16 with the camming portion CP of this pawl. Another spring 26 which is formed integrally with spring pawl 27 serves to prevent the accidental turning movement of the gearing mechanism upon the adjusting movement of finger wheel FW and that of pawl 14 in a clockwise direction, spring 27 being normally tensioned for automatically engaging the spokes of gear 24, but is limited in its downward movement by a stop arm 58 secured on the mounting CM.

To the underside of mounting CM is securely mounted a bracket 36 shown in Figs. 1, 6 and 7 provided for supporting a contact spring assembly consisting of pulsing spring 37 normally engaging its associated stationary spring 38 and a shunt spring 39 for engaging the stationary spring 38 under control of a combined lever and camming mechanism which will be hereinafter described in detail, the shunt spring 39 being connected in the spring pile-up to spring 37 and a so-called off-normal spring 40 is provided to perform a well-known function and forms no part of this invention.

The operation of shunt spring 39 is effected through the operation of an angle-shaped lever member 42 which is pivoted on a stud 43 secured on the mounting CM. One arm of lever member 42 is provided with a camming portion 44 and the end of the other arm is provided with a cam 45 of insulating material which serves to maintain the shunt spring 39 from engaging the stationary contact 38 when this lever is moved in the position indicated in Fig. 6, upon the first turn of pulsing cam 31.

Upon any adjusting movement of finger wheel FW and therefore the movement of disc 46 carried by finger wheel shaft 18 from the position indicated in Fig. 6 to the position indicated in Fig. 7 or pass that position as for transmitting any number of pulses, within the capacity of this call transmitter, the camming portion 47 of this disc engages the perpendicularly extending lug portion 48 of a three-armed lever 49 pivoted on stud 43 with lever 42 in the manner of an ordinary hinge and having its arm a_1 engaging the cam portion 45 of lever 42 for imparting a small angular movement to lever 42 and thereby releasing the shunt spring 39 which then moves in engagement with the stationary contact 38 through the medium of its own tension.

Upon the return movement of finger wheel FW and therefore the movement of pulsing cam 31 a complete turn in the direction indicated by the arrow in Figs. 6 and 7, the cam 32 carried by spindle 29 engages the cam portion 44 of lever 42 for moving this lever a small angular distance and thereby camming the shunt spring 39 from contact 38, thus rendering subsequent operation of cam 31 and the impulse spring 37 actuated thereby effective for the transmitting of pulses in the ordinary manner a number of times corresponding to the adjustment of finger wheel FW as indicated by the numerals on the number disc. A subsequent adjusting movement of finger wheel FW and the disc 46 carried thereby as indicated by the arrow in Fig. 6, that is, a small angular distance from its stop position, the perpendicularly extending camming portion 47 of disc 46 as above described engages the portion 48 of lever 49 for moving this lever a small angular distance on pivot 43 in the position shown in Fig. 7 and thereby causing its arm portion a_1 to engage the insulated member 45 of angle lever 42 for disengaging it from the bent portion of the shunt spring 39 to permit this spring to reengage the contact 38 under the medium of its own tension for rendering the first turn of pulsing cam 31 and therefore the first operation of pulsing spring 37 ineffective upon the return movement of the finger wheel to normal. One arm of lever 49 shown in Figs. 6 and 7 carries springs 51 and 52 which abut against the sides of a perpendicularly extending lug or stop member 53 secured to mounting CM. These springs being provided for yieldably holding the lever 49 in adjusted relation with respect to the cam portion 47 of disc 46.

In a typical example of operation, an adjusting movement of finger wheel FW, for example, from the numeral 1 as indicated by the number disc ND to the finger stop 12 is effective to tension the motor spring 13 and to rotate the arm 17 and the pawl 14 carried thereby in engaged relation with the tooth T_2 of ratchet wheel 15 due to the division of the finger wheel FW, the number disc ND and the ratchet wheel 15 in thirteen equal parts and the location of the first finger hole two spaces away from the finger stop 12 the spring 26 preventing the so-called follow-up movement of the gearing mechanism due to

the friction of spring pressed pawl 14 on the ratchet wheel 15 during the adusting movement of finger wheel FW. The movement of the finger wheel FW and that of disc 46 secured at the lower end of shaft 18 from its normal position shown in Fig. 6 to numeral 1 as above mentioned is effective to engage the cam portion 47 of this disc with the lug or cam portion 48 of lever 49 and to move this lever in the position shown in Fig. 7 against the resistance of its cooperating retractile springs 51 and 52, the movement of this lever being effective to impart a small angular movement to lever 42 through the engagement of arm a_1 with the insulating cam 45 as to release the shunt spring 39, thus causing this spring to engage the impulse contact 38.

The return movement of finger wheel FW under the tension of motor spring 13 and that of the gearing mechanism through the engagement of pawl 14 as in this example with the tooth T_2 of ratchet wheel 15 under control of the centrifugal governor CGM is effective to rotate the impulse cam 31 two turns in the direction indicated by the arrow in Figs. 6 and 7. Upon the first complete turn of impulse cam 31, however, the cam 32 carried by spindle 29 engages the cam portion 44 of lever 42 for moving this lever from the position shown in Fig. 7 to the position shown in Fig. 6 for camming the shunt spring 39 out of engagement from the impulse contact 38 and thereby rendering the second turn of cam 31 and therefore the second operation of the spring 37 effective to transmit one pulse.

Upon the return movement of finger wheel FW to normal position, that is, when pawl 14 engages the stop 55 the stud or pivot 16 of the pawl engages the locking spring 27 for camming it down in engaged relation with one of the spokes of gear 24 to prevent, as above mentioned, the so-called overthrow or relative movement of the gearing mechanism with respect to the stop position of the finger wheel.

In the mechanism of the call transmitter of this invention as above mentioned the time interval obtained through the negativing of the first impulse added to the time required for the fastest operation of the call transmitter being sufficient to assure the positive operation of the selector switches controlled thereby and makes possible the transmission of the ten pulses upon the adjustment of the finger wheel from 0 to the finger stop 12 as in the conventional type of call transmitter while the spring pawls 26 and 27 effectively prevent the relative movement or overthrow of the gearing mechanism under any operating condition of the finger wheel.

What is claimed is:

1. In a call transmitter, a mounting, a shaft journaled in said mounting, a finger wheel carried by said shaft having a series of holes disposed in equal spaced relation in a portion equal

$$\frac{10}{13}$$

of its circumference, a disc supported by said mounting having numerals disposed in registering relation with the holes in said finger wheel, a finger stop carried by said mounting for limiting the manual adjusting movement of said finger wheel with respect to each of said numerals, a plurality of contacts, a cam, a gearing mechanism having a 13 to 1 ratio for actuating said cam, a one way clutching device for operatively connecting said shaft to said mechanism, said finger wheel and said finger stop cooperating with said mechanism for rotating said cam for operating one of said contacts a number of times greater than the adjusting movement of said finger wheel as indicated by the numerals on said disc, means for actuating another of said contacts for negativing a certain operation of said cam, and means for controlling the operation of said finger wheel and said gearing mechanism upon the operation of said cam, means for preventing the movement of said mechanism during the adjusting movement of said finger wheel and a camming mechanism actuated by said finger wheel for preventing the movement of said gear mechanism relative to said finger wheel when the latter has returned to normal.

2. In a call transmitter, a mounting, a rotatable shaft journaled in said mounting, a finger wheel carried by said shaft having a number of holes, a number disc having numerals disposed in registering relation with the holes in said finger wheel, a finger stop carried by said mounting for limiting the movement of said finger wheel in one direction, a gearing mechanism, a one-way effective clutching device operatively connecting said shaft to said mechanism upon the movement of said finger wheel in the other direction, operable contacts, a plurality of means actuated by said mechanism upon the return movement of said finger wheel to normal for actuating one of said contacts a number of times greater than the number indicated on said disc and another of said contacts for negativing an operation of the other contact, motor means for actuating said gearing mechanism, and a plurality of independently operable means for limiting the movement of said gearing mechanism upon the return movement of said finger wheel to normal, one of said means being operated by the latter wheel.

3. In a call transmitter, a mounting, a rotatable shaft journaled in said mounting, a finger wheel carried by said shaft having ten holes disposed at equal spaced relation in a portion equal

$$\frac{10}{13}$$

of its circumference, a disc supported by said mounting having numerals from one to zero disposed in registering relation with the holes in said finger wheel, a finger stop secured to said mounting for limiting the movement of said finger wheel in one direction, an impulse cam, a gearing mechanism having a gear ratio of the order of 13 to 1 for rotating said cam a number of turns greater than the adjusting movement of said finger wheel as indicated by said numerals, impulse contacts actuated by said cam, a shunting contact, a lever member normally holding said shunting contact from engaged relation with one of said impulse contacts, a cam carried by said shaft, another lever member operated by the last-mentioned cam upon the adjusting of said finger wheel for operating the first-mentioned lever member for causing the engagement of said shunting contacts with said impulse contacts for negativing the first operation of said impulse cam, a cam carried by said impulse cam for operating the first-mentioned lever member upon the completion of the first revolution of said impulse cam for disengaging said shunting contact from said impulse spring to render the continued movement of said impulse cam effective with respect to said impulse contacts.

4. In a call transmitter, a mounting, a finger

stop carried by said mounting, a rotatable shaft journaled in said mounting, a finger wheel carried by said shaft having a series of holes disposed in equal spaced relation in a portion equal to

$$\frac{10}{13}$$

of said wheel, a disc having numerals from 1 to 0 disposed in registering relation with the holes in said finger wheel, impulse contacts, a shunting contact, a cam for actuating said impulse contacts, a gearing mechanism having a gear ratio of the order of 13 to 1 operatively connecting said cam to said shaft, said finger wheel and said finger stop cooperating with said mechanism for actuating said cam a number of revolutions greater than the number of pulses indicated on said number disc, another cam actuated by said mechanism, a lever member actuated by the last-mentioned cam, another lever controlled by the operation of said shaft, the successive operation of said lever members being effective to actuate said shunting contact to negative a predetermined operation of said impulse contacts.

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