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IMPULSE SENDER FOR USE IN TELEPHONE OR LIKE SYSTEMS

Filed July 1, 1940

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2,368,104

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FIG. 2.

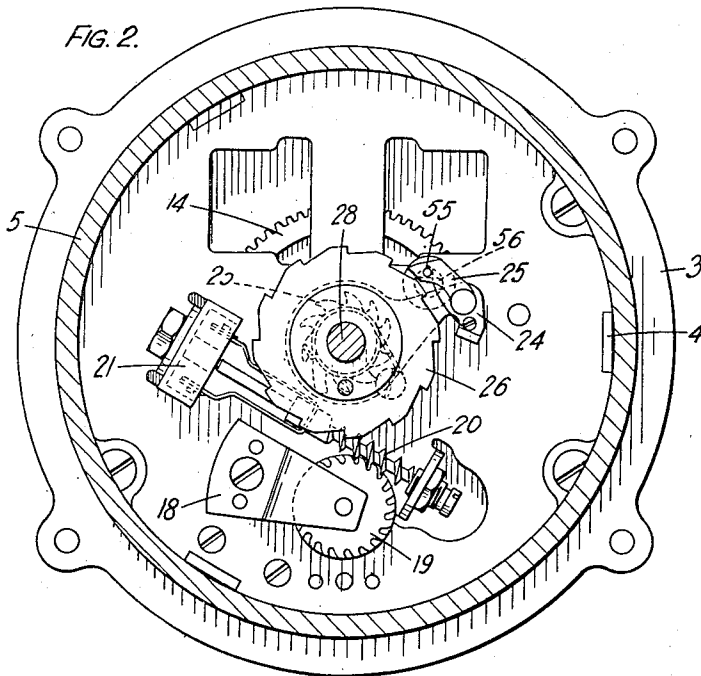
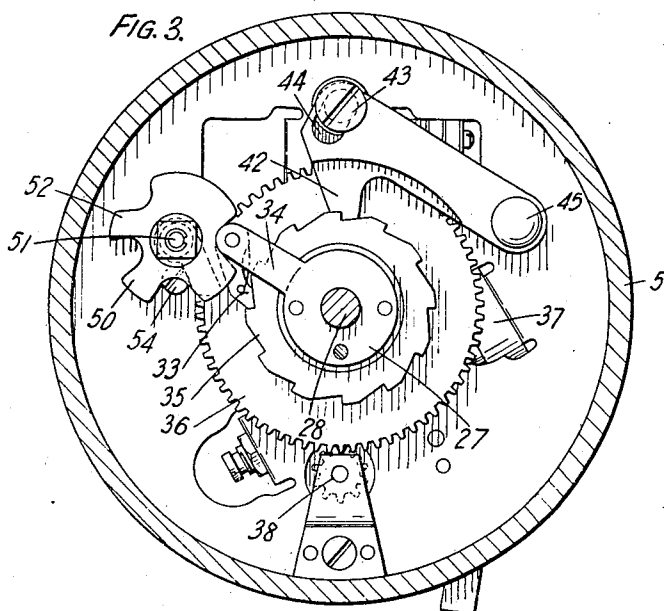


FIG. 3.



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FIG. 4.

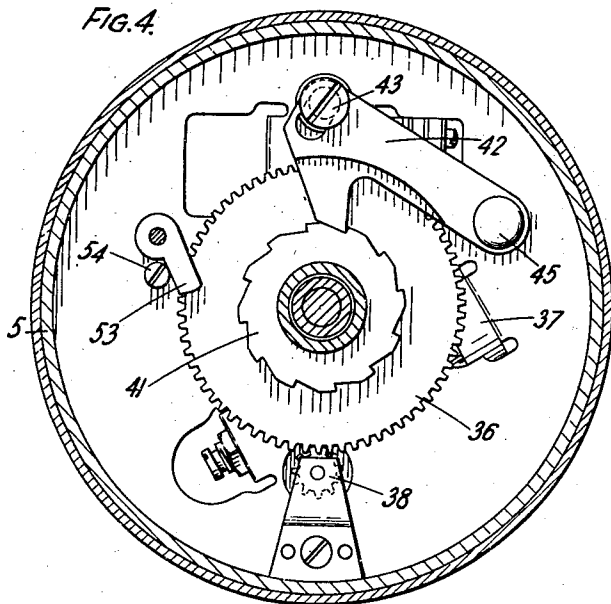
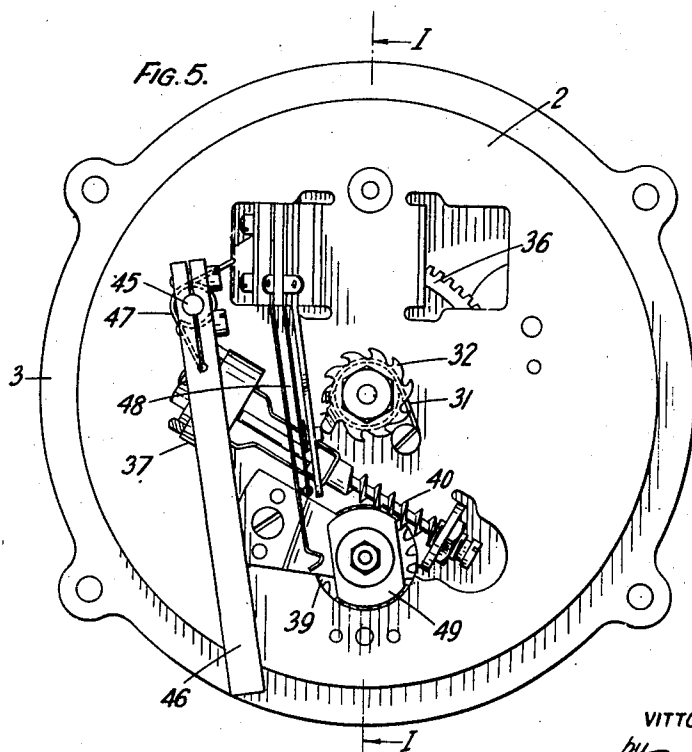


FIG. 5.



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UNITED STATES PATENT OFFICE

2,368,104

IMPULSE SENDER FOR USE IN TELEPHONE
OR LIKE SYSTEMSVittorio Beltrami, Milan, Italy, assignor to Au-
tomatic Electric Laboratories Inc., a corpora-
tion of DelawareApplication July 1, 1940, Serial No. 343,399
In Great Britain July 8, 1939

10 Claims. (Cl. 177—380)

The present invention relates to impulse senders suitable for use in telephone or like systems and is concerned more particularly with the provision of a simple and compact mechanical construction whereby a storing effect is obtained with the equivalent of a dial switch of ordinary type. Such a device will enable the transmission of a single train of impulses involving a greater number than can be generated by one operation of the dial switch. In certain circumstances the ability thus to transmit a train involving a large number of impulses is important, particularly if it can be effected from a dial switch of substantially the usual dimensions and with the standard method of operation. The chief object of the invention may be said to be the production of such a dial switch in a simple and economical manner and involving as far as possible elements such as are already employed in dial switches of the ordinary type arranged to transmit up to ten impulses.

According to one feature of the invention, in an impulse sender of the dial type for use in telephone or like systems successive operations of the finger hole plate produce storage of corresponding numbers of impulses, the transmission of the stored impulses in a single train being initiated by a further operation on the part of the user.

According to another feature of the invention, in an impulse sender of the dial type for use in telephone or like systems an ordinary dial mechanism without impulse cam or impulse springs is arranged to drive by means of a one way connection a similar ordinary dial mechanism without a finger hole plate the second mechanism including a ratchet and pawl arrangement for preventing the release of the mechanism until a further operation is performed so as to permit the storage of a plurality of digits which are subsequently discharged as a single train of impulses.

A further feature of the invention is that in an impulse sender of the dial type for use in telephone or like systems includes a finger hold plate adapted to be operated against the action of a spring and by means of a one-way drive to actuate a governor serving to control the speed of return to normal, the finger hold plate also operating a pawl arranged to drive a ratchet wheel the ratchet wheel taking the place of the finger hold plate of an ordinary dial mechanism but being prevented from restoring to normal until a separate releasing operation is performed whereby successive operations of the finger hold plate serve to effect storage of corresponding

numbers of impulses which are subsequently transmitted in a single train.

The invention will be better understood from the following description of one method of carrying it into effect which is given by way of example and should be taken in conjunction with the accompanying drawings comprising Figs. 1-5. Of these, Fig. 1 is a vertical section along the main axis as indicated by the arrows I—I in Fig. 5; Fig. 2 is an elevation looking in the direction indicated by the arrows II—II in Fig. 1; Fig. 3 is a corresponding elevation looking in the opposite direction from the same section line as indicated by the arrows III—III in Fig. 1; Fig. 4 is a somewhat similar view but with a different section line as indicated by the arrows IV—IV in Fig. 1, while Fig. 5 is a rear elevational view.

The various elements of the device are mounted on two similar circular base plates 1 and 2 each provided with an upturned edge. Secured to the plate 1 is a ring 3 provided with ears 4 by means of which connection is made by screws to a cylindrical enclosing member 5 to which plate 2 is also secured by screws. The front supporting plate 1 is provided with a central boss on each side having a circular hole so as to form a bearing for the shaft 6. The front face of the dial has a finger hole plate 7 of usual type provided with a central portion 8 arranged to accommodate an instruction card. The frusto-conical sheet metal member 9 is preferably enamelled and carries the usual or any suitable numerical designations which are located behind the corresponding finger holes. This designation plate is kept in position by a spring ring 10 which engages with a groove in the up-turned edge of the member 1, while a corrugated spring washer 11 engages the plate on the other side to maintain it in position. The finger plate 7 is secured to the boss 12 which is fixed to the shaft 6 and carries a pawl 13 which is arranged to engage with the ratchet wheel 14. The ratchet wheel 14 is free to rotate on the shaft 6 and is secured to the gear wheel 15 which meshes with the pinion 16 secured to the shaft 16. This shaft is supported in the brackets 17 and 18 and also carries the worm wheel 19 which engages with the worm 20 driving the governor 21 which is of the well-known fly-ball type. The finger plate 7 is maintained in its normal position against a stop by the spring 22, one end of which is anchored to the plate 1 while the other is secured to the shaft 6 by way of a toothed wheel 23 rigidly attached thereto which permits convenient adjustment of the ef-

fective spring tension. The shaft 6 also carries an arm 24 on the extremity of which is a pawl 25.

It will be appreciated from the description so far given of the elements which are mounted on the front plate 1 that when the finger plate 7 is rotated forwards during an ordinary dialing operation, the pawl 58 attached to the boss 12 moves over the ratchet wheel 13 without operating it and tension is stored in the spring 22. When the finger plate 7 is released after the finger of the operator encounters the finger stop, the spring 22 acts to restore it to normal and the pawl now engages with the ratchet teeth of the wheel 13 to drive the governor 21 by way of gear wheels 14 and 15, worm wheel 19 and worm 20 so that the speed of return of the finger plate is kept substantially constant in well-known manner.

The components mounted on the rear plate 2 are in many respects the same in that they involve parts of an ordinary dial mechanism including a pawl and ratchet mechanism arranged to drive a governor on the return movement but not on the forward movement of the controlling shaft which is tensioned by a helical spring. In this case, however, the finger plate and designation plate are omitted, while the equipment on the rear of the back plate illustrated more particularly in Fig. 5 resembles more closely that provided at the back of an ordinary dial switch in that it includes an impulse cam on the shaft of the worm-wheel and corresponding impulse springs.

Considering the actual details, the pawl 25 carried by the arm 24 mounted on the shaft 6 engages with a ratchet wheel 26 which is secured to a boss 27 rigidly fixed to the shaft 28 which is journaled in bosses 29 and 30 on the rear plate 2. When the ratchet wheel 26 is rotated by the pawl 25 on the forward movement of the finger plate 7, tension is stored in the spring 31 one end of which is anchored to the plate 2 while the other is hooked over one of the teeth of the wheel 32 which is secured to the shaft. During this movement the pawl 33 carried by the arm 34 moves over the ratchet wheel 35 so that the gear wheel 36 secured to the ratchet wheel 35 is not operated and hence the governor 37 which is driven by way of the pinion 38, the worm wheel 39 and the worm 40 does not come into action. The movement of wheels 35 and 36 is also controlled however by a further ratchet wheel 41 located between them and adapted to be engaged by the locking pawl 42 which is capable of movement within limits set by the screw 43 co-operating with the slot 44. The locking pawl 42 is secured to the shaft 45 to which is also secured the releasing lever 46 which is urged by the helical spring 47 into the position in which the pawl engages in its corresponding ratchet teeth.

The effect is therefore that during the forward movement of the finger plate 7 the rear shaft is rotated to tension the spring 31 but when the finger plate and the other equipment carried on the front plate 1 return to normal, no movement takes place of the rear plate mechanism since it is restrained by pawl 42 engaging the teeth of ratchet wheel 41. When the release lever 46 is operated however the locking pawl 42 is lifted and the rear plate mechanism is then restored to its normal position under the action of spring 31 thereby transmitting impulses owing to the operation of the impulse springs 48 by cam 49.

The arm 34 carrying the pawl 33 is arranged to engage with a toothed cam member 50 which is frictionally mounted on a stub shaft 51 and is

advanced one tooth for each rotation of the arm 34. After three complete rotations of the arm, its extremity engages with tooth 52 which is so shaped as to produce a jamming action so that no further winding-up movement is possible and a limit is set to the number of impulses which can be stored. The cam member 50 is also provided with an arm 53 adapted to engage with a pin 54 secured to the rear plate 2 and these co-operate in setting a limit to the release movement of the rear mechanism.

The pawl 25 carries a pin 55 adapted to engage with a post 56 supported on the front plate 1 and provided with a cam surface. The engagement of the pin 55 with this cam surface withdraws the pawl 25 from the path of its associated ratchet wheel 26 and permits the rotation of this wheel when impulses are to be transmitted by the operation of the rear mechanism.

One application of the invention is to a party line or selective signalling system in which the number of stations is greater than 10 so that selection cannot be made by the dialling of a single digit. In systems of this type moreover it is often convenient for the source of power for signalling purposes to be obtained from a magneto. It is found in practice that a certain amount of difficulty is experienced in operating a dial switch with one hand at the same time as a magneto generator is being operated with the other, and the impulse sender according to the invention enables the operation of the dial to be effected beforehand and the digits thus stored transmitted subsequently as a result of a simple release operation during which there is no difficulty in operating a magneto generator. In systems of this type it is an advantage rather than otherwise for the impulses to be transmitted in a single train rather than in separate trains corresponding to the successive dial operations.

Another possible application of the invention is in a small telephone system employing signal motion switches of say 25 points. In this case if the switch is to be stepped entirely by dialled impulses, some of the numbers will need to include three digits but they are sent from the improved mechanism in a single train of impulses so that all the contact positions of the switch can be used without any special circuits being required to prevent false operation.

In such an arrangement the improved impulse sender is preferably so mounted that the release lever is operated from the switchhook. The method of operation is that the subscriber dials the full number, for instance 005, before removing his receiver and these digits are therefore stored in the rear plate mechanism, the finger plate returning to normal after each digit in the usual manner. When the complete number has thus been set up, the subscriber removes his receiver whereupon the rear plate mechanism is released and a single train of impulses comprising in this case 25 impulses is then transmitted. This train of impulses will then operate the appropriate switch directly to the required contact.

It might happen in some circumstances that the subscriber wishes to use his dial in the ordinary manner, for instance for completing a call to a public exchange a line to which was made accessible in response to the dialling of the digit 0. In this case he would remove his receiver before dialling and trains of impulses each comprising a maximum of 10 impulses would then be sent out

in the usual manner since the storing effect would not come into action.

According to the invention therefore a very simple and compact arrangement has been produced for providing impulse storing facilities and thus simplifying or obviating entirely the special operating or circuit arrangements which have previously been found necessary to perform the same functions.

I claim:

1. In an impulse transmitter, a finger dial having a normal position and variably rotatable therefrom in a particular direction to register any digit, means for restoring said finger dial to normal after every such operation thereof, means mechanically linked to said dial and controlled by a plurality of successive variable operations of said dial to register a number corresponding to the sum of the digits dialled in said successive operations, an impulse generator operable by said last means to transmit impulses corresponding to said number, and means operated after the last of said successive operations of said finger dial and effective to initiate said operation of said generator by said last means.

2. In an impulse transmitter, a finger dial having a normal position and variably rotatable therefrom in a particular direction to register any digit, a spring effective to restore said finger dial to normal after every such operation thereof, an adding mechanism mechanically linked to said finger dial and controlled by a plurality of successive operations of said dial to add up the digits dialled in said successive operations, means manually operated after the last of said successive operations of said finger dial, and an impulse generator controlled by said mechanism and rendered effective responsive to said operation of said last means to transmit impulses corresponding to the sum of the digits dialled in said successive operations.

3. In a calling device for a telephone or like system, a member having a normal position, manually operable means for variably moving said member in a given direction to register any one of certain digits, said means operated a plurality of times in succession to register a plurality of digits, means for moving said member in the opposite direction after each movement of it in said given direction, thereby to restore said member to normal between successive movements of it in said given direction, a mechanism mechanically linked to said member and operated by it during said registration of said digits to register a number corresponding to the sum of said digits, and means operated by said mechanism for transmitting electrical impulses corresponding to said number.

4. In a calling device for a telephone or like system, a member having a normal position, manually operable means for variably moving said member in a given direction to register any one of certain digits, said means operated a plurality of times in succession to register a plurality of digits, means for moving said member in the opposite direction after each movement of it in said given direction, thereby to restore said member to normal between successive movements of it in said given direction, a second member adapted to be moved only in a predetermined direction while said digits are being registered, means mechanically linking said two members during said registration of said digits to cause said first member to move said second member in said predetermined direction to store impulses corresponding

to said digits, means for then moving said second member in the opposite direction, and means operated by said second member during its movement in said opposite direction for transmitting said stored impulses.

5. In a calling device for a telephone or like system, two members each having a normal position, means for manually moving one of said members repeatedly in a given direction, means for moving said one member in the opposite direction after each movement of it in said given direction, thereby to restore said one member to normal between successive movements thereof in said given direction, means mechanically linking the other of said members to said one member during each movement of said one member in one direction, thereby to cause said one member to move said other member in a certain direction, means normally preventing said other member from moving in the opposite direction, thereby to prevent it from returning to normal between successive movements of said one member in said one direction, means operable to disable said preventing means, means effective upon operation of said last means to move said other member in said opposite direction to restore it to normal, and means operated by said other member during said restoration to normal to transmit electrical impulses.

6. In a calling device as claimed in claim 5, a separate governor for each of said members to control the speed at which said member restores to its normal position.

7. In a calling device as claimed in claim 5, in a separate governor for each of said members, and means for linking each governor to its associated member only when that member is moving in a particular direction, thereby to control the speed at which said associated member is moved in said particular direction.

8. In a calling device for an automatic telephone system or the like, a member movable in one direction to store impulses and movable in the opposite direction to transmit stored impulses, a manually operable mechanism adapted to be operated differently at different times, means mechanically linking said mechanism to said member during each of a plurality of successive operations of said mechanism, said mechanism effective upon each of said successive operations to move said member in said one direction to store impulses, means for preventing said member from moving in said opposite direction between successive ones of said operations of said mechanism, means effective to unlink said mechanism from said member after the last of said successive operations of said mechanism, means then operable to disable said preventing means, and means effective upon operation of said last means to move said member in said opposite direction to transmit impulses.

9. In an impulse sender, two members each having a normal position, a spring for each member urging that member toward its normal position, means for manually rotating one of said members repeatedly away from its normal position against the force of its spring, said spring effective to restore said one member to normal between successive rotations of it away from its normal position, a pawl and ratchet coupling between said members causing said one member to rotate the other of said members away from its normal position against the force of its spring whenever said one member is rotated in a particular direction, a detent normally effective to

prevent said other member's spring from restoring said other member to normal, manually operable means for disengaging said detent to permit said other member to restore to normal, and means operated by said other member during said restoration to normal to transmit electrical impulses.

10. In an impulse sender, a finger dial having a normal position and rotatable therefrom different distances in accordance with different digits, means for restoring said dial to normal po-

sition after each operation, an adding mechanism associated with said dial also having a normal position, each successive operation of said dial causing movement of said adding mechanism farther from its normal position to an advanced position, and means for then releasing said adding mechanism from said advanced position to cause it to transmit a series of impulses equal in number to the sum of the digits in accordance with which the dial was operated.

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