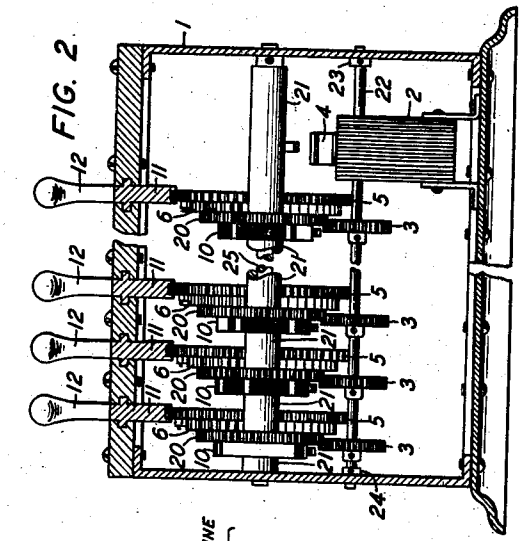
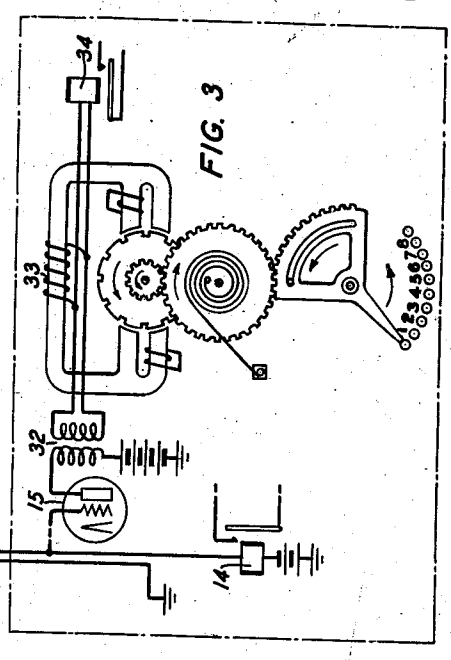
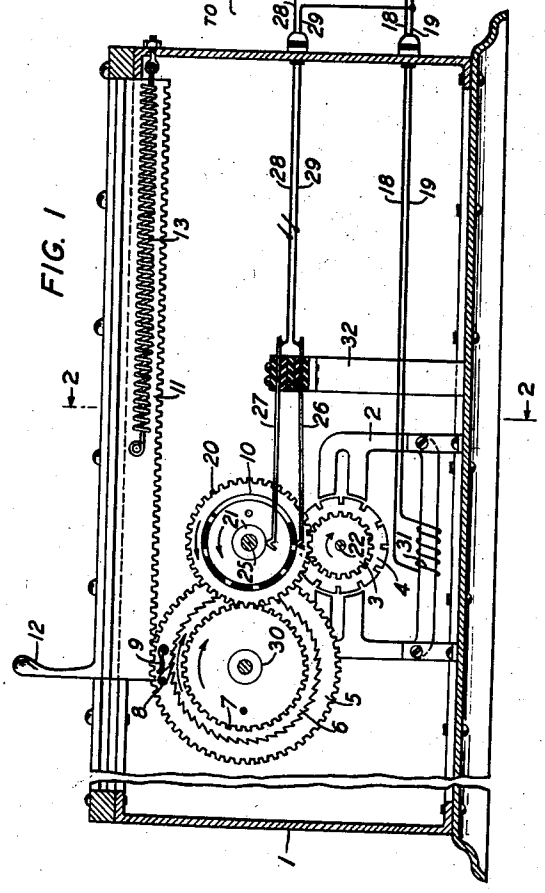
July 6, 1937. L. H. ALLEN 2,086,110

REPERTORY DIALING DEVICE

Filed Oct. 31, 1935 2 Sheets-Sheet 1







INVENTOR
L. H. ALLEN
BY
P. C. Smith
ATTORNEY

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FIG. 5

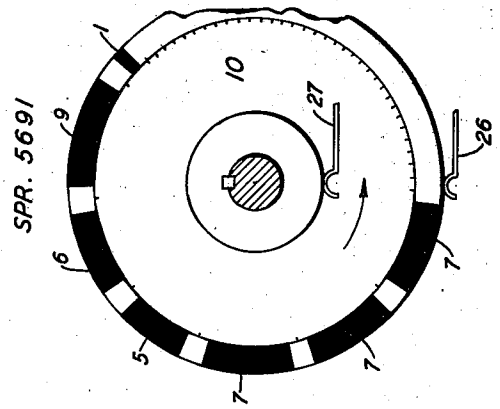
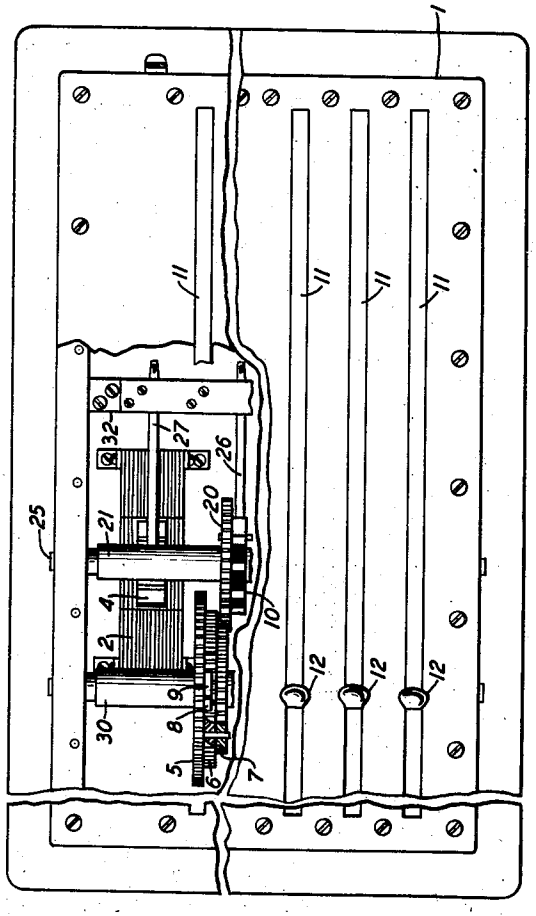


FIG. 4



INVENTOR
L. H. ALLEN

BY P. C. Smith

ATTORNEY

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2,086,110

REPERTORY DIALING DEVICE

Lawrence H. Allen, Summit, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Application October 31, 1935, Serial No. 47,583

6 Claims. (Cl. 179—90)

The present invention relates, in general, to impulse transmitting devices, but is particularly concerned with that type of impulse transmitting device which, in response to a single actuation thereof, transmits the called subscriber's entire number.

In case of a great number of telephone users a large portion of the calls made are to a limited number of stations, and of these there are usually a few stations which are being repeatedly called. Where such subscribers are connected to an automatic exchange they have to go through the operation of turning a dial successively to the letters and digits which spell out the call designation of the desired station. In a metropolitan area like New York, for instance, it is necessary to use seven letters or digits in each call designation and, in making a call, these must be successively selected on a dial, the dial turned to a stop, released, permitted to fully return to the initial position at a governed speed, and the operation repeated until the seven letters and digits have been dialed. Any means, therefore, which reduces the effort in calling such stations will result in material labor saving for telephone subscribers.

The principal object of this invention is to provide an improved transmitter which takes a minimum time to operate and in which, in the case of private branch operation, allows the operator's attention to be released as soon as the automatic operation of making a call has been initiated, so that the operator can, while the apparatus is effecting a connection over one trunk, be attending to an incoming call over another trunk, or perform other duties.

This object is attained, in accordance with the present invention, by the provision of a separate operating means for each desired line designation which, when operated releases automatically to cause the rotation of a commutator individual to the line and the rotation of an alternating current generator common to all commutators. Each commutator is provided on its periphery with a number of insulating segments equal to the number of digits in the line number which the commutator identifies, and each segment has a length proportional to the number of alternating current sine waves which must be generated and transmitted over the line to identify each of the digits. Thus, during a single revolution of a commutator, a sufficient number of sine waves, grouped in accordance with the digits of a line designation, are produced and transmitted over the line to control the establishment of a desired connection.

A clearer conception of the scope and purpose of the invention may be obtained from the following description taken in connection with the attached drawings in which:

Fig. 1 shows the side elevation of the repertory dialing device which is the subject of this invention;

Fig. 2 shows a sectional view of the repertory dialing device taken along the section line 2—2 of Fig. 1;

Fig. 3 shows a typical impulse receiving circuit which can be operated by the repertory dialing device herein disclosed and claimed;

Fig. 4 shows a top view of the repertory dialing device disclosed in Fig. 1, with a portion broken away to disclose a part of the mechanism; and

Fig. 5 shows a front view of a transmitting commutator one of which is used in the repertory dialing device for each number to be automatically dialed. The commutator shown in this figure is arranged for the number "SPRing-5691".

Referring to all the figures, in which identical parts bear identical designations, the repertory dialing device comprises an inductor alternator having a field core 2 and an armature 4 which is carried on a freely rotating shaft 22 which is supported at its ends in bearings 23 and 24 attached to the sides of the housing 1, said shaft 22 further supporting along its length as many gears 3 as there are repertory line numbers for which the dialing device is equipped to dial.

Above shaft 22 and in vertical alignment therewith is a fixed shaft 25 which extends across the housing 1 and is attached to the sides thereof. For each gear 3 on shaft 22 there is rotatably mounted on shaft 25 one gear 20, each being separated from the others by bushings 21. Each gear 20 is in mesh with gear 3. To the hub of each of the gears 20 a commutator wheel 10 is rigidly connected having a diameter sufficiently smaller than that of gear 20 to keep its rim out of contact with the teeth of gear 3. As shown more in detail in Fig. 5, each of the commutator wheels represents one of the telephone numbers that can be dialed by the device and each of their separate peripheries comprises a number of insulating segments for each of the digits of a telephone number and separated from each other by conducting segments which represent the intervals between digits. The length of each insulating segment is determined by the time taken for the armature 4 of the generator to ro-

tate sufficiently to produce a number of alternating current sine waves equal to a multiple of the digit to be transmitted, as more completely described hereinafter. Each commutator is provided with a set of contact brushes 26 and 27, brush 26 being in constant contact with the rim 10 of the commutator while brush 27 is in constant contact with the surface of bushing 21. These brushes, as well as each of the pair of brushes for every other commutator, are insulated from each other and supported in any suitable manner such as, for example, on the supporting post 32 and connected to the conductors 28 and 29 which extend to the impulse circuit shown in Fig. 3 with a tap in parallel with the field winding 31 of the generator.

In horizontal alignment with shaft 25 and extending across the housing 1 parallel with the axis of said shaft 21, is another shaft 30 on which are rotatably mounted, for each gear 20, a pinion wheel 5, a ratchet wheel 6, and a gear wheel 7. The ratchet wheel 6 and the gear wheel 7 are keyed together to permit of identical motion to both wheels while gear 7 is meshed with gear 20 and is preferably of the same diameter. On the rim of pinion wheel 5, a little above the teeth of ratchet wheel 6, is a hinged pawl 8 which is held firmly in position between any two teeth of said wheel 6 by a spring 9, said spring 9 having sufficient resiliency to permit the pawl to ride over the surfaces of said teeth when wheel 5 rotates in a counter-clockwise direction.

For each pinion wheel 5, a rack 11 is provided which has a length equal to the circumference of the pinion. The rack is free to move lengthwise in a track provided in the top of the housing 1, said housing being long enough to permit the full travel of the rack over the entire circumference of the pinion. At one end of the housing, each rack is held in a normal position with the teeth at one of its ends in contact with those of the associated pinion, by a spring 13, which at one end is attached to the housing and at the other end to a side of the rack. The rack is further provided with a handle 12 at its free extremity for the purpose of imparting movement thereto from its normal position to which it is then enabled to return by the action of the spring 13 as more particularly described hereinafter.

Having described the organization of the elements of the repertory dialing device, I will now describe its operation in connection with a circuit designed to receive alternating current sine waves and to operate a relay motor of the type shown and described in an application of R. F. Massonneau, Serial No. 6,787, filed February 16, 1935.

Considering Fig. 3 in relation to Fig. 1, it may be assumed that the repertory dialing device is associated with the telephone instrument of a subscriber's line and that each brush 26 is resting upon a conducting segment of its associated commutator. Inasmuch as brush 27 is in contact with bushing 21, which is of a conducting substance, the two brushes form a conducting path between conductors 28 and 29. When the subscriber removes the receiver from the hook, the dialing device is connected to the line wires 16 and 17 in any suitable manner well known to the telephone switching art. A circuit is then completed from grounded battery, winding of line relay 14, conductor 16, switchhook contacts (not shown), conductor 28, brushes 26 and 27, conductor 29, conductor 17 to ground. Line relay 14 is energized and closes a circuit (not shown) to transmit the usual dial tone to the subscriber, whereupon said subscriber selects the handle 12 of the rack relating to the number he desires to transmit, pulls it to the full extent of its travel and releases it. Due to the tension stored in spring 13 by the pull on the rack, said rack returns back to its normal position.

During the forward movement of the rack, its teeth will engage those of the related pinion wheel 5 and inasmuch as this wheel is rotatably mounted on shaft 30, a rotary movement is imparted to the wheel which causes it to rotate in a counter-clockwise direction with the pawl 8 riding over the teeth of the ratchet wheel 6. However, ratchet wheel 6, as well as the wheel 7 geared to it, are likewise rotatably mounted on shaft 30 so that, during the counter-clockwise rotation of pinion wheel 5, the ratchet wheel 6 and the gear 7 remain uninfluenced, in consequence of which gear 21, commutator wheel 10 and gear 3 remain stationary and no motion is imparted to the armature 4 of the generator.

When the rack is released and, due to the tension stored in spring 13, is forced back, said rack imparts a clockwise rotary motion to the pinion wheel 5 which, by virtue of the fact that its pawl 8 engages between two teeth of the ratchet wheel 6, further imparts similar motion to said ratchet wheel and to the gear wheel 7. Counter-clockwise motion is now imparted to gear 20 which is in mesh with gear 7 and also to the commutator wheel 10 which is keyed to gear 20, and, further, to gear 3 which is on the same shaft 22 as the armature 4 of the generator. The armature of the generator, therefore, rotates in a clockwise direction and due to the fact that brush 26 makes with the first insulating segment representing the first digit on the initial rotation of commutator 10, the short circuit established by the two brushes 26 and 27 is removed and the line circuit is extended from conductor 17, over conductor 19, field winding 31, conductor 18, switchhook contacts to conductor 16. A magnetic field is now produced in the stator 2, the lines of which traverse the conductors on the rotor 3 so that, as the armature rotates during the time that brush 26 is in contact with the first insulating segment, an alternating current of sine wave form is induced in the line circuit.

As mentioned before, the commutator wheel 10 of each repertory number has a periphery made up of a number of insulating segments equal to the number of digits to be dialed. The length of each of these insulating segments depends, of course, on the number of sine waves to be transmitted for a unit digit which, in turn, would depend on the number of revolutions to be made by the armature 4 of the generator for each unit. Thus, if ten successive sine waves are to be the equivalent of a pulse and the first digit to be transmitted is 6, the armature 4 would have to make as many revolutions as would be necessary to produce and transmit sixty sine waves equal to the digit 6. The length of the commutator segment, therefore, would have to be such that the brush 26 would remain in contact with the insulating segment during the time taken by the armature to revolve this number of revolutions, said brushes being open-circuited in the normal position of the commutator. The ratio between gears 20 and 3 would be selected in accordance with the characteristics of the generator to insure the rotation of the generator armature at the speed required for maximum efficiency.

During the time, therefore, that brush 26 is in contact with an insulating segment on wheel 10, the alternating current produced by the generator is transmitted over the line to alter the potential in the grid element of thermionic device 15 whereupon a pulsating current is generated in the plate circuit which further induces an alternating current in the secondary circuit of the transformer 32. This circuit includes relay 34 and the motor relay 33 and causes said motor relay to operate and advance its arm six steps in accordance with the operation described in the above-mentioned application of R. F. Massonneau.

When, in the course of the rotation of commutator 10, brush 26 comes in contact with the succeeding conducting segment, that is, after it has been in contact with the insulating segment that designates a digit, no more alternating current is transmitted over the line during the interval that the brush 26 is in contact with said conducting segment since during this time the field winding 31 is short-circuited by the metallic conducting path established by the brushes. The potential on the grid of the thermionic device 15 is reduced, during this interval, to the normal biasing potential whereupon, according to the disclosure in the above-mentioned Massonneau application, the motor relay 33 is restored to normal from the position to which it had been advanced and relay 34 releases to advance the contacts of the relay to a succeeding register for the registration of the succeeding digit. The operations are then repeated for each succeeding commutator segment until the commutator 10 has made one complete revolution in the time taken for the pinion wheel 5 to restore to normal under the influence of rack 11.

What is claimed is:

1. An impulse sending device comprising a plurality of rotatable commutators each individual to a particular designation, means for independently rotating each of said commutators through one revolution, and means controlled by each of said commutators when rotating for producing a plurality of groups of alternating current impulses corresponding to the particular designation of the operated commutator.

2. In an impulse sending device, a plurality of slidable operating devices, an alternator and cooperating means for generating a plurality of groups of alternating current impulses by the separate operation of each of said devices, said cooperating means including a plurality of commutators each individual to a particular designation and effective to operate said alternator when one of said commutators is actuated by one of said devices.

3. An impulse sending device comprising a number of coaxial rotatable commutators, each individual to a particular designation, an alternating current generator, and manually operated means for rotating each of said commutators respectively, and to operate said alternator for producing a plurality of groups of alternating current impulses characterizing the designation of the operated commutator.

4. An impulse sending device comprising a plurality of rotatable commutators, each individual to a particular designation, a pawl and ratchet device for each of said commutators capable of manipulation through a slidable member for each of said devices and operatively geared to said commutator for rotating each of said commutators through one revolution by one pull of said slidable member, and means controlled by each of said commutators when rotating for producing a plurality of groups of impulses corresponding to the particular designation of the operated commutator.

5. An impulse sending device comprising a plurality of rotatable commutators, each individual to a particular designation, means for independently rotating each of said commutators through one revolution, an alternator having a rotor containing a plurality of windings to produce a plurality of alternating current waves, and means intermediate each of said commutators and said rotor for rotating said rotor as many revolutions in one revolution of one of said commutators as will be required by the number of windings on said rotor to produce a plurality of groups of alternating current waves corresponding to the particular designation of the commutator that drives the rotor.

6. In an impulse sending device comprising an alternator having a field winding and a rotor to produce alternating current waves, the combination with said alternator of a commutator having a number of insulating segments, separated by metallic segments, operating means connecting said commutator and said rotor for rotating said rotor through one or more revolutions in the time of one revolution of said commutator, and a pair of brush contacts for said commutator bridged across the field winding of said alternator for short-circuiting said field winding when one of said brushes engages a metallic segment to prevent the production of alternating current waves and for making said winding electrically active to produce alternating current waves when said brush engages an insulating segment.

LAWRENCE H. ALLEN.