

Sept. 7, 1943.

B. D. WILLIS

2,329,022

CALL TRANSMITTER

Filed Oct. 1, 1941

3 Sheets-Sheet 1

FIG. 2

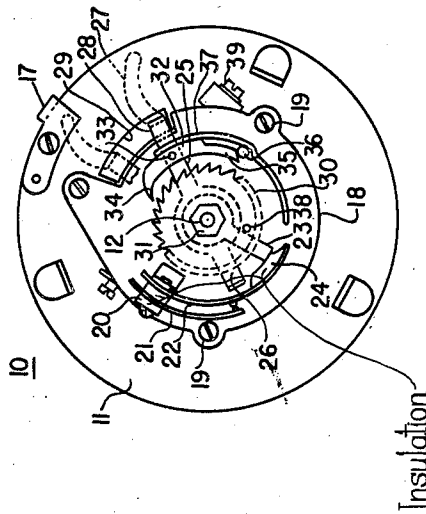
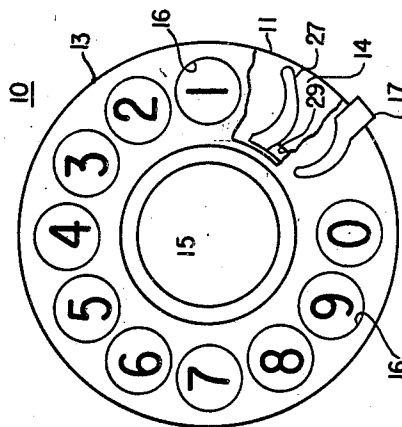


FIG. 1



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FIG. 5

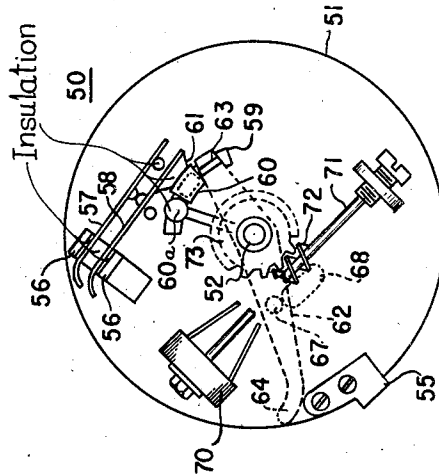


FIG. 4

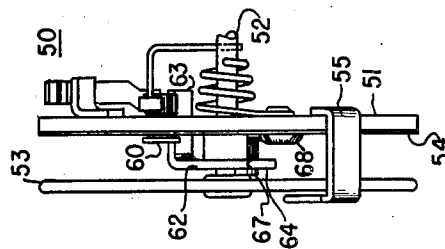


FIG. 3

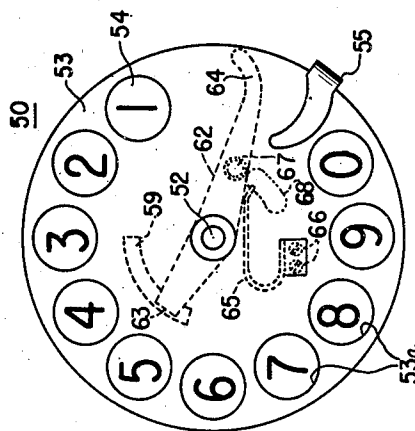
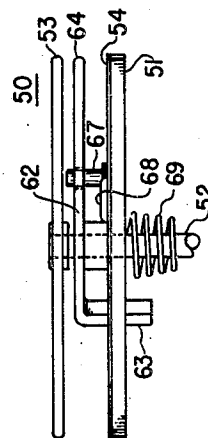


FIG. 6



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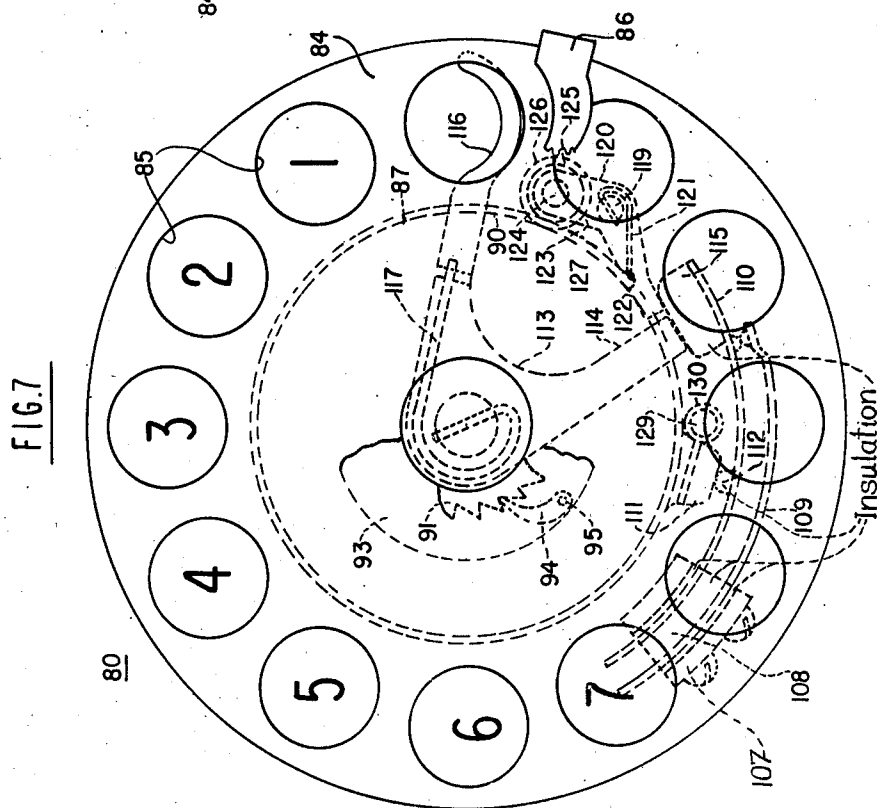
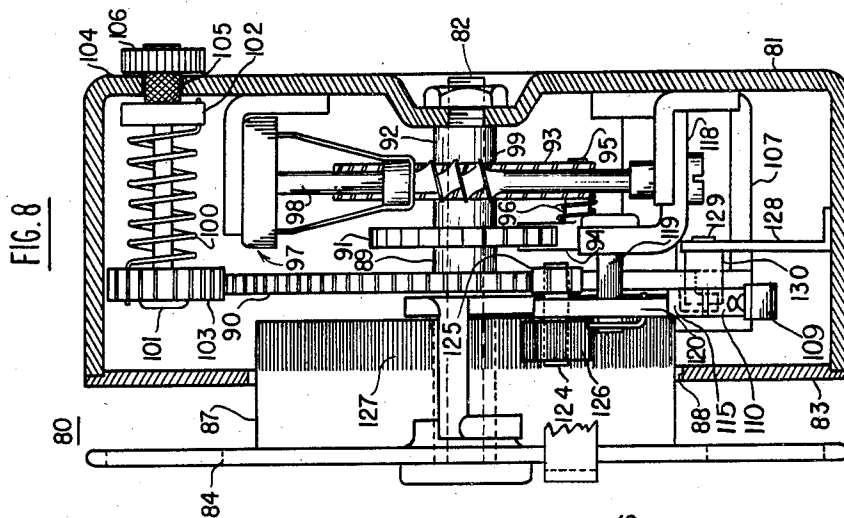
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,329,022

CALL TRANSMITTER

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Application October 1, 1941, Serial No. 413,177

15 Claims. (Cl. 179—90)

The present invention relates to call transmitters and more particularly to telephone call transmitters adapted for use in automatic telephone systems of the character of that disclosed in U. S. Patent No. 2,222,131, Bernard D. Willis, granted November 19, 1940.

In a conventional automatic telephone system, the automatic switching apparatus is selectively controlled in accordance with different digits comprising corresponding different numbers of impulses. However, in an automatic telephone system of the character of that disclosed in the Willis patent mentioned, the automatic switching apparatus is selectively controlled in accordance with different digits in the form of a single impulse and comprising corresponding different time durations.

Accordingly, the principal object of the present invention is to provide a call transmitter which is selectively operative to transmit a single impulse of variable time duration corresponding to different digits, which may be utilized selectively to control the automatic switching apparatus in an automatic telephone system of the type noted.

Another object of the invention is to provide a call transmitter embodying improved and simplified digit control mechanism.

A further object of the invention is to provide an improved call transmitter which is of compact and rugged construction and which is thoroughly reliable in operation.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification taken in connection with the accompanying drawings, in which Figure 1 is a front view, partly broken away, of a call transmitter embodying the present invention; Fig. 2 is a rear view of the call transmitter shown in Fig. 1; Fig. 3 is a front view of a modified form of the call transmitter; Fig. 4 is a side view, partly broken away, of the call transmitter shown in Fig. 3; Fig. 5 is a rear view, partly broken away, of the call transmitter shown in Fig. 3; Fig. 6 is a further side view, partly broken away, of the call transmitter shown in Fig. 3; Fig. 7 is a front view, partly broken away, of a further modified form of the call transmitter; and Fig. 8 is a side view, partly in section, of the call transmitter shown in Fig. 7.

Referring now more particularly to Figs. 1 and 2 of the drawings, there is illustrated a telephone call transmitter 10 embodying the present invention and comprising a base plate 11, a rotatably mounted arbor 12, a finger wheel 13 secured to

the outer end of the arbor 12, a dial plate 14 disposed below the finger wheel 13 and an escutcheon plate 15. The finger wheel 13 has ten finger openings 16 formed therein which are arranged in registry with suitable indicia carried on the dial plate 14. Also, the call transmitter 10 comprises a finger stop 17 secured to the base plate 11 and cooperating with the finger openings 16 formed in the finger wheel 13 to establish a fixed limit position therefor.

Also, the call transmitter 10 comprises a rear plate 18 secured to the base plate 11 in spaced relation thereto by a plurality of studs 19. The rear plate 18 supports a stack of insulating terminal blocks 20 carrying two spaced-apart contact springs 21 and 22. The contact spring 22 is formed of resilient material and normally biased away from the contact spring 21, for a purpose more fully explained hereinafter. A first blocking element 23 is pivoted upon the arbor 12 and has a normal position wherein it engages an insulator 24 carried on the outer end of the contact spring 22, whereby the contact spring 22 is forced into engagement with the contact spring 21. Also, a finger lever 25 is pivotally mounted on the arbor 12 and comprises an extended arm 26 constituting a second blocking element having a normal position and an operated position, the arm 26 of the finger lever 25 being adapted to engage the insulator 24 carried on the outer end of the contact spring 22 when it occupies its operated position, in a manner more fully explained hereinafter. Also, the finger lever 25 comprises a finger engaging portion or tab 27 which is disposed between the front surface of the dial plate 14 and the rear surface of the finger wheel 13 in spaced relation with respect thereto. More particularly, the finger tab 27 is connected to the body portion of the finger lever 25 by a riser section 28 extending through a slot 29 formed in the base plate 11, the finger tab 27 being disposed forwardly and below with respect to the finger stop 17 and rearwardly and below with respect to the first finger opening 16 formed in the finger wheel 13, as clearly shown in Fig. 1.

Further, the arbor 12 carries a ratchet wheel 30 on the outer end thereof, the ratchet wheel 30 being rigidly secured to the arbor 12 by an arrangement comprising a nut 31 threaded on the outer end of the arbor 12. The finger lever 25 carries a pawl 32 mounted on a pivotal pin 33, which comprises a head 34 adapted to cooperate with the teeth disposed about the periphery of the ratchet wheel 30 and a tail 35 which cooperates with an outwardly extending pin 36

fixed to the rear plate 18. Also, the pawl 32 carries a spring 37 which cooperates with the pin 36, in a manner more fully explained hereinafter. Further, the ratchet wheel 30 carries a pin 38 which normally engages the first blocking element 23 in order to retain the latter element in its normal position.

Finally the call transmitter 10 comprises a spring motor, not shown, operatively associated with the arbor 12, speed governor mechanism 39 and ratchet mechanism, not shown, operatively interconnecting the arbor 12 and the speed governor mechanism 39, in a manner more fully explained hereinafter.

Considering now the operation of the call transmitter 10 to transmit a given digit, the operator first places his finger in the appropriate finger opening 16 formed in the finger wheel 13 and rotates the finger wheel 13 in the clockwise direction, as viewed in Fig. 1, up to the fixed limit position as established by the finger stop 17, in accordance with conventional practice. As the finger wheel 13 is rotated in the clockwise direction, as viewed in Fig. 1 (the counterclockwise direction, as viewed in Fig. 2), the arbor 12 is rotated therewith in the counterclockwise direction.

Referring now more particularly to Fig. 2, the arbor 12 is rotated in the counterclockwise direction away from its normal position an amount corresponding to the digit to be transmitted, whereupon the associated spring motor, not shown, is wound. Also, the ratchet mechanism, not shown, interposed between the arbor 12 and the speed governor mechanism 39 permits free rotation of the arbor 12 without control by the speed governor mechanism 39. Also, as the arbor 12 is rotated in the counterclockwise direction, the ratchet wheel 30 is rotated therewith, whereby the pin 38 carried thereby disengages the first blocking element 23 and is moved away therefrom, in the counterclockwise direction, an amount corresponding to the digit to be transmitted; however, the first blocking element 23 remains in its normal position in engagement with the insulator 24, thereby to retain the contact spring 22 in engagement with the contact spring 21.

As the finger opening 16 formed in the finger wheel 13 and receiving the finger of the operator approaches the finger stop 17, the finger of the operator engages the finger tab 27 carried by the finger lever 25; whereby the finger lever 25 is pivoted in the counterclockwise direction about the arbor 12. As the finger lever 25 is pivoted in the counterclockwise direction about the arbor 12, the second blocking element 26 carried thereby engages the insulator 24 carried by the contact spring 22 and subsequently engages the first blocking element 23; whereupon the first blocking element 23 is pivoted in the counterclockwise direction from its normal position to an operated position. At this time, the second blocking element 26 occupies its operated position engaging the insulator 24 carried by the contact spring 22, thereby to retain the contact spring 22 forced into engagement with the contact spring 21; and the first blocking element 23 occupies its operated position disengaging the insulator 24 carried by the contact spring 22.

Also, when the finger lever 25 is thus pivoted in the counterclockwise direction about the arbor 12, the pawl 32 is moved therewith; whereby the tail 35 of the pawl 32 disengages the pin 36 and the outer end of the spring 37 rides up on the pin

36. When the outer end of the spring 37 rides up on the pin 36 the pawl 32 is rotated in a counterclockwise direction about its own pivot pin 33, whereby the head 34 of the pawl 32 is forced into engagement with the teeth disposed about the periphery of the ratchet wheel 30. Accordingly, at this time, the finger lever 25 is locked to the arbor 12 due to the engagement between the pawl 32 and the ratchet wheel 30.

After the finger opening 16 formed in the finger wheel 13 and receiving the finger of the operator is rotated up to the fixed limit position, as established by the finger stop 17, the operator withdraws his finger, thereby releasing the finger wheel 13 and the finger tab 27 carried by the finger lever 25. At this time, the spring motor, not shown, associated with the arbor 12 rotates the arbor 12 and the finger wheel 13 connected thereto, in the clockwise direction, back into their normal position. During a preliminary rotation of the arbor 12 in the clockwise direction toward its normal position, the finger lever 25 is rotated therewith due to the connection therebetween afforded by the ratchet wheel 30 and the pawl 32, as previously explained. Accordingly, the finger lever 25 and consequently the second blocking element 26 are rotated in a clockwise direction with the arbor 12, during the preliminary rotation of the arbor 12 toward its normal position; whereby the second blocking element 26 is moved from its operated position back to its normal position, wherein it disengages the insulator 24 carried on the outer end of the contact spring 22. At this time, the first blocking element 23 occupies its operated position disengaging the insulator 24, and the second blocking element 26 occupies its normal position disengaging the insulator 24; accordingly, the contact spring 22 is moved away from the contact spring 21 due to its own resiliency, thereby to interrupt a normally completed circuit therebetween.

At the conclusion of the preliminary rotation of the arbor 12 in the clockwise direction, the outer end of the spring 37 carried by the pawl 32 rides off of the pin 36 and the tail 35 of the pawl 32 rides up on the pin 36; whereby the pawl 32 is rotated in the clockwise direction about its own pivot pin 33. When the pawl 32 is thus rotated in the clockwise direction about its own pivot pin 33, the head 34 thereof disengages the teeth disposed about the periphery of the ratchet wheel 30, whereby the finger lever 25 is disconnected from the arbor 12 in order to permit the arbor 12 to be rotated in the clockwise direction back to its normal position without interference. Also, as the arbor 12 is rotated in the clockwise direction back to its normal position the ratchet mechanism, not shown, disposed between the arbor 12 and the speed governor mechanism 39 is controlled; whereby the speed governor mechanism 39 is operatively connected to the arbor 12 in order to effect the return rotation of the arbor 12 back to its normal position at a substantially uniform speed. The preliminary rotation of the arbor 12 in the clockwise direction back toward its normal position, and prior to the complete operation of the second blocking element 26 from its operated position back to its normal position, permits the arbor 12 and the associated speed governor mechanism 39 to acquire a substantially constant speed before the contact spring 22 disengages the contact spring 21.

Finally, when the arbor 12 is returned in the clockwise direction back to its normal position,

the pin 38 carried by the ratchet wheel 30 engages the first blocking element 23 and moves it from its operated position back to its normal position; wherein the first blocking element 23 engages the insulator 24 carried on the outer end of the contact spring 22, whereby the contact spring 22 is again forced into engagement with the contact spring 21.

In view of the foregoing explanation of the mode of operation of the call transmitter 10, it will be understood that the contact springs 21 and 22 occupy their open-circuit position during a time interval which corresponds to the time interval required by the arbor 12 to return from its operated position to its normal position after the second blocking element 26 is operated back to its normal position, which time interval is under the control of the speed governor mechanism 39 and is directly proportional to the initial rotation of the finger wheel 13 away from its normal position; which initial rotation of the finger wheel 13 away from its normal position is determined in accordance with the finger opening 16 formed in the finger wheel 13 which is utilized. Accordingly, when any given digit is dialed on the finger wheel 13 by the operator the call transmitter 10 operates to transmit a single impulse comprising an open-circuit period which is directly proportional to the digit dialed. Hence, the call transmitter 10 is selectively operative to transmit a single impulse of variable time duration corresponding to the different digits.

Referring now more particularly to Figs. 3 to 6, inclusive, of the drawings, there is illustrated a modified form of the call transmitter 50 embodying the present invention and comprising a base plate 51, a rotatably mounted arbor 52, a finger wheel 53 secured to the outer end of the arbor 52 and a dial plate 54 disposed below the finger wheel 53. The finger wheel 53 has ten finger openings 53a formed therein which are arranged in registry with suitable indicia carried on the dial plate 54. Also the call transmitter 50 comprises a finger stop 55 secured to the base plate 51 and cooperating with the finger openings 53a formed in the finger wheel 53 to establish a fixed limit position therefor.

The rear surface of the base plate 51 supports a stack of insulating terminal blocks 56 carrying two spaced-apart contact springs 57 and 58. The contact spring 58 is formed of resilient material and normally biased away from the contact spring 57, for a purpose more fully explained hereinafter. An arcuate-shaped slot 59 is formed in the base plate 51 and supports a slidably mounted insulator 60 therein. The insulator 60 constitutes a first blocking element which has a normal position wherein it engages an insulator 61 carried on the outer end of the contact spring 58, whereby the contact spring 58 is forced into engagement with the contact spring 57. A pin 60a is secured to the arbor 52 and normally engages the first blocking element 60 in order to retain the latter element in its normal position. Also a finger lever 62 is pivotally mounted on the arbor 52 and comprises an extended arm 63 projecting into the slot 59 formed in the base plate 51 and constituting a second blocking element having a normal position and an operated position, the arm 63 of the finger lever 62 being adapted to engage the insulator 61 carried on the outer end of the contact spring 58 when it occupies its operated position, in a manner more fully explained hereinafter. Also the finger lever 62 comprises a finger engaging portion or tab

64 which is disposed between the front surface of the dial plate 54 and the rear surface of the finger wheel 53 in spaced relation with respect thereto. More particularly, the finger tab 64 is disposed forwardly and below with respect to the finger stop 55 and rearwardly and below with respect to the first finger opening 53a formed in the finger wheel 53, as clearly shown in Fig. 3.

The finger lever 62 is biased in a counterclockwise direction about the arbor 52, as viewed in Fig. 3, by a resilient spring 65 secured to the front surface of the base plate 51 by a plurality of screws 66. Also, the finger lever 62 slidably supports a pin 67 in an opening formed therein, the head of the pin 67 being adapted to engage and cooperate with a rounded projection 68 formed on the front surface of the base plate 51, in a manner more fully explained hereinafter.

Further, the call transmitter 50 comprises a spring motor 69 operatively associated with the arbor 52, speed governor mechanism 70 and ratchet mechanism, not shown, operatively interconnecting the arbor 52 and the speed governor mechanism 70, in a manner more fully explained hereinafter. More particularly, the speed governor mechanism 70 comprises an operating shaft 71 carrying a worm 72; and a co-operating worm gear 73 is rotatably mounted on the arbor 52; the ratchet mechanism, not shown, being disposed between the arbor 52 and the worm gear 73.

Considering now the operation of the call transmitter 50 to transmit a given digit, the operator first places his finger in the appropriate finger opening 53a formed in the finger wheel 53 and rotates the finger wheel 53 in the clockwise direction, as viewed in Fig. 3, up to the fixed limit position as established by the fixed finger stop 55, in accordance with conventional practice. As the finger wheel 53 is rotated in the clockwise direction, as viewed in Fig. 3 (the counterclockwise direction, as viewed in Fig. 5), the arbor 52 is rotated in the counterclockwise direction.

Referring now more particularly to Fig. 5, the arbor 52 is rotated in the counterclockwise direction away from its normal position an amount corresponding to the digit to be transmitted, whereby the associated spring motor 69 is wound. Also, the ratchet mechanism, not shown, interposed between the arbor 52 and the worm gear 73 permits free rotation of the arbor 52 without control by the speed governor mechanism 70. Also, as the arbor 52 is rotated in the counterclockwise direction, the pin 60a carried thereby disengages the first blocking element 60 and is moved away therefrom, in the counterclockwise direction, an amount corresponding to the digit to be transmitted; however, the first blocking element 60 remains in its normal position in engagement with the insulator 61, thereby to retain the contact spring 58 in engagement with the contact spring 57.

As the finger opening 53a formed in the finger wheel 53 and receiving the finger of the operator approaches the finger stop 55, the finger of the operator engages the finger tab 64 carried by the finger lever 62, whereby the finger lever 62 is pivoted in the counterclockwise direction about the arbor 52. As the finger lever 62 is pivoted in the counterclockwise direction about the arbor 52, the second blocking element 63 carried thereby engages the insulator 61 carried by the contact spring 58 and also the first blocking element 60; whereby the first blocking

element 60 is slid in the counterclockwise direction in the slot 59 from its normal position to an operated position. At this time, the second blocking element 63 occupies its operated position engaging the insulator 61 carried by the contact spring 58, thereby to retain the contact spring 58 forced into engagement with the contact spring 57; and the first blocking element 60 occupies its operated position disengaging the insulator 61 carried by the contact spring 58.

Also, as the finger lever 62 is thus pivoted in the counterclockwise direction about the arbor 52, the pin 67 carried thereby slides onto the rounded projection 68 carried on the front surface of the base plate 51 and is forced outwardly toward the left, as viewed in Fig. 4; whereby the pin 67 locks the finger lever 62 to the finger wheel 53, for a purpose more fully explained hereinafter.

After the finger opening 53a formed in the finger wheel 53 and receiving the finger of the operator is rotated up to the fixed limit position, as established by the finger stop 55, the operator withdraws his finger; thereby releasing the finger wheel 53 and the finger tab 64 carried by the finger lever 62. At this time, the spring motor 69 associated with the arbor 52 rotates the arbor 52 and the finger wheel 53, secured thereto, in the clockwise direction back into their normal positions. During the preliminary rotation of the arbor 52 in the clockwise direction toward its normal position, the finger lever 62 is rotated therewith due to the connection between the finger lever 62 and the finger wheel 53 afforded by the pin 67, as previously explained. Accordingly, the finger lever 62 and consequently the second blocking element 63 are rotated in a clockwise direction with the arbor 52, during the preliminary rotation of the arbor 52 toward its normal position; whereby the second blocking element 63 is moved from its operated position back to its normal position, wherein it disengages the insulator 61 carried on the outer end of the contact spring 58. At this time, the first blocking element 60 occupies its operated position disengaging the insulator 61, and the second blocking element 63 occupies its normal position disengaging the insulator 61; accordingly, the contact spring 58 is moved away from the contact spring 57 due to its own resiliency, thereby to interrupt a normally completed circuit therebetween.

At the conclusion of the preliminary rotation of the arbor 52 in the clockwise direction, the head of the pin 67 rides off of the rounded projection 68 carried on the front surface of the base plate 51 and falls, due to the action of gravity, to the right away from the finger wheel 53, as viewed in Fig. 4, thereby to unlock the finger lever 62 from the finger wheel 53 in order to permit the arbor 52 and the finger wheel 53 connected thereto to be rotated in the clockwise direction back to their normal positions without interference. Also, as the arbor 52 is rotated in the clockwise direction back to its normal position, the ratchet mechanism, not shown, disposed between the arbor 52 and the worm gear 73 is controlled; whereby the worm gear 73 is operatively connected to the arbor 52 in order to effect an operative connection between the arbor 52 and the speed governor 70. Accordingly, the speed governor 70 effects the return rotation of the arbor 52 back into its normal position at a substantial uniform speed. The preliminary rotation of the arbor 52 in the clockwise direction

back toward its normal position, and prior to the complete operation of the second blocking element 63 from its operated position back to its normal position, permits the arbor 52 and the associated speed governor 70 to acquire a substantially constant speed before the contact spring 58 disengages the contact spring 57.

Finally, when the arbor 52 is returned in the clockwise direction back to its normal position, the pin 60a carried thereby engages the first blocking element 60 and slides it in the clockwise direction in the slot 59 from its operated position back to its normal position; wherein the first blocking element 60 engages the insulator 61 carried on the outer end of the contact spring 58, whereby the contact spring 58 is again forced into engagement with the contact spring 57.

In view of the foregoing explanation of the mode of operation of the call transmitter 50, it will be understood that the contact springs 57 and 58 occupy their open-circuit position during a time interval which corresponds to the time interval required by the arbor 52 to return to its normal position after the second blocking element 63 is operated back to its normal position, which time interval is under the control of the speed governor 70 and is directly proportional to the initial rotation of the finger wheel 53 away from its normal position; which initial rotation of the finger wheel 53 away from its normal position is determined in accordance with the finger opening 53a formed in the finger wheel 53 which is utilized. Accordingly, when any given digit is dialed on the finger wheel 53 by the operator, the call transmitter 50 operates to transmit a single impulse comprising an open-circuit period which is directly proportional to the digit dialed. Hence, the call transmitter 50 is selectively operative to transmit a single impulse of variable time duration corresponding to the different digits.

Referring now more particularly to Figs. 7 and 8 of the drawings, there is illustrated a further modified form of the call transmitter 30 embodying the present invention and comprising a cup-shaped enclosing casing 31 supporting a stationary stud 32, a cover or dial plate 33 and a finger wheel 34 rotatably mounted on the stud 32. The finger wheel 34 has twelve finger openings 35 formed therein which are arranged in registry with suitable indicia carried on the dial plate 33. Also, the call transmitter 30 comprises a finger stop 36 secured to the casing 31 and cooperating with the finger openings 35 formed in the finger wheel 34 to establish a fixed limit position.

The finger wheel 34 carries a centrally located cylindrical skirt 37 which extends through a circular opening 38 formed in the dial plate 33 into the interior of the casing 31. A tubular bushing 39 is rotatably mounted on the stud 32 and carries a gear 90 and a ratchet wheel 91 disposed in spaced-apart relation. Also, a tubular bushing 92 is rotatably mounted on the stud 32 and carries a worm gear 93. A pawl 94 is pivotally mounted on a pivot pin 95 carried by the worm gear 93 and biased in a clockwise direction, as viewed in Fig. 7, by a surrounding coil spring 96. More particularly, the pawl 94 is biased by the coil spring 96 into engagement with the teeth disposed about the periphery of the ratchet wheel 91, for a purpose more fully explained hereinafter.

Also, the call transmitter 30 comprises a speed governor 97, including a rotatable shaft 98 car-

rying a worm 99 which is meshed with the teeth disposed about the periphery of the worm gear 93. Also housed in the casing 71 is a spring motor comprising a coil spring 100, a spindle 101 and a collar 102, the opposite ends of the coil spring 100 being secured, respectively, to the collar 102 and to a pinion 103 rotatably mounted on the spindle 101. Also, it is noted that the teeth disposed about the periphery of the pinion 103 engage the teeth disposed about the periphery of the gear 90, for a purpose more fully explained hereinafter. The collar 102 comprises a tubular portion 104 which extends through an opening 105 formed in the bottom wall of the casing 81 and carries an adjusting wheel 106 on the outer end thereof. More particularly, the tubular portion 104 of the collar 102 frictionally engages the surrounding surface of the opening 105 formed in the bottom wall of the casing 81 and may be rotated against the frictional engagement by the adjusting wheel 106 in order to vary the initial stress exerted upon the coil spring 100.

Further, the bottom wall of the casing 81 carries a bracket 107 which supports a stack of insulating terminal blocks 108 which carry two spaced-apart contact springs 109 and 110. The contact spring 110 is formed of resilient material and is normally biased away from the contact spring 109, for a purpose more fully explained hereinafter. The gear 90 carries an upwardly offset and outwardly extending arm 111 constituting a first blocking element having a normal position, wherein it engages an insulator 112 carried intermediate the ends of the contact spring 110; whereby the contact spring 110 is forced into engagement with the contact spring 109. Also, a finger lever 113 is pivotally mounted on the stud 82 and comprises an extended arm 114 constituting a second blocking element having a normal position wherein it engages an insulator 115 carried on the outer end of the contact spring 110, whereby the contact spring 110 is further forced into engagement with the contact spring 109. Also the finger lever 113 carries a finger engaging portion or tab 116 which is disposed between the front surface of the dial plate 83 and the rear surface of the finger wheel 84 in spaced relation with respect thereto. More particularly, the finger tab 116 is disposed forwardly and below with respect to the finger stop 86 and rearwardly and below with respect to the finger opening 85 formed in the finger wheel 84 and arranged in registry with the index "1" carried on the dial plate 83, as clearly shown in Fig. 7. Also, it is noted that the finger lever 113 is normally biased in the counterclockwise direction by a resilient leaf spring 117 extending between the stud 82 and the finger lever 113.

Further, the bottom wall of the casing 81 carries a substantially U-shaped bracket 118 which supports a pivot pin 119 upon which a control lever 120 is pivotally mounted. The control lever 120 is normally biased in the counterclockwise direction about the pivot pin 119, as viewed in Fig. 7, by a leaf spring 121 extending between the control lever 120 and the pivot pin 119. The control lever 120 comprises a rearwardly extending arm 122 which cooperates with the insulator 115 carried on the outer end of the contact spring 110, in a manner more fully explained hereinafter, and a forwardly extending arm 123 which supports a rotatably mounted shaft 124. The shaft 124 carries a geared pinion 125 on the lower end thereof and a friction pinion 126 on the upper end thereof. The teeth disposed about the periphery

of the geared pinion 125 normally engage the teeth disposed about the periphery of the gear 90; while the friction surface of the friction pinion 126 normally engages a friction surface 127 disposed about the lower end of the skirt 87 carried by the finger wheel 84. Preferably, the friction surface formed on the friction pinion 126, as well as the friction surface 127 formed on the skirt 87, are provided thereon by knurling or serrating the surfaces mentioned. Accordingly, the shaft 124 is forced toward the skirt 87 and the gear 90 due to the bias of the control lever 120 in the counterclockwise direction about the pivot pin 119, as viewed in Fig. 7, as previously noted; whereby the friction surface of the friction pinion 126 normally engages the friction surface 127 disposed about the skirt 87 and the teeth disposed about the periphery of the geared pinion 125 normally engage the teeth disposed about the periphery of the gear 90. Finally, the side wall of the casing 81 carries a bracket 128 which supports a pin 129 upon which a roller 130 is mounted. The arm 111 is carried by the gear 90 normally engages the roller 130, thereby to retain the gear 90 in its normal position.

In view of the foregoing description of the construction and arrangement of the call transmitter 80, it will be understood that the coil spring 100 normally biases the pinion 103 in a clockwise direction about the spindle 101, as viewed in Fig. 7; whereby the gear 90 is biased in a counterclockwise direction about the stud 82, as viewed in Fig. 7, in order to force the arm 111 carried by the gear 90 into engagement with the roller 130 mounted on the pin 129.

Considering now the operation of the call transmitter 80 to transmit a given digit, the operator first places his finger in the appropriate finger opening 85 formed in the finger wheel 84 and rotates the finger wheel 84 in the clockwise direction, as viewed in Fig. 7, up to the fixed limit position as established by the finger stop 86, in accordance with conventional practice. As the finger wheel 84 is rotated in the clockwise direction, as viewed in Fig. 7, the attached skirt 87 is rotated therewith. The rotation of the skirt 87 in the clockwise direction rotates the shaft 24 in the counterclockwise direction due to the engagement between the friction pinion 126 and the friction surface 127 disposed about the periphery of the skirt 87; whereby the geared pinion 125 carried by the shaft 124 is rotated in the counterclockwise direction. The rotation of the geared pinion 125 in the counterclockwise direction causes rotation of the gear 90 in the clockwise direction about the stud 82 due to the engagement of the teeth disposed about the periphery of the geared pinion 125 and the teeth disposed about the periphery of the gear 90. The rotation of the gear 90 in the clockwise direction effects rotation of the pinion 103 in the counterclockwise direction about the spindle 101 due to the engagement between the teeth disposed between the periphery of the gear 90 and the teeth disposed about the periphery of the pinion 103. Finally, the rotation of the pinion 103 in the counterclockwise direction about the spindle 101 winds the coil spring 100. Also, as the gear 90 is rotated in the clockwise direction the tubular member attached thereto is rotated therewith; whereby the teeth disposed about the periphery of the ratchet wheel 91 carried by the tubular member 89 rides over the pawl 94 carried by the worm gear 93. Accordingly, the speed gov-

error mechanism 97 permits free rotation of the gear 90 in the clockwise direction about the stud 82.

Also, as the gear 90 is rotated in the clockwise direction about the stud 82, the first blocking element 111 carried thereby is rotated therewith away from its normal position engaging the insulator 112 carried intermediate the ends of the contact spring 110 to an operated position and an amount corresponding to the digit to be transmitted; however, the second blocking element 114 remains in its normal position in engagement with the insulator 115 carried on the outer end of the contact spring 110, thereby to retain the contact spring 110 in engagement with the contact spring 109. As the finger opening 85 formed in the finger wheel 84 and receiving the finger of the operator approaches the finger stop 86, the finger of the operator engages the finger tab 116 carried by the finger lever 113, whereby the finger lever 113 is pivoted in the clockwise direction about the stud 82. As the finger lever 113 is pivoted in the clockwise direction about the stud 82 the second blocking element 114 carried thereby is rotated therewith away from its normal position engaging the insulator 115 carried on the outer end of the contact spring 110 to an operated position disengaging the insulator 115.

Accordingly, when the finger opening 85 formed in the finger wheel 84 and receiving the finger of the operator is rotated up to the fixed limit position, as established by the finger stop 86, the finger lever 113 is fully moved; thereby to operate the second blocking element 114 from its normal position to its operated position. When the second blocking element 114 is thus moved to its operated position the insulator 115 carried on the outer end of the contact spring 110 is disengaged thereby; accordingly, the contact spring 110 is moved away from the contact spring 109 due to its own resiliency, thereby to interrupt a normally completed circuit therebetween. More particularly, the insulator 115 carried on the outer end of the contact spring 110 is moved toward the stud 82, thereby acting upon the arm 122 of the control lever 120 in order to cause the control lever 120 to be rotated in a clockwise direction about the pivot pin 119 against the bias of the leaf spring 121. When the control lever 120 is thus rotated in the clockwise direction about the pivot pin 119 the shaft 124 is moved away from the skirt 87 and the gear 90, whereby the friction pinion 126 disengages the friction surface 127 disposed about the periphery of the skirt 87 and the geared pinion 125 disengages the gear 90. Accordingly, at this time, the connection between the skirt 87 and the gear 90 is broken.

When the gear 90 is thus disconnected from the skirt 87 the pinion 103 is free to rotate in the clockwise direction about the spindle 101 under the control of the coil spring 100. The rotation of the pinion 103 in the clockwise direction about the spindle 101 effects rotation of the gear 90 in the counterclockwise direction about the stud 82 due to the engagement between the teeth disposed about the periphery of the pinion 103 and the teeth disposed about the periphery of the gear 90. Accordingly, the gear 90 is rotated in the counterclockwise direction about the stud 82 back into its normal position, whereupon the first blocking element 111 carried thereby engages the roller 130 mounted on the pin 129; thereby to arrest further rotation of the gear 90

in the counterclockwise direction and further rotation of the pinion 103 in the clockwise direction. Moreover, when the first blocking element 111 carried by the gear 90 is returned to its normal position the insulator 112 carried intermediate the ends of the contact spring 110 is engaged thereby; whereby the contact spring 110 is again forced into engagement with the contact spring 109. Also, when the contact spring 110 is moved toward the contact spring 109 the insulator 115 carried on the outer end of the contact spring 110 disengages the arm 122 of the control lever 120; whereby the control lever 120 is rotated in the counterclockwise direction about the pivot pin 119 by the leaf spring 120. When the control lever 120 is thus rotated in the counterclockwise direction about the pivot pin 119 the shaft 124 is again returned toward the skirt 87 and the gear 90, whereby the friction pinion 126 reengages the friction surface 127 disposed about the periphery of the skirt 87 and the teeth disposed about the periphery of the geared pinion 125 reengage the teeth disposed about the periphery of the gear 90.

At this point it is noted that the finger wheel 84 is of the nonreturnable type; and, in the event the operator withdraws his finger from the engaged finger opening 85 formed therein, when his finger is brought into engagement with the finger stop 86 the finger lever 113 is latched in its operated position by the cooperation between the second blocking element 114 carried by the finger lever 113 and the insulator 115 carried on the outer end of the contact spring 110. More particularly, when the second blocking element 114 is moved from its normal position to its operated position the insulator 115 is moved toward the stud 82 and behind the second blocking element 114, thereby to latch the finger lever 113 in its operated position. Subsequently, when the gear 90 is returned to its normal position and the first blocking element 111 carried thereby engages the insulator 112 carried intermediate the ends of the contact spring 110, the insulator 115 carried on the outer end of the contact spring 110 is moved away from the stud 82. When the insulator 115 is thus moved away from the stud 82 and from behind the first blocking element 114, the finger 113 is unlatched and is free to be rotated in the counterclockwise direction about the stud 82 by the leaf spring 117. On the other hand, in the event the operator does not withdraw his finger from the engaged finger opening 85 formed in the finger wheel 84, when his finger engages the finger stop 86 the mechanism housed in the call transmitter 80 operates, in the manner explained above; except that the finger lever 113 is not automatically returned in the counterclockwise direction back to its normal position after the digit has been transmitted by the call transmitter 80 until the operator withdraws his finger from the engaged finger opening 85 formed in the finger wheel 84, in an obvious manner.

When the gear 90 is rotated in the counterclockwise direction back toward its normal position the tubular member 89 and the ratchet wheel 91 secured thereto are rotated therewith. When the ratchet wheel 91 is thus rotated in the counterclockwise direction about the stud 82, the teeth disposed about the periphery of the ratchet wheel 91 engage the associated pawl 94, thereby to lock the worm gear 93 to the ratchet wheel 91 for rotation therewith. Accordingly, as the gear 90 is rotated in the counterclockwise direction back to its normal position, the worm gear

93 is rotated in the counterclockwise direction about the stud 82 therewith. This rotation of the worm gear 93 in the counterclockwise direction effects rotation of the operating shaft 98 of the speed governor mechanism 97; whereby the speed governor mechanism 97 effects the return rotation of the gear 90 back to its normal position at a substantially uniform speed.

In view of the foregoing explanation of the mode of operation of the call transmitter 80, it will be understood that the contact springs 109 and 110 occupy their open-circuit position during a time interval which corresponds to the time interval required by the gear 90 to return from its operated position to its normal position after the second blocking element 114 is operated from its normal position to its operated position, which time interval is under the control of the speed governor mechanism 97 and is directly proportional to the initial rotation of the finger wheel 84 away from its initial position; which initial rotation of the finger wheel 84 away from its initial position is determined in accordance with the finger opening 85 formed in the finger wheel 84 which is utilized. Accordingly, when any given digit is dialed on the finger wheel 84 by the operator the call transmitter 80 operates to transmit a single impulse comprising an open-circuit period which is directly proportional to the digit dialed. Hence, the call transmitter 80 is selectively operative to transmit a single impulse of variable time duration corresponding to the different digits.

While one embodiment of the invention has been disclosed, it will be understood that various modifications may be made therein which are within the true spirit and scope of the invention.

What is claimed is:

1. A call transmitter adapted to transmit a single impulse of variable time duration corresponding to different digits comprising variably operable digit register mechanism, a timer, means responsive to the registration of a digit in said digit register mechanism and controlled in accordance with the particular digit registered therein for operating said timer through a fixed cycle of a corresponding time duration, a pair of contacts having a normal position, and means governed by said timer for operating said contacts away from their normal position at the beginning of said cycle and for operating said contacts back to their normal position at the end of said cycle, whereby said contacts are operated to transmit a single impulse corresponding in time duration to the particular digit registered in said digit register mechanism.

2. A call transmitter comprising a rotatably mounted finger wheel variably rotatable in accordance with different digits to be transmitted, a rotatably mounted member having a normal position, means responsive to rotation of said finger wheel in accordance with a given digit for rotating said member away from its normal position an amount corresponding to said given digit, a pair of contacts having a normal position, means for initiating return rotation of said member back to its normal position and for operating said contacts away from their normal position, means responsive to the return of said member to its normal position for operating said contacts back to their normal position, and governor means for effecting the return rotation of said member back to its normal position at a substantially uniform speed, whereby said contacts are

operated away from their normal position a time interval corresponding to said given digit.

3. A call transmitter comprising a rotatably mounted finger wheel variably rotatable up to a fixed limit position in accordance with different digits to be transmitted, a rotatably mounted member having a normal position, means responsive to rotation of said finger wheel up to said limit position in accordance with a given digit for rotating said member away from its normal position an amount corresponding to said given digit, a pair of contacts having a normal position, means controlled subsequent to rotation of said finger wheel up to said limit position for initiating return rotation of said member back to its normal position and for operating said contacts away from their normal position, means responsive to the return of said member to its normal position for operating said contacts back to their normal position, and governor means for effecting the return rotation of said member back to its normal position at a substantially uniform speed, whereby said contacts are operated away from their normal position a time interval corresponding to said given digit.

4. A call transmitter comprising a rotatably mounted finger wheel variably rotatable up to a fixed limit position in accordance with different digits to be transmitted, a rotatably mounted member having a normal position, means responsive to rotation of said finger wheel up to said limit position in accordance with a given digit for rotating said member away from its normal position an amount corresponding to said given digit, a pair of contacts having a normal position, means controlled in response to rotation of said finger wheel up to said limit position and the subsequent release thereof for initiating return rotation of said member back to its normal position and for operating said contacts away from their normal position, means responsive to the return of said member to its normal position for operating said contacts back to their normal position, and governor means for effecting the return rotation of said member back to its normal position at a substantially uniform speed, whereby said contacts are operated away from their normal position a time interval corresponding to said given digit.

5. A call transmitter comprising a rotatably mounted finger wheel variably rotatable up to a fixed limit position in accordance with different digits to be transmitted, a rotatably mounted member having a normal position, means responsive to rotation of said finger wheel up to said limit position in accordance with a given digit for rotating said member away from its normal position an amount corresponding to said given digit, means controlled in response to rotation of said finger wheel up to said limit position and the subsequent release thereof for initiating return rotation of said member back to its normal position, a pair of contacts having a normal position, means responsive to a preliminary rotation of said member back toward its normal position for operating said contacts away from their normal position, means responsive to the return of said member to its normal position for operating said contacts back to their normal position, and governor means for effecting the return rotation of said member back to its normal position at a substantially uniform speed, whereby said contacts are operated away from their normal position a time interval corresponding to said given digit.

6. A call transmitter comprising a rotatably mounted finger wheel variably rotatable up to a fixed limit position in accordance with different digits to be transmitted, a rotatably mounted member having a normal position, means responsive to rotation of said finger wheel up to said limit position in accordance with a given digit for rotating said member away from its normal position an amount corresponding to said given digit, a pair of contacts having a normal position, a first blocking element normally restraining said contacts in their normal position, a second blocking element adapted to restrain said contacts in their normal position, means controlled in response to rotation of said finger wheel up to said limit position for removing said first blocking element and for placing said second blocking element, means responsive to subsequent release of said finger wheel for initiating return rotation of said member back to its normal position, means responsive to a preliminary rotation of said member back toward its normal position for removing said second blocking element, whereby said contacts are operated away from their normal position, means responsive to the return of said member to its normal position for replacing said first blocking element, whereby said contacts are operated back to their normal position, and governor means for effecting the return rotation of said member back to its normal position at a substantially uniform speed, whereby said contacts are operated away from their normal position a time interval corresponding to said given digit.

7. A call transmitter comprising a rotatably mounted finger wheel variably rotatable up to a fixed limit position in accordance with different digits to be transmitted, a rotatably mounted member having a normal position, means responsive to rotation of said finger wheel up to said limit position in accordance with a given digit for rotating said member away from its normal position an amount corresponding to said given digit, a pair of contacts having a normal position, a first blocking element normally restraining said contacts in their normal position, a second blocking element adapted to restrain said contacts in their normal position, means including a finger lever controlled in response to rotation of said finger wheel up to said limit position for removing said first blocking element and for placing said second blocking element and for connecting said second blocking element to said member, means responsive to subsequent release of said finger wheel for initiating return rotation of said member back to its normal position, means responsive to a preliminary rotation of said member back toward its normal position for removing said second blocking element and for disconnecting said second blocking element from said member, whereby said contacts are operated away from their normal position, means including a part carried by said member and responsive to the return of said member to its normal position for replacing said first blocking element, whereby said contacts are operated back to their normal position, and governor means for effecting the return rotation of said member back to its normal position at a substantially uniform speed, whereby said contacts are operated away from their normal position a time interval corresponding to said given digit.

8. In a call transmitter, a rotatably mounted finger wheel variably rotatable up to a fixed limit position in accordance with different digits to be

transmitted, a rotatably mounted member having a normal position, means responsive to rotation of said finger wheel up to said limit position in accordance with a given digit for rotating said member away from its normal position an amount corresponding to said given digit, a first control element having a normal position and an operated position, a second control element having a normal position and an operated position, the normal position of said first control element and the operated position of said second control element constituting a common position, means responsive to rotation of said finger wheel up to said limit position for moving said second control element from its normal position to its operated position, thereby to force said first control element from its normal position to its operated position, and for locking said second control element to said member, means responsive to subsequent release of said finger wheel for initiating return rotation of said member back to its manual position, means responsive to a preliminary rotation of said member back toward its normal position for operating said second control element from its operated position back to its normal position and for unlocking said second control element from said member, means responsive to the return of said member to its normal position for operating said first control element from its operated position back to its normal position, and digit transmitting means selectively operated by said first and second control elements.

9. A call transmitter comprising a rotatably mounted finger wheel variably rotatable up to a fixed limit position in accordance with different digits to be transmitted, a rotatably mounted member having a normal position, a pair of contacts having a normal position, means responsive to rotation of said finger wheel up to said limit position in accordance with a given digit for rotating said member away from its normal position an amount corresponding to said given digit and for operating said contacts away from their normal position and for initiating return rotation of said member back to its normal position, means responsive to the return of said member to its normal position for operating said contact back to their normal position, and governor means for effecting the return rotation of said member back to its normal position at a substantially uniform speed, whereby said contacts are operated away from their normal position a time interval corresponding to said given digit.

10. A call transmitter comprising a rotatably mounted finger wheel variably rotatable up to a fixed limit position in accordance with different digits to be transmitted, a rotatably mounted member having a normal position, means responsive to rotation of said finger wheel up to said limit position in accordance with a given digit for rotating said member away from its normal position an amount corresponding to said given digit, a pair of contacts having a normal position, means including a finger lever responsive to rotation of said finger wheel up to said limit position for operating said contacts away from their normal position and for initiating return rotation of said member back to its normal position, means responsive to the return of said member to its normal position for operating said contacts back to their normal position, and governor means for effecting the return rotation of said member back to its normal position at a substantially uniform speed,

whereby said contacts are operated away from their normal position a time interval corresponding to said given digit.

11. A call transmitter comprising a rotatably mounted finger wheel variably rotatable up to a fixed limit position in accordance with different digits to be transmitted, a rotatably mounted member having a normal position, means responsive to rotation of said finger wheel up to said limit position in accordance with a given digit for rotating said member away from its normal position an amount corresponding to said given digit, a pair of contacts having a normal position, means including a finger lever responsive to rotation of said finger wheel up to said limit position for operating said contacts away from their normal position, means responsive to the operation of said contacts away from their normal position for initiating return rotation of said member back to its normal position, means responsive to the return of said member to its normal position for operating said contacts back to their normal position, and governor means for effecting the return rotation of said member back to its normal position at a substantially uniform speed, whereby said contacts are operated away from their normal position a time interval corresponding to said given digit.

12. A call transmitter comprising a rotatably mounted finger wheel variably rotatable up to a fixed limit position in accordance with different digits to be transmitted, a rotatably mounted member having a normal position, means responsive to rotation of said finger wheel up to said limit position in accordance with a given digit for rotating said member away from its normal position an amount corresponding to said given digit, a pair of contacts having a normal position, first and second blocking elements each normally restraining said contacts in their normal position, means responsive to rotation of said member away from its normal position for removing said first blocking element, means responsive to rotation of said finger wheel up to said limit position for removing said second blocking element, whereby said contacts are operated away from their normal position, and for initiating return rotation of said member back to its normal position, means responsive to the return of said member to its normal position for replacing said first and second blocking elements, whereby said contacts are operated back to their normal position, and governor means for effecting the return rotation of said member back to its normal position at a substantially uniform speed, whereby said contacts are operated away from their normal position a time interval corresponding to said given digit.

13. In a call transmitter, a rotatably mounted finger wheel variably rotatable in the same direction up to a fixed limit position in accordance with different digits to be transmitted, a rotatably mounted member having a normal position, means normally connecting said member to said finger wheel, a spring motor associated with said member, means responsive to rotation of said finger wheel up to said limit position in accordance with a given digit for rotating said member through said connection away from its normal position an amount corresponding to said given digit and for storing energy in said spring motor,

means responsive to rotation of said finger wheel up to said limit position for disconnecting said member from said finger wheel, means including said spring motor and responsive to the disconnection of said member from said finger wheel for rotating said member back to its normal position, means responsive to the return of said member to its normal position for reconnecting said member to said finger wheel, and digit transmitting means selectively controlled by said member.

14. In a call transmitter, a rotatably mounted finger wheel variably rotatable up to a fixed limit position in accordance with different digits to be transmitted, a rotatably mounted member having a normal position, a pivotally mounted control lever carrying clutch elements adapted to cooperate with clutch elements respectively carried by said finger wheel and by said member and normally biased to engage said clutch elements, a spring motor associated with said member, means responsive to rotation of said finger wheel up to said limit position in accordance with a given digit for rotating said member through said clutch elements away from its normal position an amount corresponding to said given digit and for storing energy in said spring motor, means responsive to rotation of said finger wheel up to said limit position for moving said control lever against its bias, thereby to declutch said clutch elements, means including said spring motor and responsive to the declutching of said clutch elements for rotating said member back to its normal position, means responsive to the return of said member to its normal position for returning said control lever, thereby to re clutch said clutch elements, and digit transmitting means selectively controlled by said member.

15. In a call transmitter, a rotatably mounted finger wheel variably rotatable up to a fixed limit position in accordance with different digits to be transmitted, a rotatably mounted member having a normal position, means normally connecting said member to said finger wheel, a spring motor associated with said member, means responsive to rotation of said finger wheel up to said limit position in accordance with a given digit for rotating said member away from its normal position an amount corresponding to said given digit and for storing energy in said spring motor, a finger lever having a normal position, means responsive to rotation of said finger wheel up to said limit position for moving said finger lever away from its normal position, means responsive to movement of said finger lever away from its normal position for locking it out of its normal position and for disconnecting said member from said finger wheel, means including said spring motor and responsive to the disconnection of said member from said finger wheel for rotating said member back to its normal position, means responsive to the return of said member to its normal position for unlocking said finger lever and for returning it to its normal position, means responsive to the return of said finger lever to its normal position for reconnecting said member to said finger wheel, and digit transmitting means selectively controlled by said member.

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