Dec. 30, 1947. C. D. RICHARD 2,433,398

INDICATING KEYBOARD TELEPHONE CALL TRANSMITTER

Filed Sept. 1, 1945 4 Sheets-Sheet 1

FIG. 1

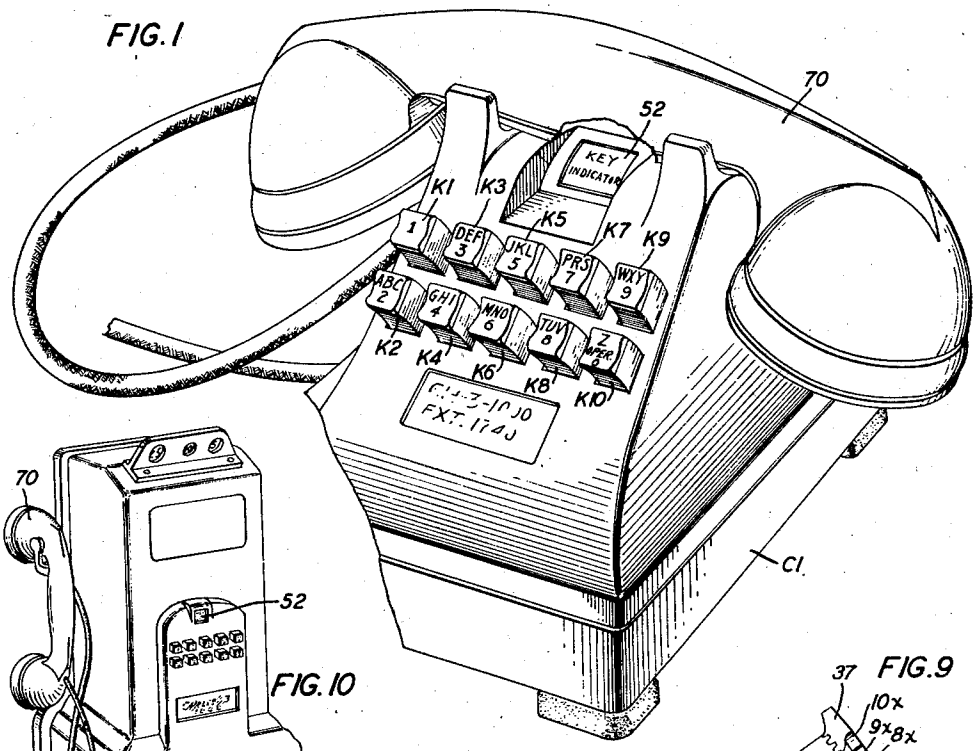


FIG. 10

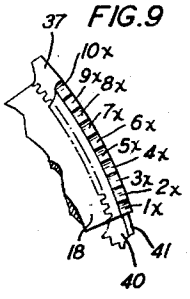


FIG. 9

FIG. 2

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FIG. 3

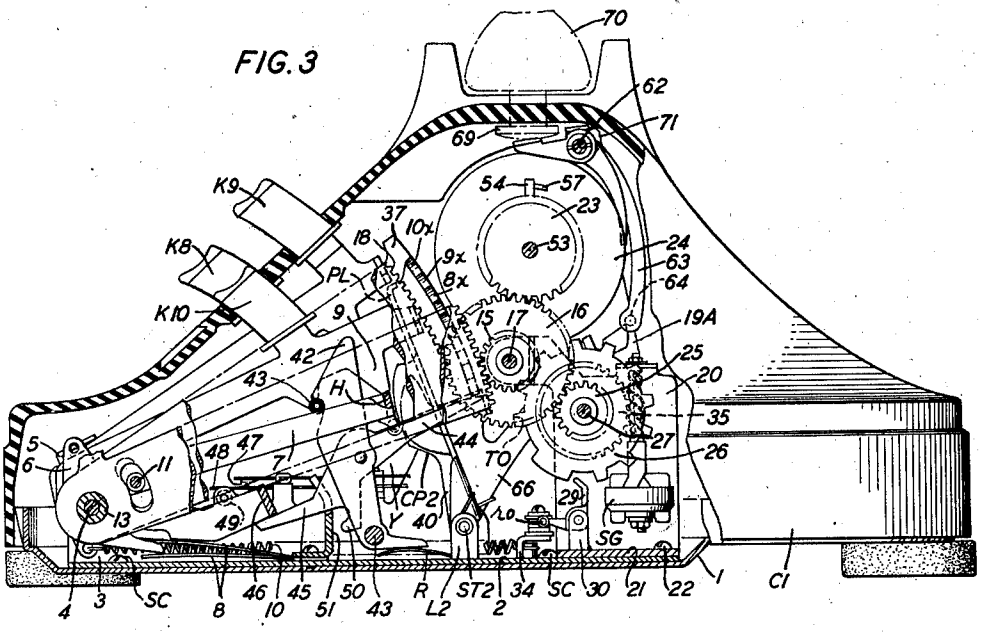
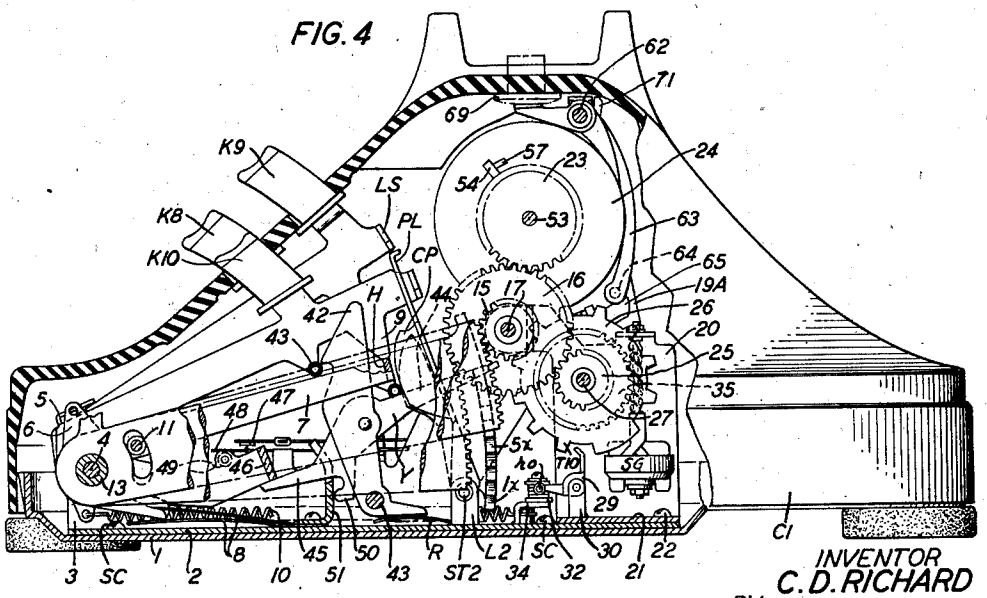


FIG. 4



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FIG. 5

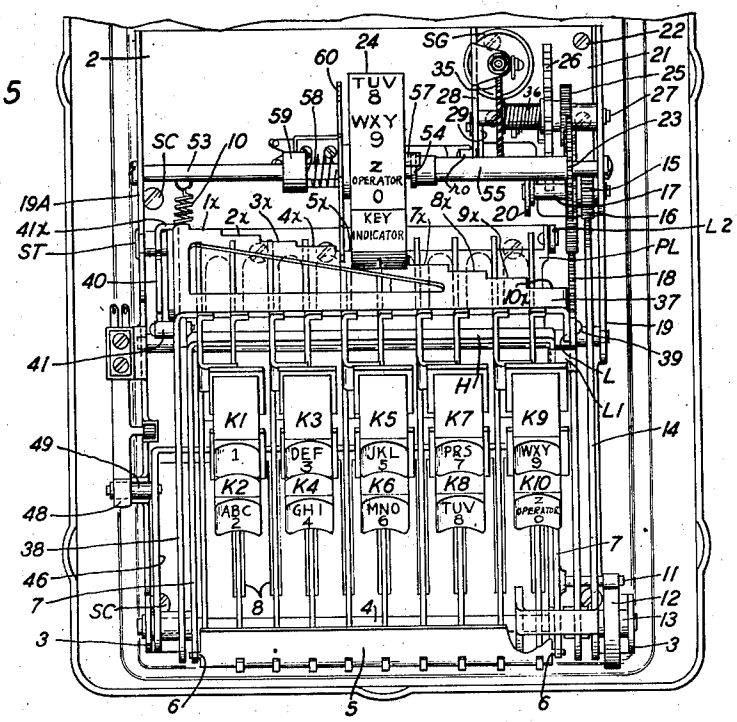
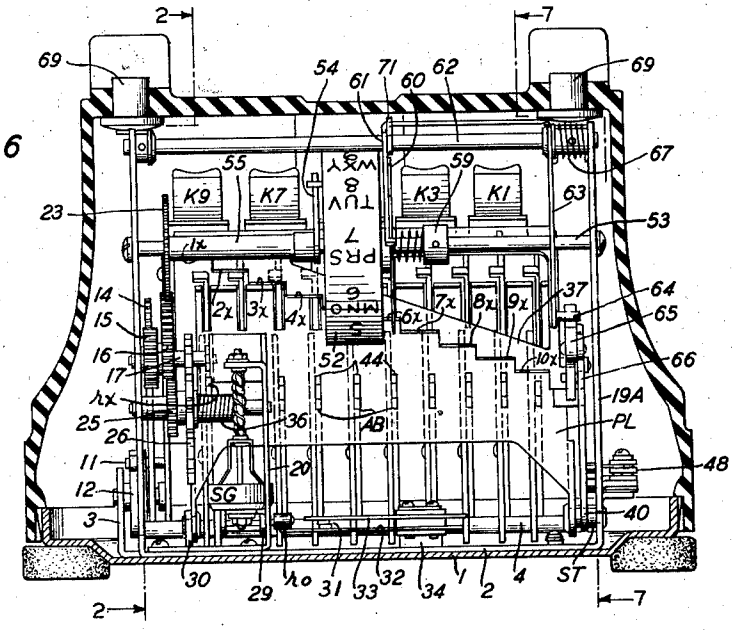


FIG. 6



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FIG. 7

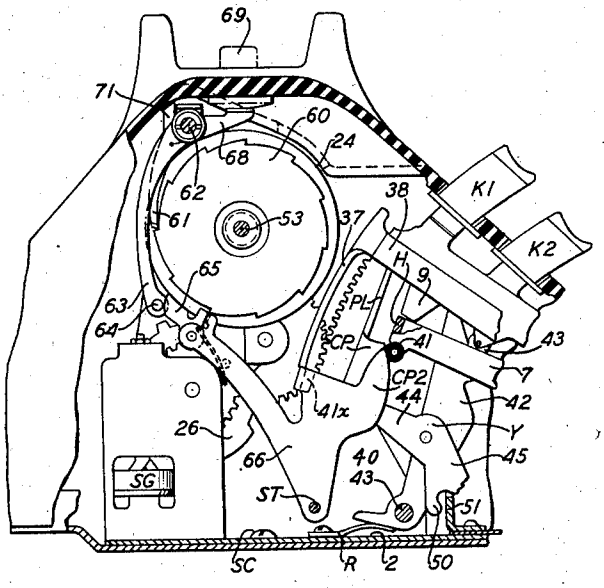
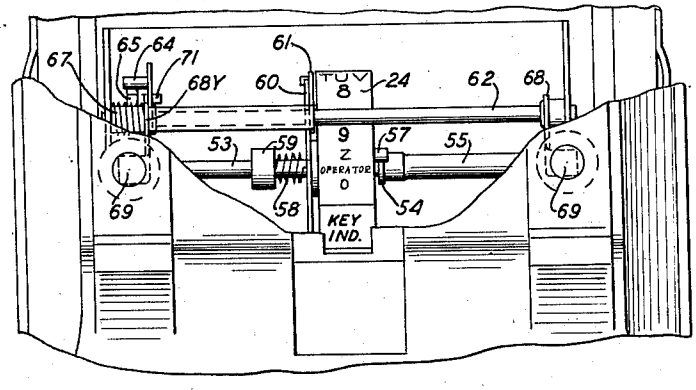


FIG. 8



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Patented Dec. 30, 1947

2,433,398

UNITED STATES PATENT OFFICE

2,433,398

INDICATING KEYBOARD TELEPHONE CALL TRANSMITTER

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Application September 1, 1945, Serial No. 613,980

10 Claims. (Cl. 179—90)

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This invention relates to telephone call transmitters of the key-operated type.

The object of the present invention is the provision of a call transmitter of the type above referred to which will be simple in construction, convenient in use, accurate in operation, and which will indicate the symbol of the depressed key at each stage in the sending of a telephone call designation.

A novel feature in the telephone call transmitter of this invention is the provision of means actuated by the operation of any key in a set of symbol carrying key members for tensioning a motor spring serving to operate a gear sector forming the driving element of a speed multiplier gear mechanism, such gear mechanism actuating a pulsing mechanism and an element of a mechanism controlling the operation of the pulsing mechanism.

Another feature is the provision of means normally positioned in the path of the element in the mechanism for controlling the operation of the pulsing mechanism for preventing the operation of the gear speed multiplier and that of the pulsing mechanism during the tensioning of the motor spring by the movement of the means actuated by the individual operation of the keys, such positioned means being actuated for permitting the operation of such element following the operation of a mechanism serving to lock the depressed key into the operated position preparatory to the operation of the pulsing mechanism.

Another feature is the provision of means movable by the operation of the means actuated by the depressed key for locking the non-operated keys in that position, such locking operation occurring in timed relation with the release of the element in the mechanism controlling the operation of the pulsing mechanism.

Another feature is the provision of a plurality of means each actuated by the operation of its respective key for locking the latter in its operated position, each of such means positioning a pivoted member carried thereby in the path of the element in the pulsing controlling mechanism for actuating such a member and thereby causing the release of the operated key and the closing operation of a shunting contact in circuit with the contact actuated by the pulsing mechanism.

Another feature is the provision of means operated by the movement of the speed multiplier mechanism for indicating the symbol of the key depressed.

Another feature is the provision of a mechanism for holding the indicating means in each indicating position against the tension of a spring serving to return the indicating means to normal position, such return movement being effected upon the operation of said holding mechanism by the operation of each succeeding key member in the writing operation of a telephone call designation.

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Another feature is the provision of means actuated by the placing of the telephone handset into its support to cause the operation of the mechanism holding the indicating means to operated position for releasing the indicating means, as when following a telephone conversation.

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

Fig. 1 is an elevation of the telephone call transmitter of the invention shown in perspective;

Fig. 2 is a right side elevation view shown with a number of parts with portions broken away and the casing partly in vertical longitudinal section taken on line 2—2 of Fig. 6, the operating parts being shown in normal positions;

Fig. 3 is a view similar to that of Fig. 2 but showing one of the keys in the operated position;

Fig. 4 is a view similar to that of Figs. 2 and 3 but showing the pulsing mechanism and the digit indicating wheel in the operated position at the time when the operated key is being released by its respective locking pawl;

Fig. 5 is a top view shown with the casing housing the transmitter mechanism removed and the mechanism in normal position;

Fig. 6 is a rear elevation view shown with the casing in vertical cross-section;

Fig. 7 is a partial view shown in vertical section taken on line 7—7 of Fig. 6, showing the digit indicating wheel and its controlling mechanism in normal positions;

Fig. 8 is a partial top view showing the release mechanism for the digit indicating wheel controlled by the placing of the telephone handset on its support;

Fig. 9 is a partial detail view of the combined step bar gear sector unit actuated by the speed gear multiplier mechanism; and

Fig. 10 is a view of a telephone coin collector embodying the call transmitter of this invention.

In the construction of the call transmitter of

this invention, a base 1 shown in Figs. 2, 3, 4, 5 and 6 is provided for securing as by a number of similar screws SC a mounting plate 2 which is formed at its front end portion with two upright supports 3 serving as bearings for a shaft 4, and on this shaft is mounted for pivotal movement a set of key members K1, K2, K3, K4, K5, K6, K7, K8, K9 and K10 held in spaced relation to each other at their pivoted ends by a notched bar 5 itself pivoted on upright extending lugs 6 formed with the arms 7 of a U-shaped bar H pivoted on shaft 4 and actuated by the movement of any one of the keys K1, K2, K3, etc. The keys K1, K2, K3, etc., are held in normal position as shown in Figs. 1, 2, 5 and 6 by the tension of similar reed-type retractile springs 8 while the U-bar H is held against lugs such as 9 formed with the keys K1, K2, etc., by the tension of a retractile helical spring 10.

One arm 7 of the U-shaped bar H is provided with a stud 11 laterally extending therefrom for securing the outer convolution of a spiral spring 12 best seen in Figs. 2, 5 and 6 having its inner convolution secured to the hub portion 13 of a gear sector 14 pivoted on shaft 4. Gear sector 14 meshes with a pinion 15 mounted on a shaft 17 for rotation as a unit with a gear 16 while the gear 16 meshes with a second gear sector 18 pivoted on shaft 4, the shaft 17 being journaled at one end in an upright support 19 formed with the mounting plate 2 and its opposite end in an upright extending lug 20 formed with a bracket 21 secured to the mounting plate 2 by a number of screws 22.

The gear 16 meshes with a gear 23 and with a pinion 25, the gear 23 actuating a digit indicating wheel 24 in a manner which will be hereinafter described in detail while the pinion 25 is mounted for rotation as a unit with a pulsing cam 26 on a shaft 27 having one of its ends journaled in the upright support 19 and its opposite end in the upright support 28 of bracket 21.

An angle-shaped lever member 29, best seen in Figs. 2, 3 and 4, is pivoted on a support 30 and upright extending lug 28 with one arm disposed in operative relation with the pulsing cam 26 while its other arm carries a roller *ro* disposed in operative relation with the operable spring 32 of a pulsing contact 31, Fig. 6, formed in cooperation with the operable spring 32 and a stationary spring 33 mounted in a pile-up arrangement on a bracket 34 formed with the mounting plate 2.

The operation of contact 31 is effected by the movement of the gear sector 14, pinion gear unit 15—16, pinion 25 under the tension of motor spring 12 but under the control of a centrifugal speed governor SG driven by a worm gear 35 which is mounted for free rotation on shaft 27 through a one-way clutch in the form of a spring 36, coiled on the hub of worm gear 35 and on the hub of pulsing cam 26, the clutch spring 36 being wound in a manner to permit the return of the pulsing cam and its actuating gear mechanism to normal independently of the speed governor CG. The operation of gear 16 is effective to actuate a gear sector 18 pivoted on shaft 4 while a bar 37, best seen in Figs. 5 and 6, is formed at one end with an arm 38 pivoted on shaft 4 and the other end of this bar terminates in the form of a lug portion L secured as by a rivet 39 to the gear sector 18 for arcuate movement as a unit therewith as effected by the tension of the motor spring 12. The release of bar 37 is effected through the engagement of a roller 41 carried by

one of the arms 7 of the U-shaped bar H with the cam portion CP2 of a pawl-shaped member 40 for disengaging the lug 41*x* formed with this pawl-like member from the bar 37 upon the operation of the U-shaped bar H under control of any one of the key members K1, K2, K3, etc.

Each key member K1, K2, K3, etc., carries a roller 43 best seen in Figs. 2, 3, 4 and 7 provided for engaging the camming surface of a respectively associated pawl 42 for moving the latter against the tension of a retractible spring R for locking the depressed key in its operated position which occurs following the locking of the non-operated keys K1, K2, K3, etc., to normal by the pivotal movement of a plate PL on studs ST and ST2 for positioning its top disposed edge in the path of lugs as LS formed at the free end of the keys, such pivotal movement being effected through the engagement of the roller 41 carried by the U-shaped bar H with the cam portion CP formed with the plate PL.

The operation of each pawl 42 in response to the operation of its respectively associated key is effective to position a yoke member Y pivoted thereon wherein the free end portion of arm 44 of this yoke is engaged by its corresponding step as 1*x*, 2*x*, 3*x*, 4*x*, 5*x*, 6*x*, 7*x*, 8*x*, 9*x* and 10*x* shown in Figs. 2, 3, 4, 5, 6 and 9 forming the diagonal or staggered edge of the bar 37 the steps 1*x*, 2*x*, 3*x*, etc., being of a pitch proportional to the spacing of the cam portions or teeth of pulsing cam 26.

The engagement of arm 44 of yoke Y by step bar 37 is effective to impart a pivotal movement to this yoke to cause its opposite arm 45 to engage with a U-shaped bar 46, Figs. 2, 3 and 4, pivoted on shaft 4 to close a contact 47 having its operable spring 48 disposed in engageable relation with an insulated stud 49 carried by one arm of the bar 46. The closing of contact 47 serves to establish a shunt around the telephone line following the sending of a train of pulses corresponding to the key depressed, while the continued movement of yoke Y by the step bar 37 is effective to engage a projection 50 formed with the yoke Y with a stop bar 51 secured to the mounting plate 2 to cause the pivotal movement of its supporting pawl 42 from the position shown in Fig. 3 to the position shown in Fig. 4 for releasing the operated key which is returned to normal by the tension of its own retractile spring 8 while the U-shaped bar H is returned to normal position by its retractile spring 10. In the return movement of U-shaped bar H, this bar engages a lug L1, best seen in Fig. 5, laterally extending from the gear sector 18 for returning the latter and consequently the step bar 37 to normal and through the pinion gear unit 15—16 the gear sector 14 and the impulse cam 26, but the speed governor SG because of the one-way clutch spring 36 is not operated during the return of the impulse cam to normal.

The digit of the key depressed and, therefore, the operation of pulsing cam 26 following the sending of each train of pulses is indicated by a printed dial on the indicating wheel 24 which is mounted for free rotation on a shaft 53 and actuated by an arm 54 keyed to one end of the sleeve 55 mounted for free rotation on shaft 53 as effected by the rotation of gear 23 secured to the opposite end of sleeve 55 and meshing with gear 16 of the gear pinion unit 15—16 above mentioned.

The arm 54 is disposed in engageable relation with a projection 57 extending laterally from the indicating wheel 24 for imparting rotary move-

ment to this wheel corresponding to that of pulsing cam 26 against the tension of a retractile spring 58 best seen in Figs. 5, 6 and 8 having one of its ends secured to a collar member 59 secured to the shaft 53 and its other end secured to a ratchet wheel 60 in turn secured to the indicating wheel 24. A ratchet pawl 61 best seen in Figs. 6, 7 and 8 is mounted for pivotal movement on a shaft 62 with a downwardly extending arm 63, the latter having a stud 64 at its free end portion for engaging with a pawl 65 pivoted to the upright extending arm 66 of pawl 40 to cause the pawl 65 to disengage the retaining pawl 61 from the ratchet wheel 60 so as to permit the latter to return to normal position following the operation of any one of the key members K1, K2, K3, etc., and that of U-shaped bar H which, as above-mentioned, through the roller 41 carried thereby engages the cam portion CP2 of pawl 40. The operation of pawl 40 and, therefore, that of pawl 65 pivoted thereon from the position shown in Fig. 7 to the position shown in Fig. 4, the arm 63 has moved the pawl 61 in disengaged position from the ratchet wheel 60 where it is held a sufficient length of time prior to reaching the position shown in Fig. 4 for permitting the indicating wheel to return to position where the lug 57 carried by this wheel reengages the driving arm 54 followed by the movement of pawl 65 to the opposite side of pin 64 to the position as indicated in Fig. 4, thus causing the retaining pawl 61 to reengage the ratchet wheel 60 by the tension of a retractile spring 67 coiled on shaft 62, the pivotal movement of pawl 65 on arm 66 permitting the return of pawl 40 to normal position following the return of the U-shaped bar H to normal position at the conclusion of each digit sending operation.

On shaft 62 is keyed a pair of arms 68 and 68Y which extend in engageable relation with plunger members 69 guided in similarly sized holes in the casing C1 housing the transmitter mechanisms, the arm 68Y being provided with a projection 71 for actuating the retaining pawl 61 independently of the operation of pawl 40 for permitting the return movement of the indicating wheel 24 to normal upon the placing of the handset 70 in position in its supporting cradle as shown in Fig. 1 for actuating the plungers 69 by gravity.

A typical example of operation is as follows: The operation of key K10, for example, having the marking symbol

Z
operator
O

from the position shown in Figs. 1 and 2 to the position shown in Fig. 3 is effective to impart a pivotal movement to its associated pawl-like member 42 to cause this pawl under the tension of its retractile spring R to engage the roller 43 carried by that key to hold the latter in the operated position where the pawl 42 and the yoke Y are held in the position wherein the free end of arm 44 of yoke Y is positioned for engagement by the step 10x of the step bar 37 upon the operation of the latter in a manner which will be hereinafter described in detail.

The operation of the key 10 also imparts a pivotal movement to the U-shaped bar H for tensioning the motor spring 12 due to the gear sector 14 being prevented from operating by the pawl 40 having its lug portion 41x engaging the lower disposed edge of step bar 37 as best seen in Fig. 7. The operation of U-shaped bar H through the roller 41 is effective to engage the camming portion CP2 of pawl 40 for disengaging the lug 41x of this pawl from step bar 37 for releasing the latter which occurs following the operation of arm 63 of the digit indicating wheel mechanism by the pawl 65 engaging the pin 64 of this arm, thus moving the retaining pawl 61 out of engagement from the ratchet wheel 60, but since the release of this wheel has been effected by the placing of the telephone handset in its cradle from a previous call transmitting operation, the digit indicating wheel 24 remains in normal position with the lug 57 carried thereby abutting with the driving arm 54. It is to be noted that pawl 65 following the operation of pawl 40 for disengaging the lug 41x from the step bar 37 is moved to the opposite side of pin 64 so as to permit the arm 63 to return to normal position to cause the reengagement of pawl 61 with ratchet wheel 60 for retaining the digit indicating wheel in any digit indicating position it may have been moved by the gearing mechanism as controlled by the step bar and the yoke Y in this example position

Z
operator
O

representing the key K10.

The operation of U-shaped bar H due to the engagement of stud 41 with the cam portion CP of pivoted plate PL is effective to move this plate for positioning its top end portion in the path of lug LS of the non-operated keys as shown in Fig. 4 for preventing the operation of these keys during the transmitting of the train of pulses represented by key K10 above-mentioned.

The operation of gear sector 14, the pinion gear unit 15—16, the pinion 25, gear 23 and the gear sector 18 under the tension of motor spring 12 following the release of step bar 37 by pawl 40, as above described, the step 10x of the step bar engages the free end of arm 44 of yoke Y mounted on pawl 42 respective to key K10 to cause a pivotal movement to the yoke Y which is transmitted to the bar 46 by arm 45 of this yoke for closing the shunting contact 47 by the movement of its operable spring 48 immediately following the operation of the pulsing pawl 29 by the tooth T10 of pulsing cam 26 rotated $^{10}/_{12}$ of a turn by the engagement of pinion 25 with the gear 16 under control of speed governor SG. The continued pivotal movement of yoke Y following the closing of shunting contact 47 to the position where the free end of this yoke engages the abutment AB formed by slots in the plate PL as shown in Fig. 6, the lug 50 formed with yoke Y engages the bar 51 and thereby causes the pivotal movement of pawl 42 to the position shown in Fig. 4 for disengaging the roller 43 of key K10 which is then returned to normal by the tension of its retractile spring 8.

The rotation of gear 16 of the pinion gear unit 15—16 for actuating the pulsing cam 26 is effective to rotate the gear 23 and thereby the arm 54 keyed on sleeve 55 for rotating the digit indicator wheel 24 an angular distance corresponding to that of pulsing cam 26 for indicating the number of pulses transmitted and consequently the digit of the key depressed, the digit wheel remaining in its indicating position by the engagement of retaining pawl 61 with the ratchet wheel 60. The return of the operated key K10 and the U-shaped bar H to normal position under the tension of their respectively associated retractile springs 8 and 10, the U-shaped bar H engages the lug L1 carried by gear sector 18 for returning the pulsing cam 26 and

the driving arm 64 for the indicating wheel to normal position, but the indicating wheel remains in the operated

Z
operator
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position while the pawl 65 pivoted at the free end of arm 66 returns from the position shown in Fig. 4 to the position shown in Fig. 7 when the roller 41 carried by the U-bar H frees the camming portion CP2 of pawl 40 while permitting the lug 41x of pawl 40 to move into the path of bar 37 and the transmitter is now ready for the operation of a succeeding key, but if it is supposed that the telephone handset is placed in its cradle following the telephone conversation, the operation of plunger 69 by gravity causes the pivotal movement of shaft 62 and through the lug 71 carried by arm 68Y on shaft 62 imparts a small angular movement to the arm 63 and thereby to pawl 61 for releasing the indicator wheel which, as above-mentioned, is returned to normal by the tension of its retractile spring 67 and the transmitter is now ready for the sending of a successive telephone call designation. In actual practice it has been found that the transmitting of a telephone call designation of seven digits, for example, by the use of a call transmitter of the key or finger wheel operated type, wrong connections were effected because of the failure of the operator not remembering the last digit transmitted among the seven digits and the failure of the call transmitter to give such indications as the transmitting of the call proceeds. The provision of means for giving a visual indication of the last key depressed in the writing operation of a call is one of the novel features of this invention.

What is claimed is:

1. In a call transmitter device, a set of key members, a pulsing mechanism, a digit indicator drive mechanism, a gear speed multiplier mechanism operatively connecting with said pulsing mechanism and said indicator drive mechanism, and a motor spring tensioned by the operation of anyone of said key members for actuating said gear speed multiplier for operating said pulsing mechanism and said indicator drive mechanism.

2. In a call transmitter device, a set of numbered key members, digit indicating means, a pulsing mechanism, a driving mechanism for said indicating means, a gear speed multiplier mechanism operatively connecting with said pulsing mechanism and said drive mechanism, a step bar movable with said gear multiplier mechanism for actuating means set by the movement of the operated key member for controlling the movement of said pulsing mechanism and driving mechanism for indicating the number of the operated key member.

3. In a call transmitter device, a set of numbered key members, a pulsing mechanism, digit indicating means, a gear speed multiplier mechanism operatively connecting with said pulsing mechanism and said digit indicating means, means for returning said gear speed multiplier mechanism, said pulsing mechanism and said digit indicating means to normal following the operation of said pulsing mechanism and the setting of said indicating means for indicating the operation of said pulsing mechanism, means for holding said indicating means to said indicating position, and means actuated by the operation of a succeeding key for actuating said holding means for permitting said indicating means to return to normal.

4. In a call transmitter mechanism a set of digit key members, latching means operatively associated with each of said key members for locking said keys individually into operated position, a pivoted bar actuated by the operation of any one of said key members, a gear sector, a motor spring tensioned by the operation of said bar for actuating said gear sector, a movable step bar, a gear speed multiplier mechanism actuated by said gear sector for actuating said step bar, means pivoted on each of said latching means for operation by the movement of said step bar following the locking of the operated key for controlling the operation of said speed multiplier gear mechanism, and means actuated by said speed multiplier gear mechanism for indicating the digit of the operated key member.

5. In a call transmitter device, a set of digit key members, latching means operatively associated with each of said key members, a bar actuated by the operation of any one of said key members, a gear sector, a motor spring tensioned by the operation of said bar for actuating said gear sector, a gear speed multiplier mechanism actuated by said gear sector, said mechanism comprising a pinion meshing with said gear sector, a gear movable as a unit with said pinion, a second gear sector meshing with said gear in said unit, a bar having staggered steps along one edge thereof, means engaging said bar for preventing its operation during the tensioning of said motor spring, a pulsing contact, a pulsing cam, a pinion engaging the gear of said unit for rotating said pulsing cam for actuating said contact, means carried by each of said latching means positioned for engaging with its respective step upon the operation of the means engaging said bar for controlling the operation of said gear speed multiplier mechanism, and a plate actuated by the last-mentioned means for locking the non-operated keys in that position during the operation of said gear speed multiplier mechanism.

6. In a call transmitter device, a set of digit key members, a bar actuated by the operation of anyone of said key members, a gearing mechanism, a motor spring tensioned by the movement of said bar for actuating said gearing mechanism, means individually associated with said key members for locking the depressed key into the operated position, a pulsing mechanism actuated by said gear mechanism, a normally open shunting contact for said pulsing mechanism, a step bar actuated by said gearing mechanism and a pivoted yoke shaped member carried by each of said locking means positioned by the operation of the latter by its respective key member for engagement with said step bar for closing said shunting contact for controlling the number of pulses transmitted by said pulsing mechanism.

7. In a call transmitter device, a set of digit key members, a bar operated by the movement of anyone of said key members, a gear sector, a motor spring tensioned by the movement of said bar for actuating said sector, another gear sector, a pinion and gear unit operatively connecting said gear sectors, a bar having staggered steps at one edge thereof secured to the last-mentioned gear sector for movement therewith, a plurality of pivoted latching elements one for each of said key members for individually locking said keys in the depressed position, a yoke shaped member pivoted on each of said elements and set in en-

gageable relation with its respective step at the edge of said bar to cause the movement of its latching element for disengaging the depressed key, a pulsing mechanism actuated by the gear of said unit, a shunting contact operated by the yoke carried by the locking element associated with the operated key member for controlling the operation of said pulsing mechanism, and means operable by the movement of the first-mentioned bar for locking the non-operated keys in that position during the operation of said pulsing mechanism.

8. In a call transmitter device, a set of digit key members, a U-shaped bar actuated by the operation of any one of said key members, a gear sector, a motor spring tensioned by the operation of said U-shaped bar for actuating said gear sector, another gear sector, a gear speed multiplier mechanism for actuating the last-mentioned gear sector, a pulsing mechanism, and an indicator wheel actuated by said gear mechanism, means operable with the last-mentioned gear sector for actuating means positioned by the operation of the depressed key member to cause the release of the depressed key, means for returning said key to normal position, means for returning said U-shaped bar to normal position simultaneously with the return of the operated key and means for holding said indicator wheel to the operated position during the return movement of said gear multiplier mechanism.

9. In a call transmitter device, a set of digit key members, a U-shaped bar actuated by the operation of any one of said key members, a motor spring, a gear speed multiplier mechanism comprising a pair of gear sectors, a pinion gear unit meshing with said gear sectors, a pulsing cam having a pinion engaging the gear of said unit, an indicator wheel, a drive for said wheel having a gear meshing with the gear of said unit and an arm engaging means carried by said wheel, a bar having staggered steps at one of its edges and secured to one of said sectors for movement therewith, means positioned by the operation of any one of said key members for operation by the movement of said bar to cause the return of said gear multiplier mechanism, said pulsing cam and said indicator drive to normal, means for holding said indicating wheel to operated position during the return of said drive to normal for indicating the digit of the key depressed and means actuated by a succeeding key to cause the return of said indicator wheel prior to the operation of said gear multiplier mechanism in response to the operation of said succeeding key.

10. In a call transmitter device, a set of key members disposed in two parallel rows, a gear mechanism, a pulsing mechanism and an indicator mechanism actuated by said gear mechanism, said indicator mechanism comprising a shaft, a sleeve mounted for free rotation on said shaft, a gear keyed on said sleeve meshing with said gear mechanism, an arm keyed to the opposite end of said sleeve, an indicating wheel mounted for free rotation on said shaft having means for engagement with said arm, a ratchet wheel secured to said indicating wheel, another shaft, a pawl pivoted on the last-mentioned shaft for engaging said ratchet wheel to hold the latter in its indicating position, means actuated by the movement of the operated key member for actuating said pawl for releasing said wheel, spring means for returning said wheel to normal wherein the means carried by said wheel engages said arm following the operation of said pawl, and a casing for housing said mechanisms, said casing having a window opening disposed in alignment with the middle disposed keys in said rows through which the numbers on said indicating wheel appear following each setting operation thereof.

CHARLES D. RICHARD.

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