Feb. 12, 1946. R. F. MALLINA 2,394,926

KEY OPERATED TELEPHONE CALL TRANSMITTER

Filed Nov. 16, 1944 4 Sheets-Sheet 1

FIG. 1

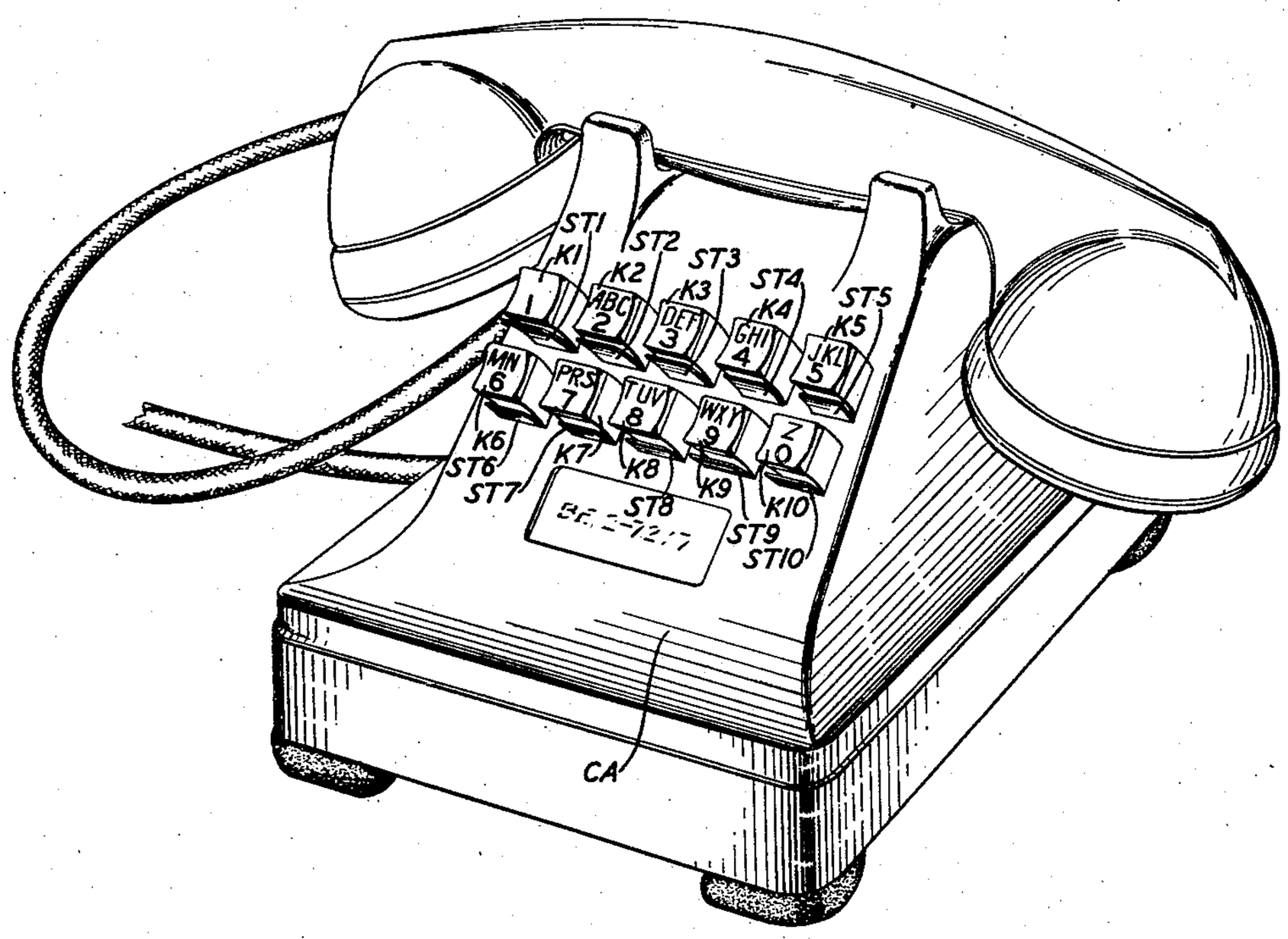
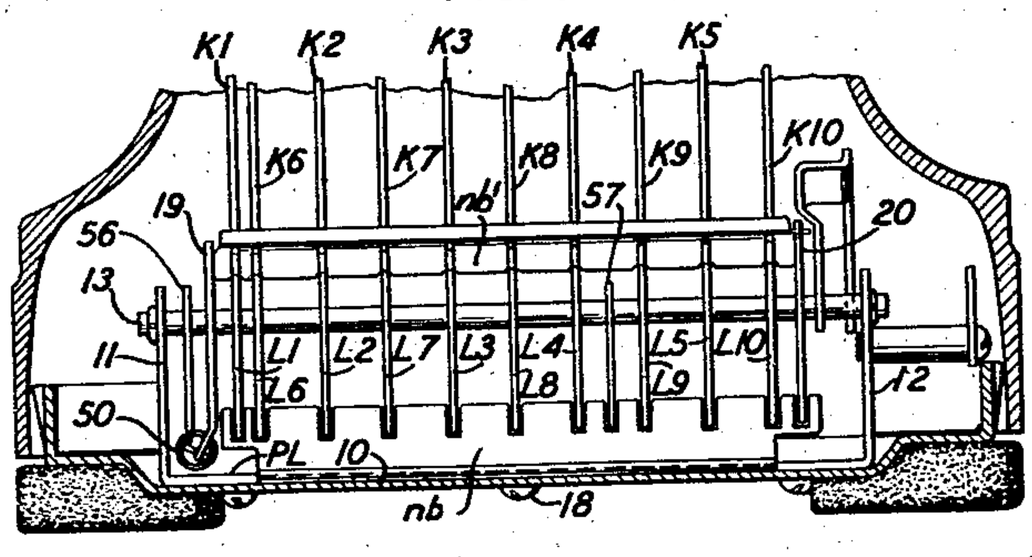


FIG. 1



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Filed Nov. 16, 1944 4 Sheets-Sheet 2

FIG. 2

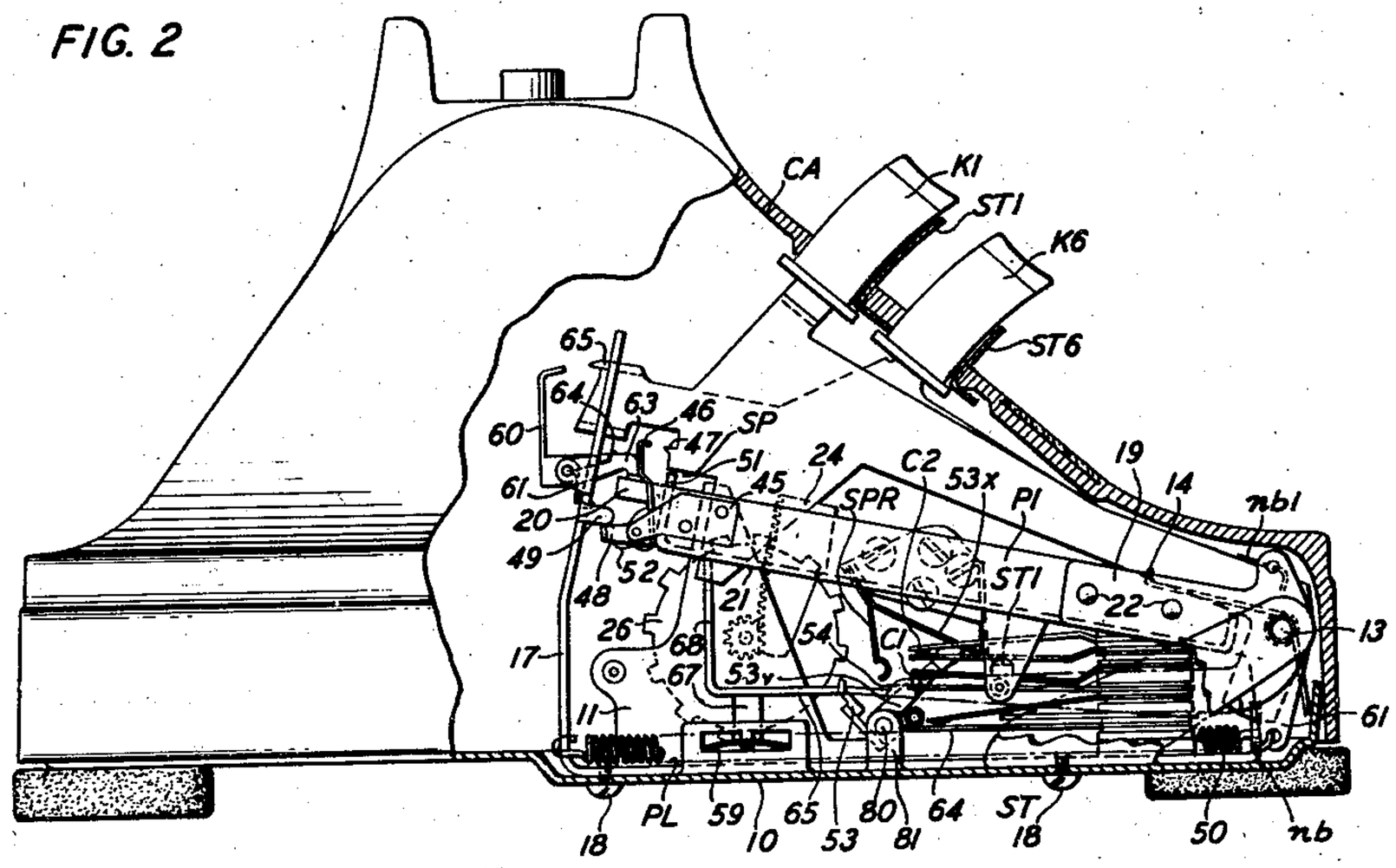
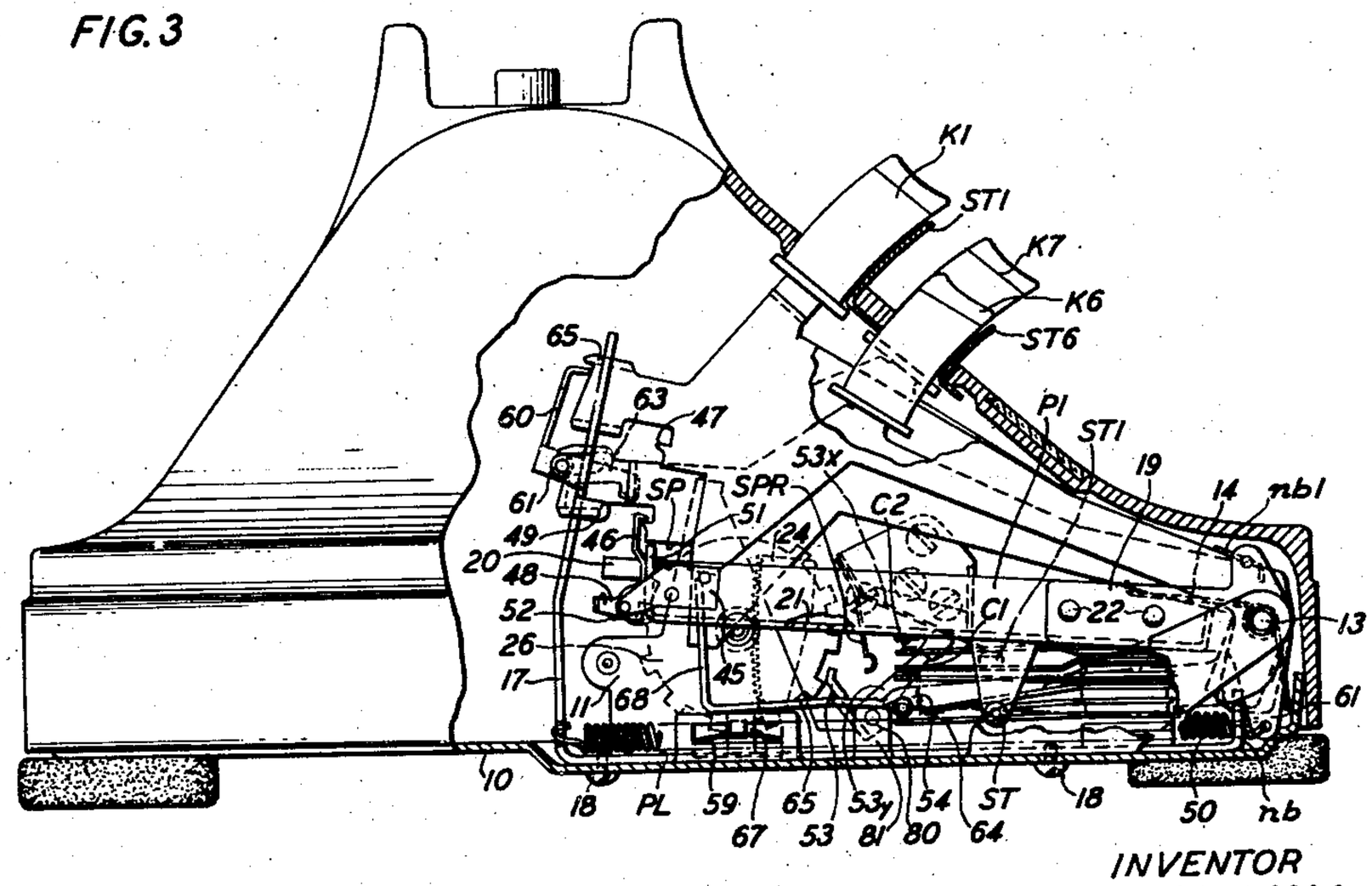


FIG. 3



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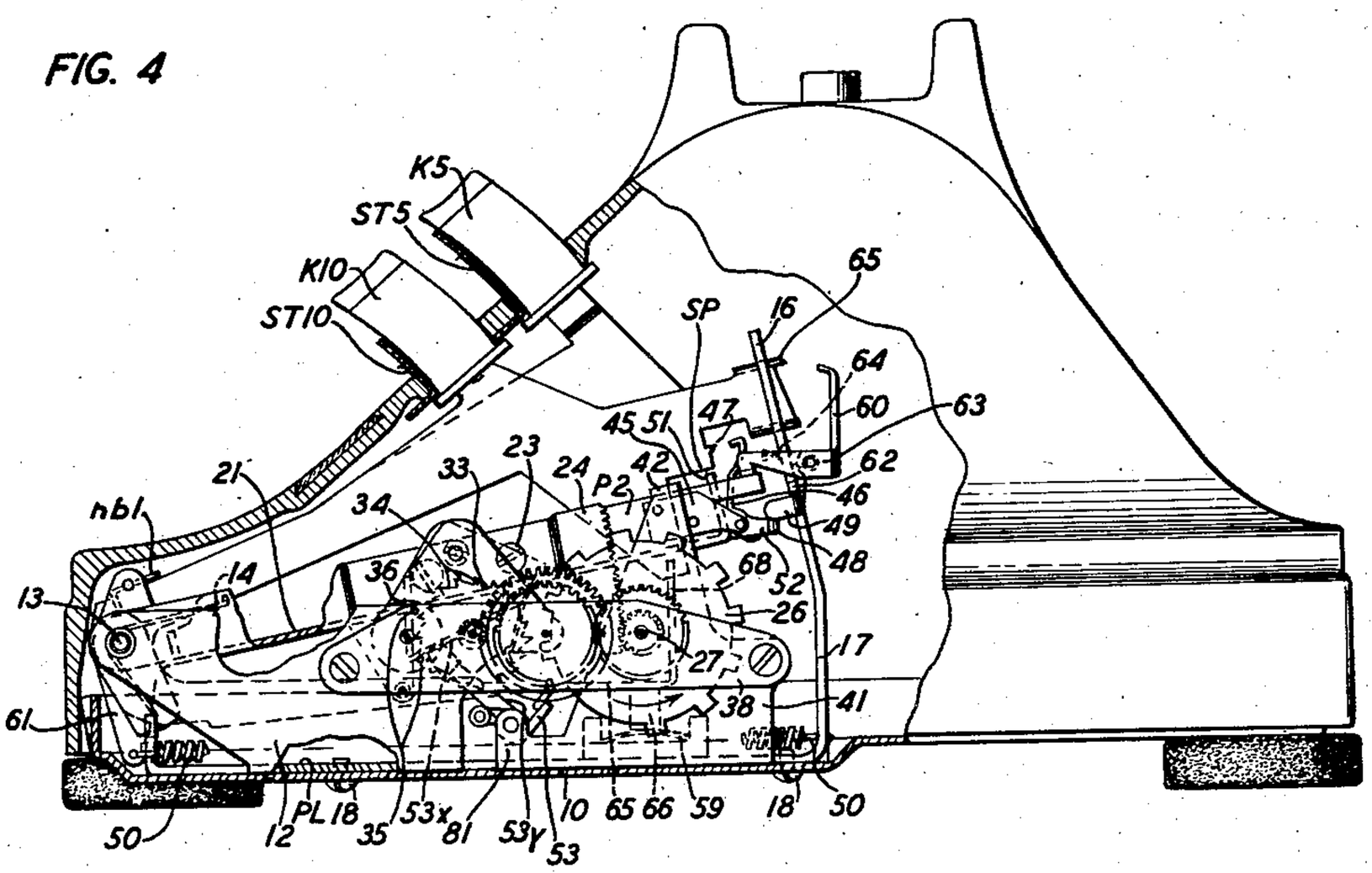
Filed Nov. 16, 1944 4 Sheets-Sheet 3

FIG. 4



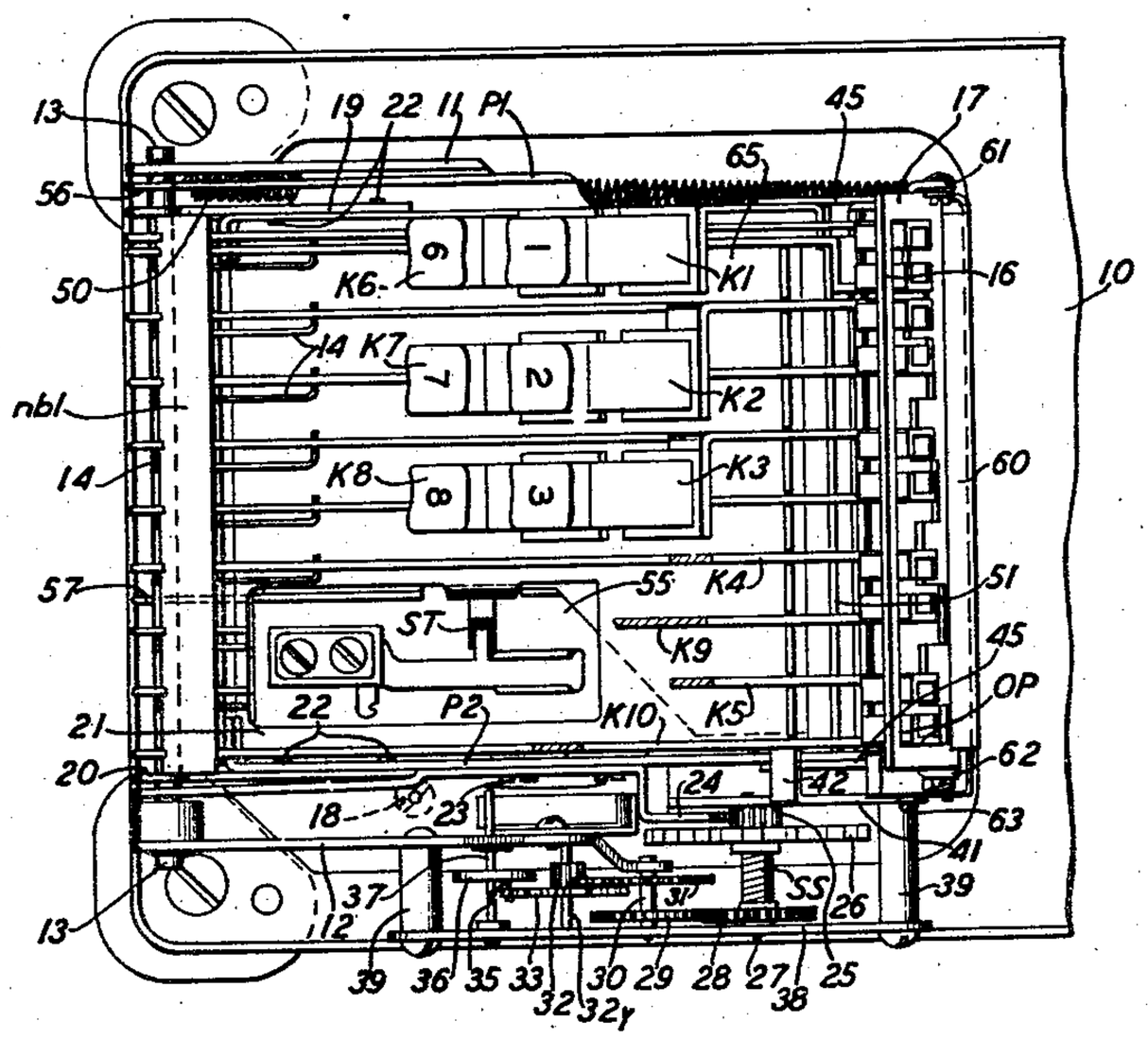


FIG. 5

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KEY OPERATED TELEPHONE CALL TRANSMITTER

Filed Nov. 16, 1944 4 Sheets-Sheet 4

FIG. 6

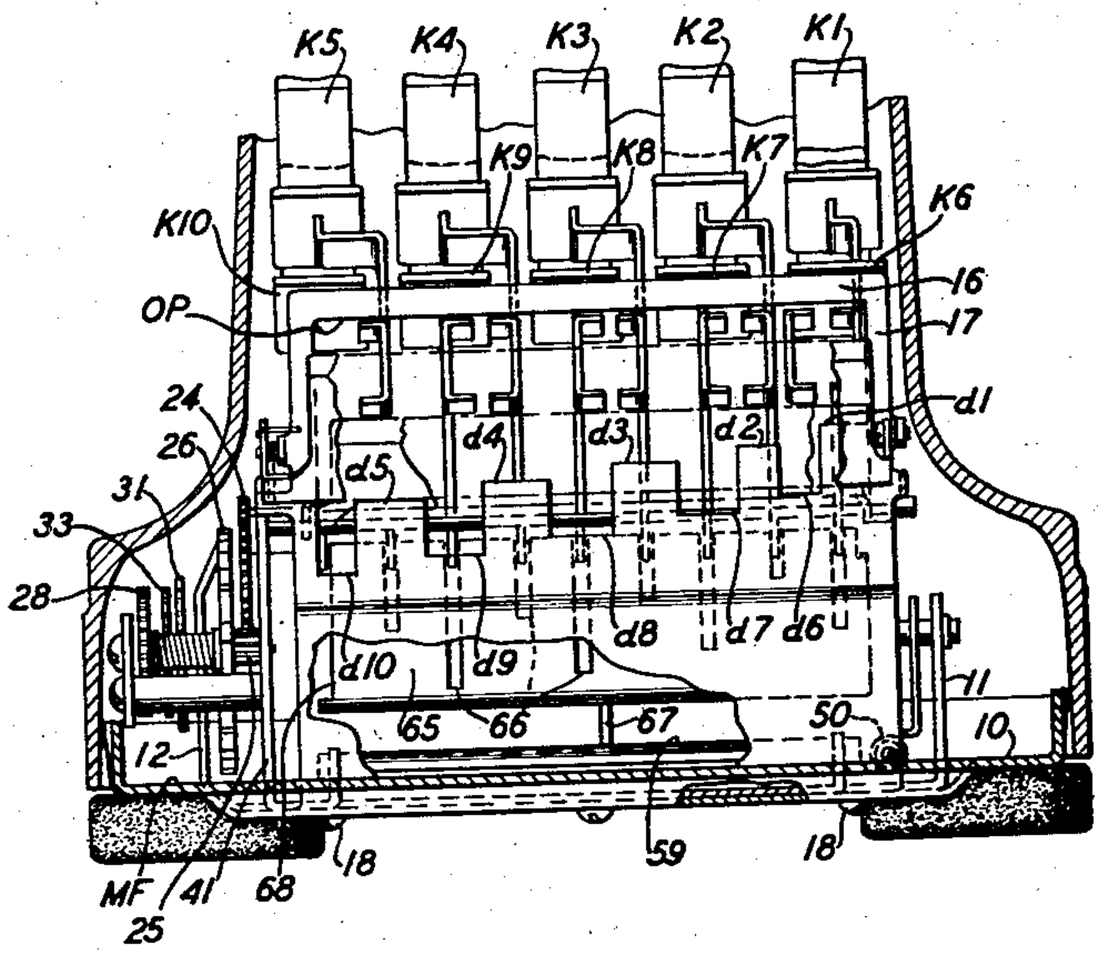
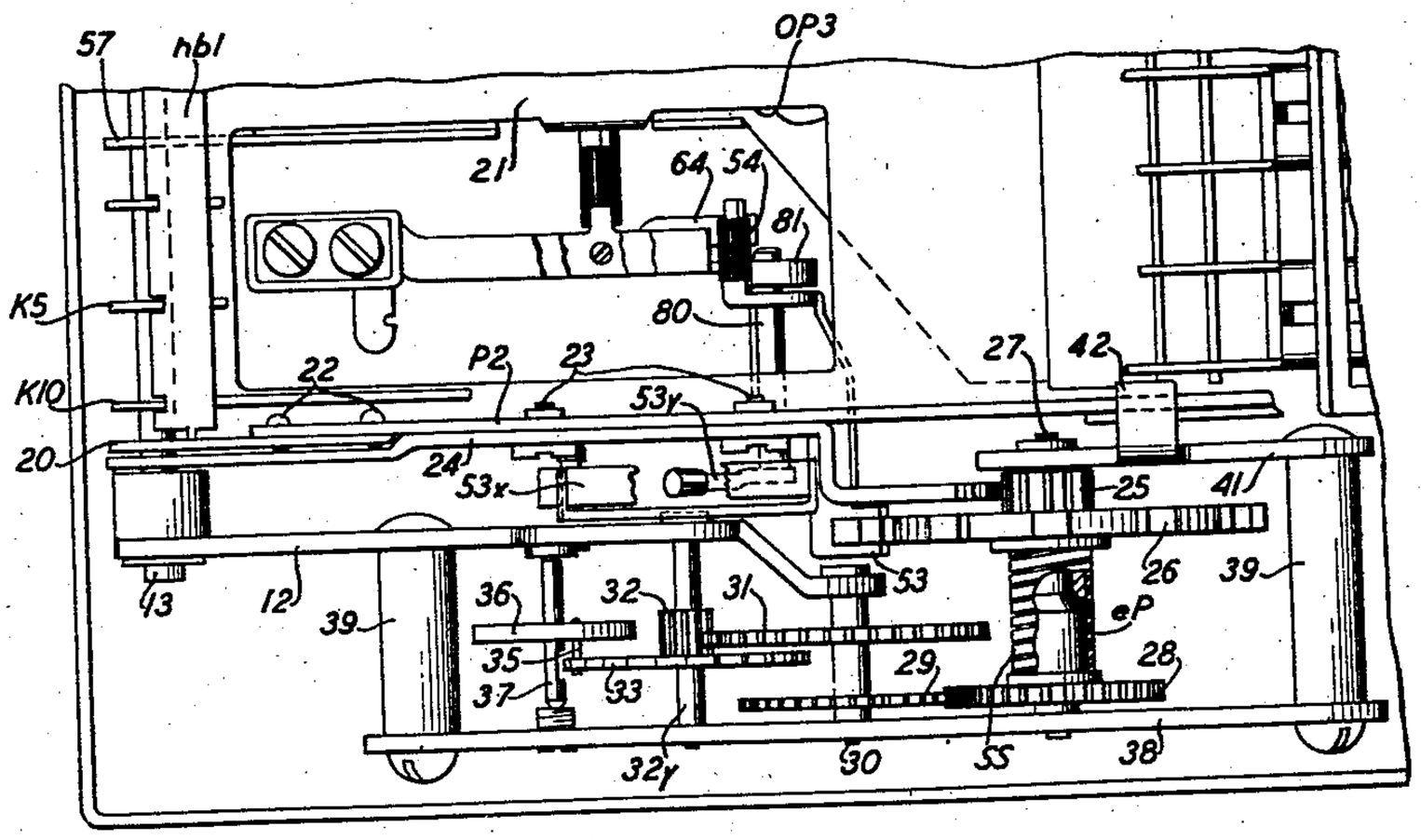


FIG. 8



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Patented Feb. 12, 1946 2,394,926

UNITED STATES PATENT OFFICE

2,394,926

KEY OPERATED TELEPHONE CALL TRANSMITTER

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Application November 16, 1944, Serial No. 563,673

5 Claims. (Cl. 179—90)

This invention relates to telephone call transmitter devices of the key operated type.

The object of this invention is to provide a call transmitter of the type above referred to which will be simple in construction, cheap to manufacture and convenient in operation.

In accordance with this invention a call transmitter is provided in which the non-uniform operation of digit numbered key members against the tension of respective retractile springs is effective to impart different angular movements to a common pivoted plate as determined by the engagement of the key members with respective stops formed in a second plate secured to and extending perpendicularly from a base mounting the transmitter mechanism.

Means pivoted on the stop plate and movable under control of the pivoted plate as effected by the operation of any one of the keys serves to lock the other keys in the non-operated position while means carried by the common pivoted plate cooperates with means carried by each of the keys for locking the depressed key to the pivoted plate for actuating a pulsing mechanism by the combined tension of a motor spring acting on the pivoted plate and the tension of the retractile spring for the depressed key both under control of a speed governor mechanism.

A plurality of means in the form of finger stops carried by the casing for the transmitter mechanism serve to assist the operator in the depression of the keys to distances corresponding to the value of the digits of these keys in addition to their respective stops in the stop plate so as to decrease the liability of transmitting wrong trains of pulses and the consequent establishing of wrong telephone connections.

Other novel features and advantages of the 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 view shown in perspective, the keys being shown in the non-operated position;

Fig. 2 is a left side elevation view shown with the base and the casing for housing the transmitter mechanism partly in vertical longitudinal section;

Fig. 3 is a view similar to Fig. 2 but showing one of the keys and the pulsing mechanism in the operated position as effected by the manual operation of that key;

Fig. 4 is a right side elevation view shown with the base and the casing partly in vertical longitudinal section, the keys being shown in the non-operated position;

Fig. 5 is a plan view shown with a number of keys in horizontal section and the base with portions broken away;

Fig. 6 is a rear elevation view shown with the base and the casing in transverse vertical section;

Fig. 7 is a partial front view showing notched bars used for holding the key members in spaced relation to each other on their supporting shaft; and

Fig. 8 is a partial plan view, enlarged, of the pulsing and governor mechanism.

In the call transmitter of this invention, a base 10 is provided for securing as by a number of screws 18 a plate PL formed with upright extending bearing portions 11 and 12 serving for supporting the ends of a shaft 13 and on this shaft is pivoted a set of key members K1, K2, K3, K4, K5, K6, K7, K8, K9 and K10 formed with projections at their free ends extending, as shown in Figs. 2, 3, 4 and 5, into an opening OP in an upright extending portion 17 of plate PL and normally held against the stop bar 16 thus formed at the top end of this plate by the tension of respective retractile springs 14 best seen in Figs. 2, 3 and 5, while stops as $d1$, $d2$, $d3$, $d4$, $d5$, $d6$, $d7$, $d8$, $d9$ and $d10$ formed in the opening OP of plate PL as shown in Fig. 6 to serve for limiting the movement of the keys K1, K2, K3, etc., to angular distances corresponding to the digit values of the key numbers K1, K2, K3, etc., in addition to the finger stops ST1, ST2, ST3, ST4, ST5, ST6, ST7, ST8, ST9 and ST10 secured in any convenient manner to a casing CA serving in cooperation with the base 10 to form a housing for the call transmitter mechanism.

On shaft 13 is pivotally mounted a pair of arms 19 and 20 to which are secured as by a plurality of rivets 22 the ridge or flange portions P1 and P2 of a plate 21, and to the ridge portion P1 of plate 21 as shown in Figs. 4, 5 and 8 is secured by screws 23 a gear sector 24 for movement with the plate 21, this plate being limited in its upward or non-operated position by a lug 42 best seen in Figs. 5, 6 and 8 extending laterally from an upward extending portion 41 formed with the plate PL.

The gear sector 24 engages with a pinion 25 on the hub of which is secured a pulsing cam 26. The hub of pinion 25 is mounted for free rotation on a shaft 27 and on one end of this shaft is keyed a gear 28 operatively connected to pinion 25 by a one-way effective clutch in the form of

a ribbon-shaped spring SS coiled on the hub of pinion 25 and on the enlarged portion EP of shaft 27 as shown in Figs. 5, 6 and 8. The gear 28 engages with a gear 29 mounted on a shaft 30 for movement as a unit with a gear 31, this gear in turn engages with a pinion 32 formed on a shaft 32Y to which is secured an escapement wheel 33, the teeth of which, are engaged by a pair of pins 35 laterally extending from a so-called balance wheel 36 keyed on a shaft 37.

Shafts 27, 30, 32Y and 37 are supported at one of their ends by a plate 38 supported by a pair of spacer members 39 extending laterally from the upright portions 12 and 41 of the mounting plate PL, the upright portion 41 serving to support the opposite end of shaft 27, while the upright portion 12 supports the opposite ends of shafts 37, 32Y and 30.

To the free end portions of ridges P1 and P2 of pivoted plate 21 are secured as by riveting a pair of similarly shaped arms 45 shown in Figs. 2, 3, 4 and 5, serving for pivotally mounting a spring pressed pawl-shaped bar 46 disposed for engagement with the ratchet tooth 47 of the depressed key in a manner and for a purpose which will be hereinafter described in detail.

The pawl bar 46 is normally held out of engagement from the teeth 47 of keys K1, K2, K3, etc., by the engagement of an arm 48 carried by this pawl bar with a lug 49 formed with the upright projection 17 of the mounting plate PL, this plate and the gear sector 24 carried thereby together with the pawl bar 46 pivoted on the arms P1 and P2 of the plate being normally held in non-operated position as shown in Figs. 2 and 4 by a motor spring 50 having one end as shown in Figs. 2, 3, 4 and 5 hooked to the lower end of the upright extending portion 17 and its opposite end to a downwardly extending arm 61 formed integrally with the arm 19 secured to ridge P2 of plate 21. The key members K1, K2, K3, etc., are provided with downwardly extending lug elements L1, L2, L3, L4, L5, L6, L7, L8, L9 and L10, best seen in Fig. 7 engaging respective notches in an upturned edge *nb* of plate PL for holding these keys in spaced relation to each other on the shaft 13 in addition to the engagement of these keys in the notches of an angle bar *nb1* best seen in Figs. 2, 5, 7 and 8 pivoted on lugs formed with the arms 19 and 20 to which the plate 21 is secured for pivotal movement on the shaft 13.

According to this construction the operation of any one of the key members K1, K2, K3, etc., is effective to actuate the pivoted plate 21 through the engagement of a shoulder portion SP formed with each of the keys as shown in Figs. 2, 3 and 4 with the upper disposed edge of an upturn portion 51 formed at the front end of the pivoted plate 21, the pivotal movement of plate 21 in turn causing the pivotal movement of the pawl bar 46 under the tension of its retractile spring 52 for engaging the tooth 47 of the operated key and thereby locking the latter to the plate 21.

The operation of plate 21 and gear sector 24 carried thereby is effective to tension the motor spring 50 and to rotate the pulsing cam 26 which in turn actuates a pivoted pawl-like member 53 and an insulating stud 54 carried thereby in a direction away from the operable spring 64 of a pulsing contact shown in Figs. 2, 3 and 8 and, therefore, ineffective to open such a contact while the one-way clutch spring SS is ineffective to actuate the gear drive for the escapement wheel 33.

The pawl-like member 53 is mounted on a shaft 80 journaled in bearing portions 81 formed with the mounting plate PL and 8 projecting as shown in Figs. 2, 3 and 8 through an opening OP3 in the pivoted plate 21 while an arm 53Y carried by pawl 53 frictionally engages a tangentially disposed ribbon-shaped spring member 53X for yieldably holding this pawl in operative relation with the pulsing cam 26 in its movement either toward or away from the pulsing contact depending upon the direction of rotation of cam 26, the pawl 53 being limited in its movement away from the pulsing cam 26 by a spring SPR engaged by the arm 53Y of pawl 53.

A second plate 65, best seen in Figs. 2 and 3 pivoted on shaft 13 is formed at its free end with a vertically extending portion 68 extending transverse of the key members K1, K2, K3, etc., and having grooves as 66, see Fig. 6, of different depth engaged by their respective keys for operation by the movement of any one of these keys but a small distance from the full operated position of the latter for engaging a lug 67 carried by the plate 65 with a so-called breakdown spring 59 of concavo-convex cross-section, the function of which being to offer a maximum resistance to the key being depressed which resistance diminishes rapidly so as to induce the full movement of the operated key by an operator and therefore the full movement of the gear sector 24 under control of that key.

A second pawl bar 60, as shown in Figs. 2, 3, 4 and 5, is pivoted on lugs 61 and 62 formed with the upright extending portion 17 of the mounting plate PL. This pawl bar is formed with an arm 63 held in operative relation with a lug 20 extending from the plate 21 under the tension of a retractile spring 64, the function of pawl bar 60 being to move from the position shown in Figs. 2 and 4 to the position shown in Fig. 3 in engageable relation with the ratchet teeth 65 formed at the free end of the keys K1, K2, K3, etc., following the operation of any one of these keys for locking the non-operated keys in that position during the operation of the pulsing mechanism as will be hereinafter described in detail.

In a typical operation of the call transmitter of this invention the operation of any one of the key members, as key K6 for example, from the position shown in Fig. 2 to the position shown in Fig. 3 against its respective stop *d6*, is effective to impart a corresponding angular movement to the pivoted plate 21 through the engagement of this key with the edge of the upturned ridge or bar 51 formed with this plate. The movement of key K6 prior to reaching its stop *d6* formed in the upright extension 17 of mounting plate PL engages the upright portion 68 of pivoted plate 65 in its respective groove 66 for actuating this plate and thereby causing the lug 67 carried thereby to flex the spring 59, the function of which, as above described, is to induce the movement of the operated key to full depressed position. The pivotal downward movement of plate 21 and the pawl bar 46 pivoted thereon causes the movement of this pawl bar from the position shown in Fig. 2 to the position shown in Fig. 3 due to the disengagement of its arm 48 from lug 49 of upright extension 17, thus locking the operated key K6 as in this example to the plate 21 and to the gear sector 24 secured to this plate.

The operation of pivoted plate 21 as effected by the operation of the depressed key is effective to tension the motor spring 50 and to cause the pawl bar 60 to move under the tension of its retractile spring 64 from the position shown in

Fig. 2 to the position shown in Fig. 3 due to the movement of arm 20 carried by plate 21 away from the arm 63 of the pawl bar, thus locking the non-operated keys in that position. The rotation of pulsing cam 26 by the downward movement of gear sector 24 actuates the pawl-like member 53 and the insulating stud 54 carried thereby in a direction ineffective to open the pulsing contact 64 while the movement of plate 21 through insulating studs ST and ST1 causes the operation of the off-normal contacts C1 and C2 to perform switching operations well known in the automatic telephone art but which forms no part of the present invention.

The return of the operated key and that of the pivoted plate 21 locked to that key and therefore the return movement of gear sector 24 and pulsing cam 36 is effected by the tension of motor spring 50 and that of the retractile spring of the depressed key under control of the escapement wheel 33 and balance wheel 36 now operatively connected to pinion 25 by the spring clutch SS, the reverse rotary movement of cam 26 being effective to actuate the pawl-like member 53 in a direction for engaging the spring 64 and thereby opening this contact a number of times corresponding to the digit number printed on the operated key, that is, six pulses when the plate 21 and gear sector 24 carried thereby engages the stop lug 42 formed with upright portion 41.

Upon the return of the pivoted plate 21 to normal position, the arm 48 of pawl bar 46 reengages the lug 49 carried by upright 17 for unlocking the key K6 from the plate 21 while the arm 20 of plate 21 engages the arm 63 of pawl bar 60 for returning it to the position shown in Fig. 2 a small angular distance prior to the stopping of the movement of plate 21 by the stop 42, and the transmitter is now ready for the operation of a succeeding key.

What is claimed is:

1. In a call transmitter, a set of digit numbered key members, a plate actuated by each of said key members, means operable upon the movement of said plate for locking the latter to the operated key, a motor spring tensioned by the movement of said plate, a pulsing mechanism actuated upon the return movement of said plate and the depressed key to normal, and a governor mechanism for controlling the return movement of said plate and said key.

2. In a call transmitter, a set of manually operable digit numbered key members, stop elements for limiting the movement of said key members to distances proportional to the digit value of each of said key members, a pair of plates actuated by each of said key members, means common to each of said key members operable for locking one of said plates to the operated key member upon movement of the latter from normal, a spring flexed by the operation of the other of said plates for inducing the manual movement of the operated key to full operated position, a gear sector carried by the first-mentioned plate, a motor spring tensioned by the movement of said plate for returning the latter to normal position, a pulsing mechanism actuated by said gear sector toward said normal position, and an escapement mechanism geared to said sector for controlling the speed of said pulsing mechanism.

3. In a call transmitter, a set of digit key members, a pulsing mechanism, stop elements for limiting the movement of said key members, a pivoted plate actuated by each of said key members, a gear sector carried by said plate for actuating said pulsing mechanism, and means operable upon the movement of said plate for preventing the operation of the other of said key members.

4. In a call transmitter, a mounting plate having bearing portions, a shaft journaled in said bearing portions, a set of digit numbered key members pivotally mounted on said shaft, said plate having an upright extending bent portion disposed transverse of said key members, means in said plate for defining the normal non-operated position of said key members, retractile springs for yieldably holding said key members in said position, other means for limiting the movement of said key members to distances corresponding to the digit values represented by said key members, a pulsing mechanism, and means actuated by said key members for actuating said pulsing mechanism for transmitting series of pulses proportional to the digit value of said key members.

5. In a call transmitter, a mounting plate, support elements carried by said mounting plate, a shaft journaled in said support elements, a set of key members pivoted on said shaft, a ridge formed with said plate having means for holding said key members in spaced relation to each other on said shaft, a plate pivoted on said shaft having bearing portions, a bar pivoted on said bearing portions transverse of said key members and adjacent said shaft, means carried by said bar for holding said keys in spaced relation to each other at points opposite said ridge, stop means for controlling the movement of said key members to distances for variably operating said pivoted plate, a gear sector carried by the last-mentioned plate for actuating said pulsing mechanism upon the operation of any one of said key members and a speed governor for controlling the operation of said pulsing mechanism.

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