Jan. 29, 1946. R. F. MALLINA 2,393,790

SIGNALING DEVICE

Filed June 24, 1942 4 Sheets-Sheet 1

FIG. 1

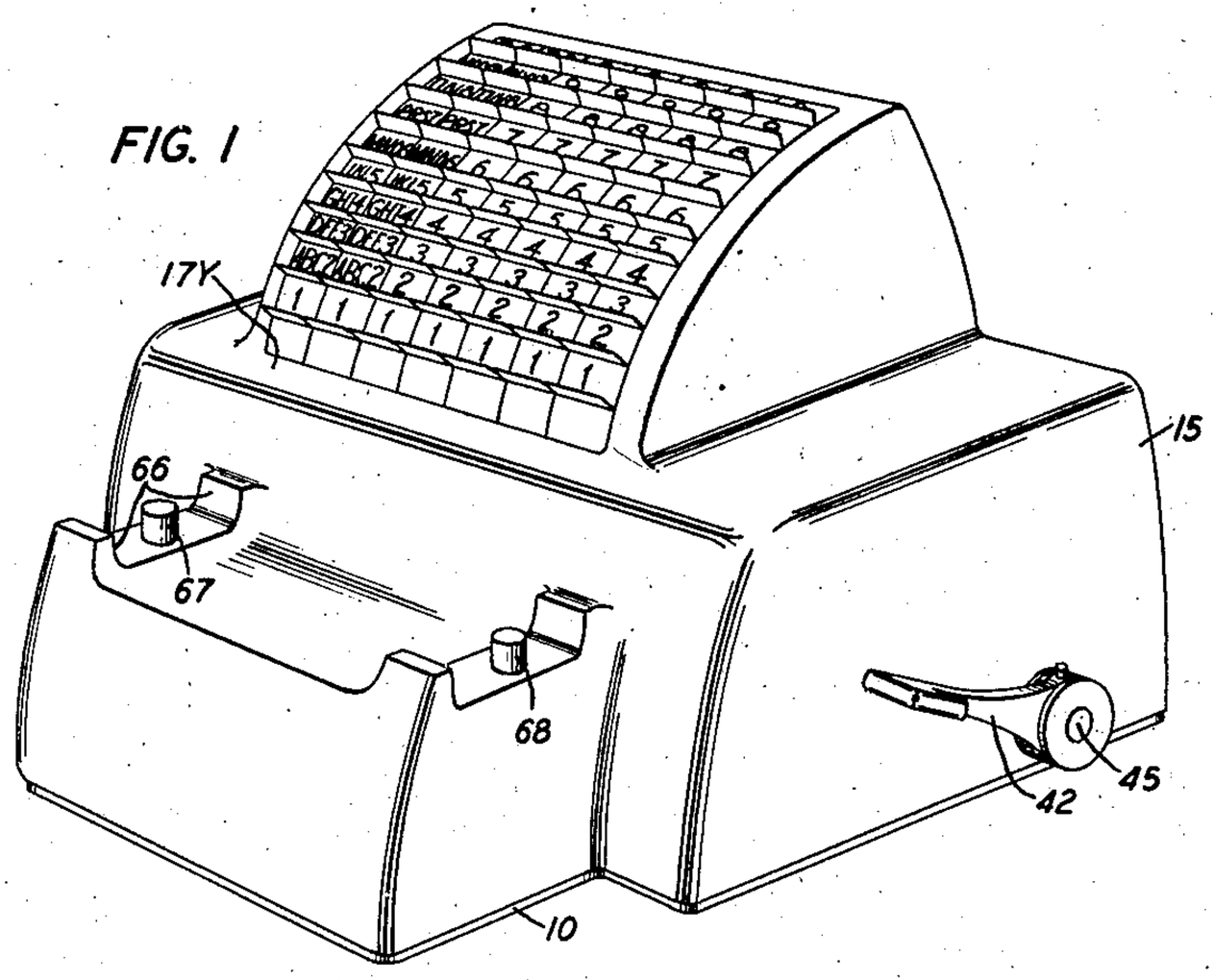

FIG. 2

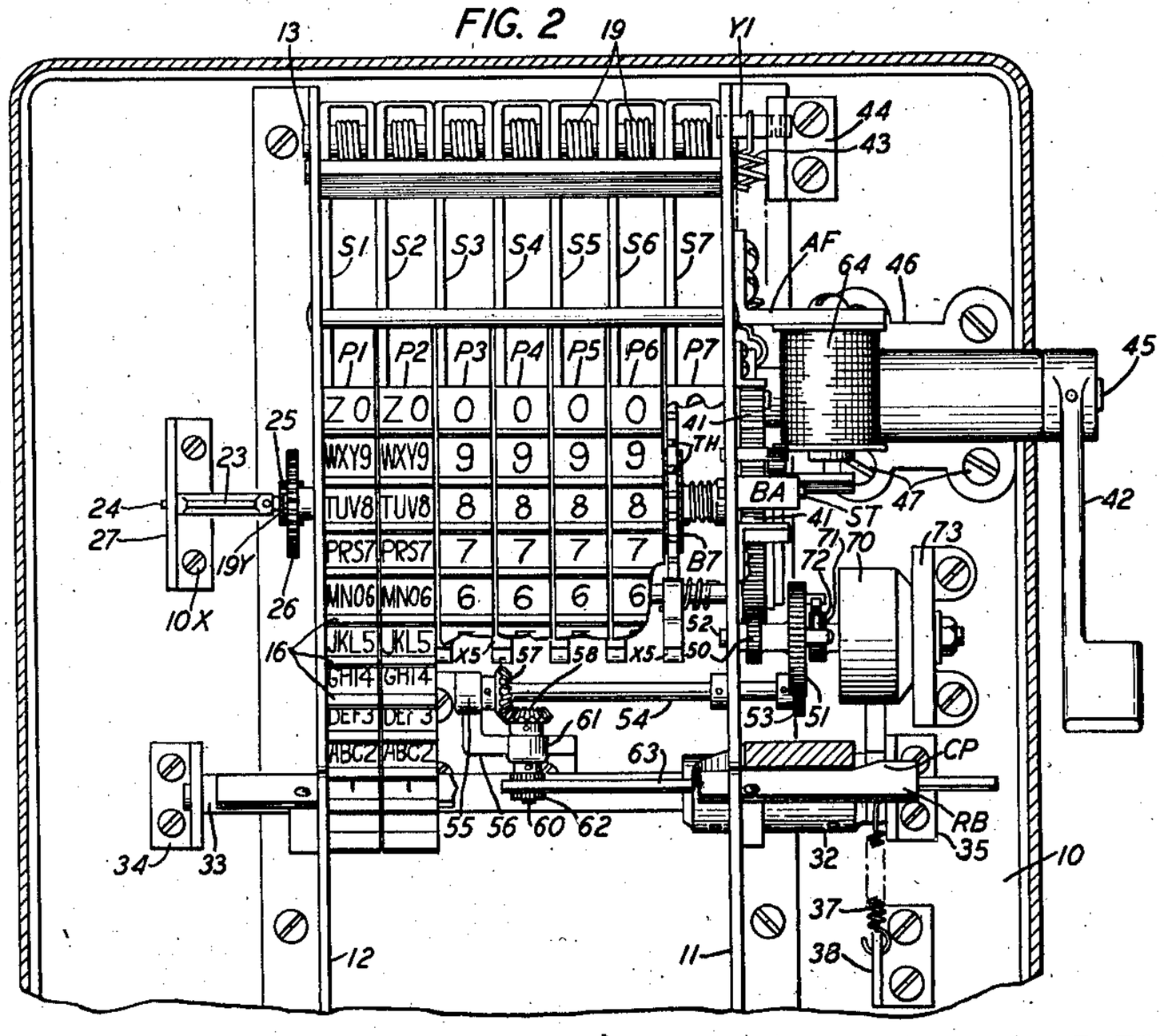

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FIG. 3

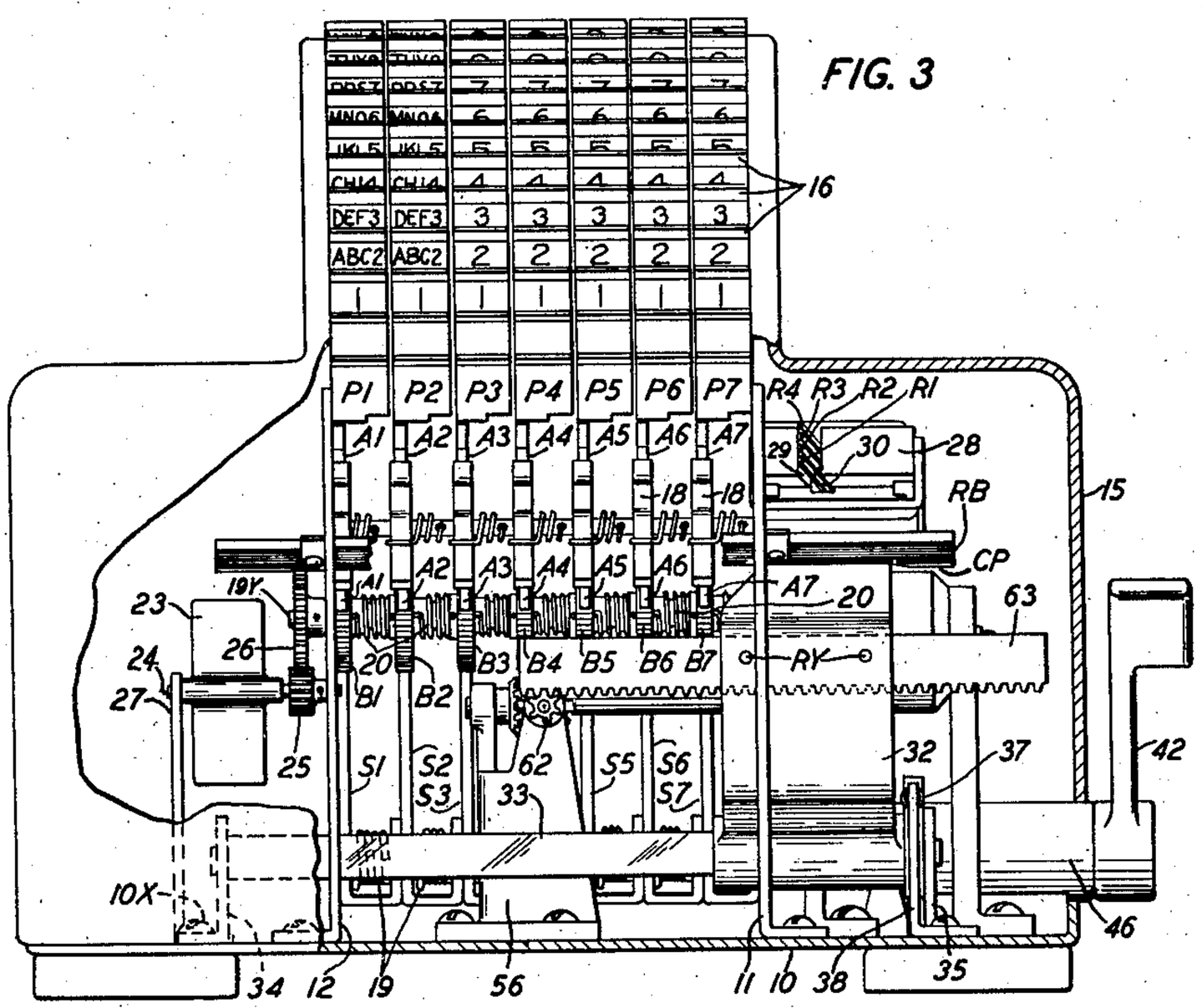

FIG. 4

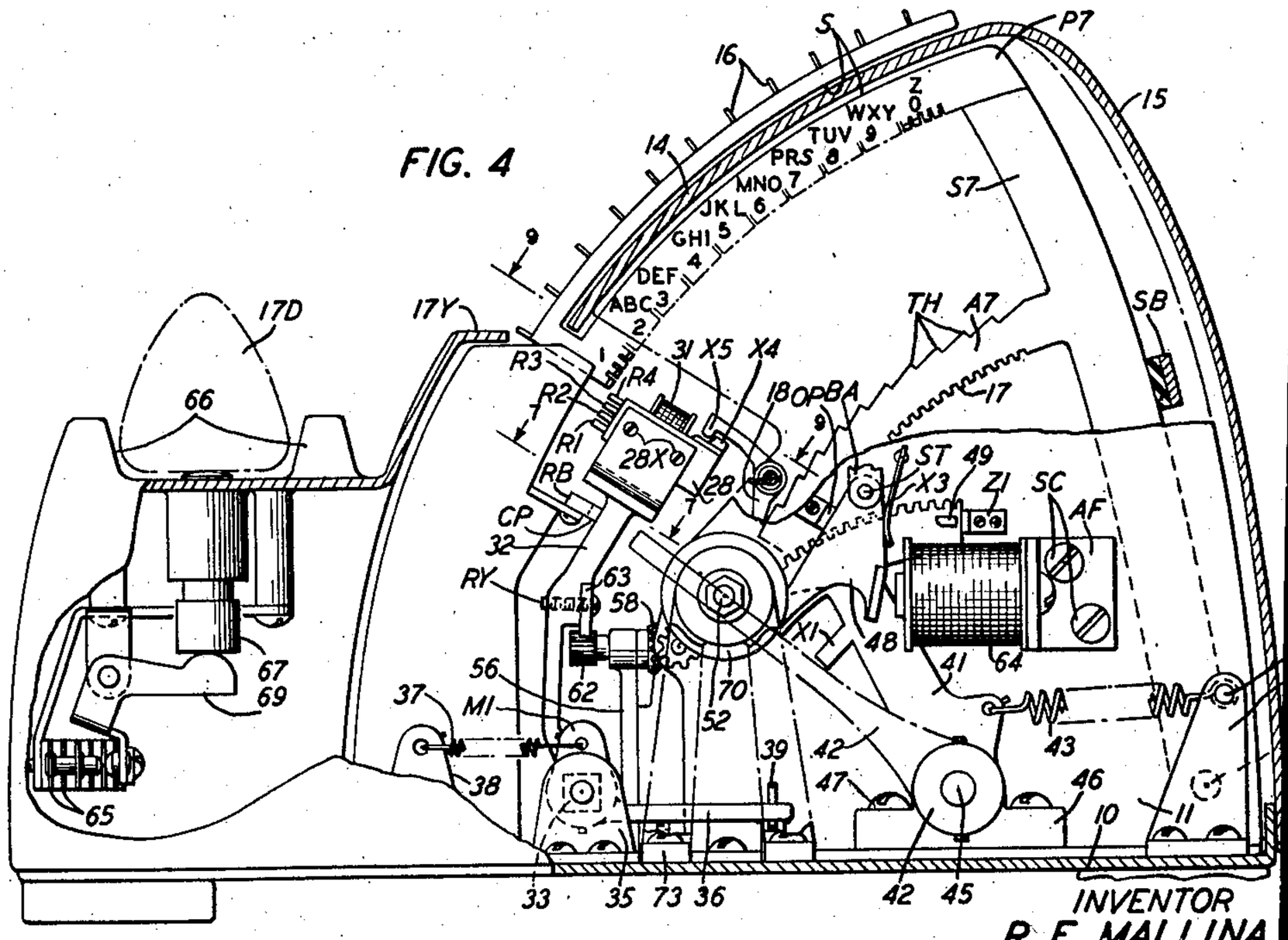

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FIG. 5

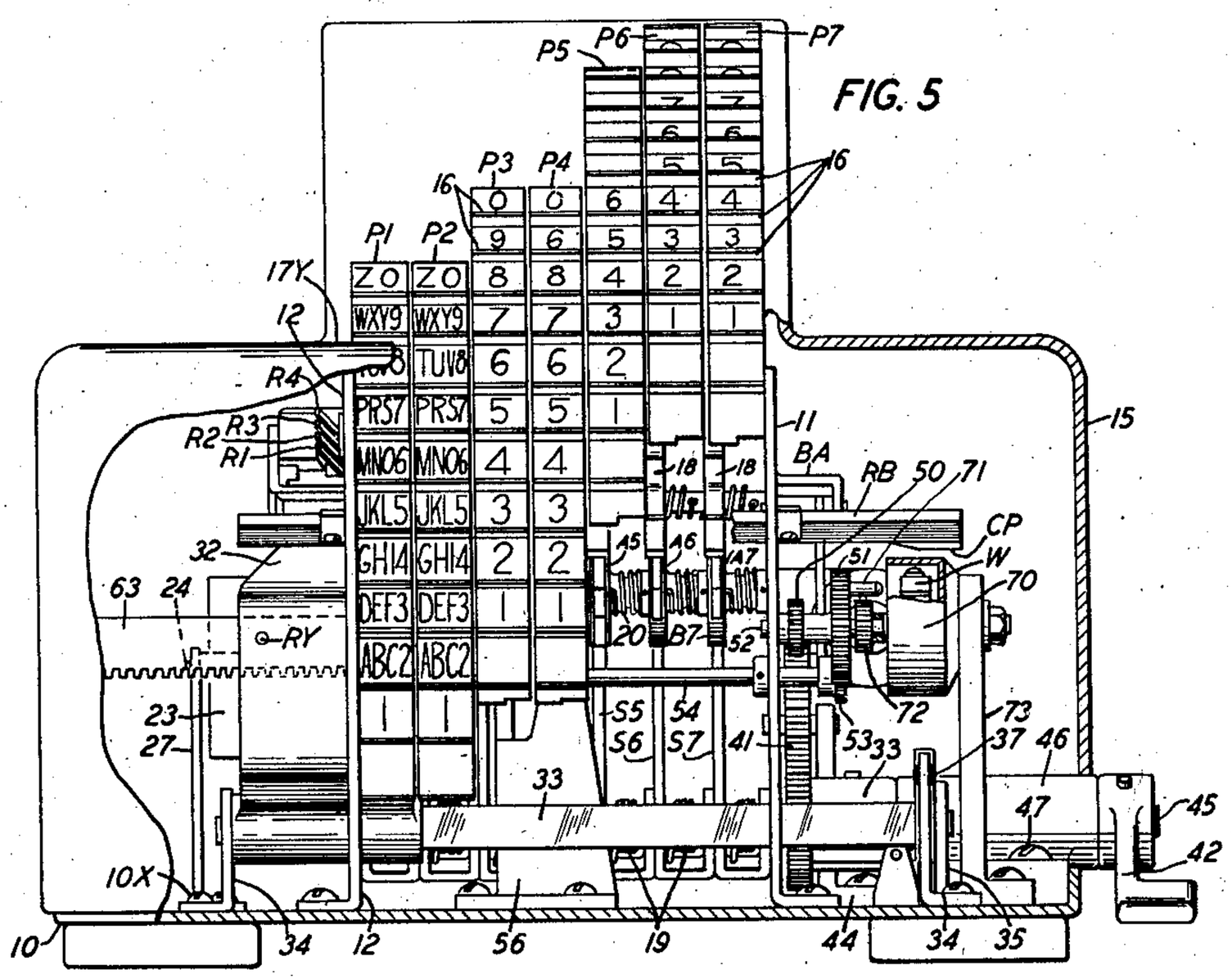
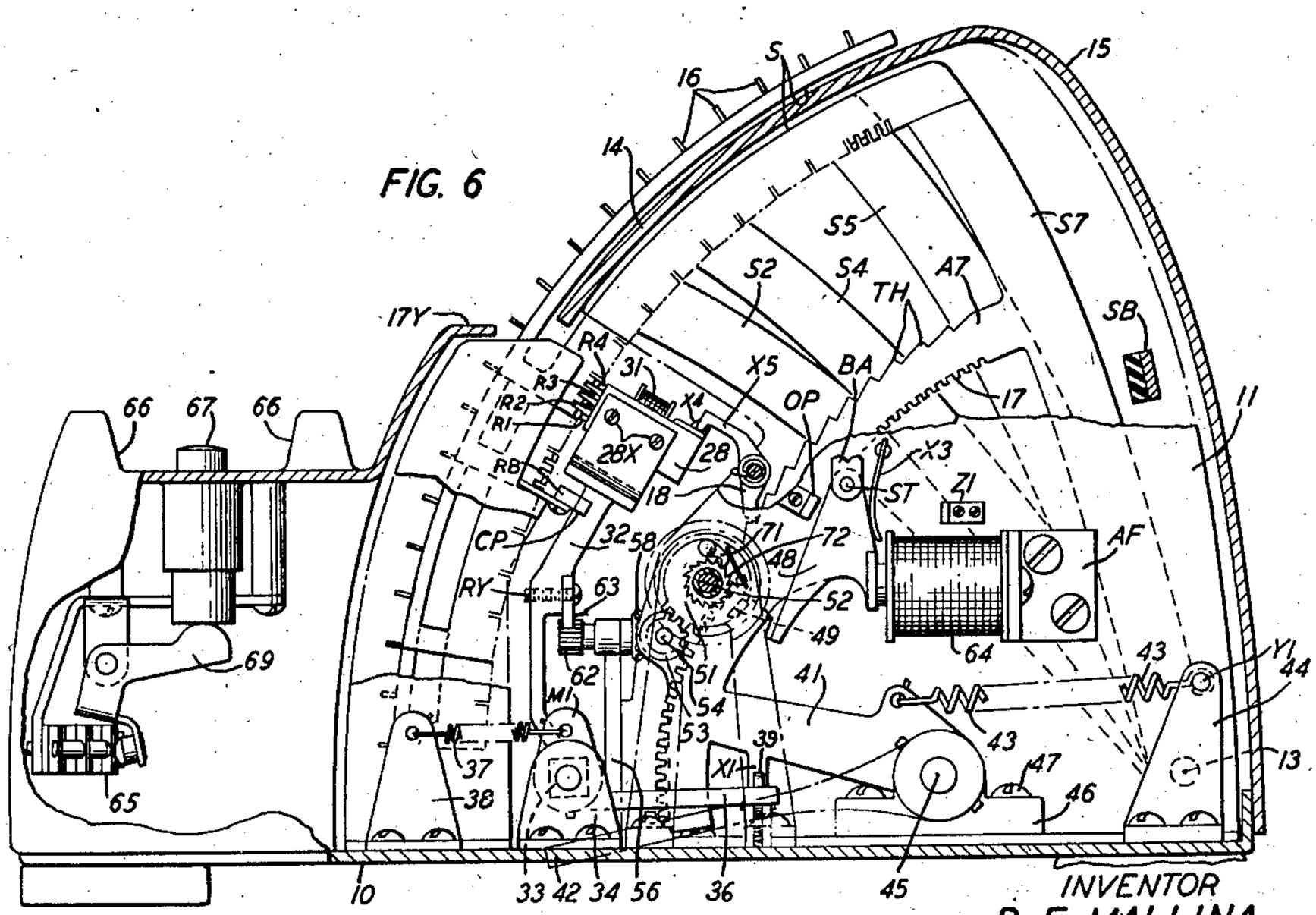


FIG. 6



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SIGNALING DEVICE

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FIG. 7

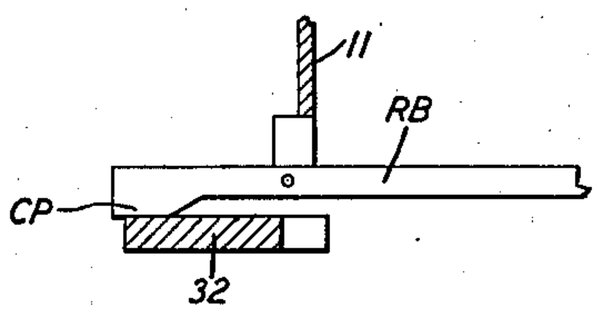


FIG. 8

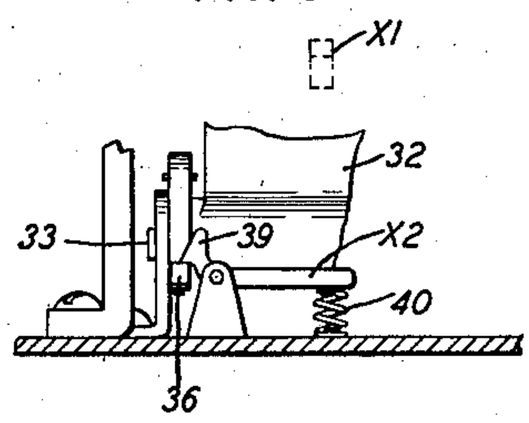


FIG. 12

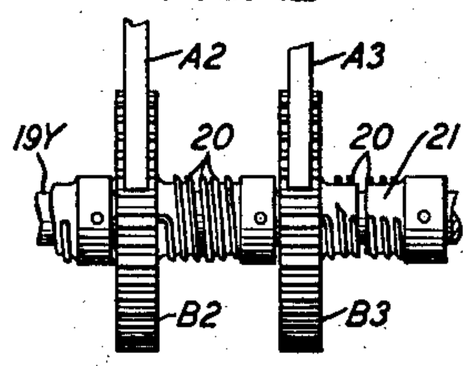


FIG. 10

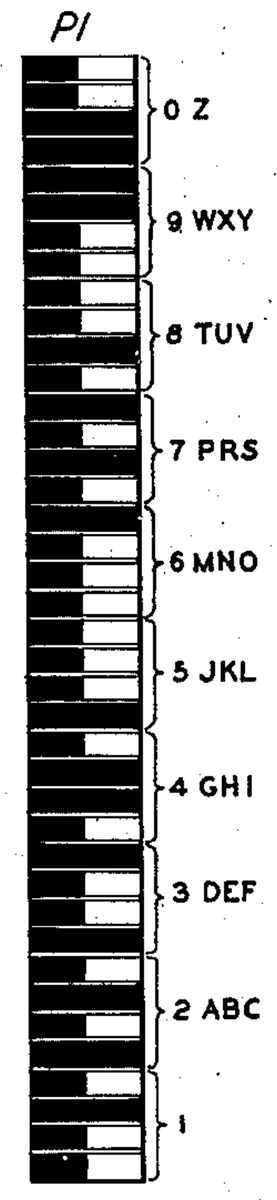


FIG. 9

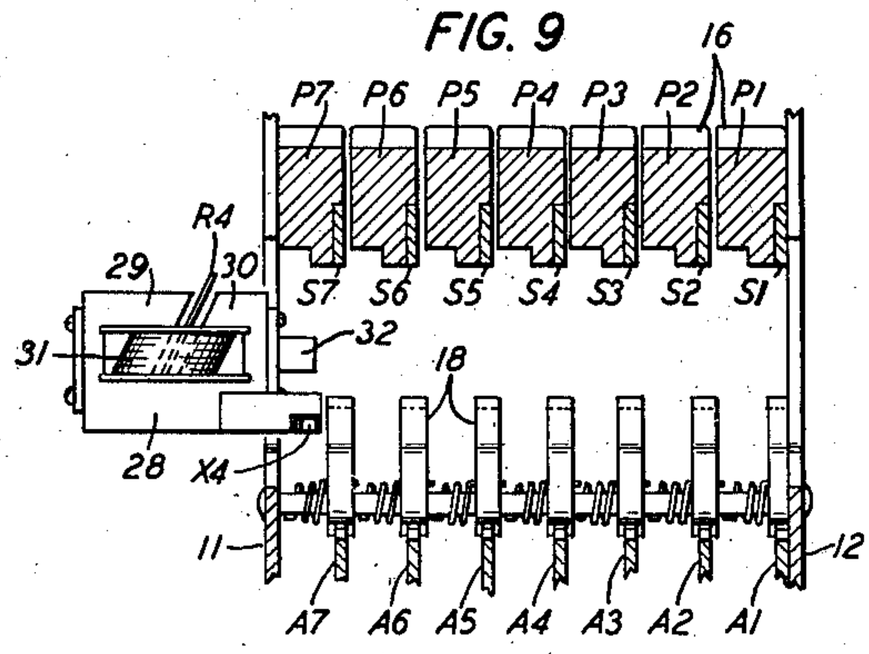
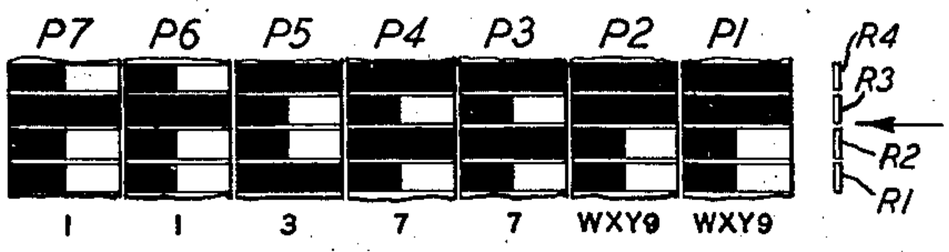


FIG. 11



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Patented Jan. 29, 1946 2,393,790

UNITED STATES PATENT OFFICE

2,393,790

SIGNALING DEVICE

Rudolph F. Mallina, Hastings on Hudson, N. Y., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Application June 24, 1942, Serial No. 448,231

4 Claims. (Cl. 177—380)

This invention relates to signaling devices and more specifically to a type of signaling device used, for example, in telephone systems for establishing talking connections.

The object of the invention is the provision of a signaling device of the type above referred to which will be simple in construction, convenient in use and accurate in operation.

According to the invention, code elements representing digits or letters or both are moved manually from normal to any one of a plurality of selected positions in line with a common stop for positioning the code elements in the path of vibrative reeds in an alternating current generator to cause their operation in predetermined combinations for transmitting current signals of frequencies corresponding to the digits selected.

Means is provided for normally placing the alternating current generator in position ineffective relative to the code elements prior to its initial movement from normal to start position effective by the operation of a handle lever, with motor means in the form of a spring tensioned by the handle lever for actuating a gearing mechanism for moving the generator in the reverse direction to that imparted by the handle lever to cause the operation of the vibrative reeds.

Means operable upon the energization of an electromagnet following the closure of a contact by the removal of the telephone handset from its cradle is effective to remove a latch from the gearing mechanism so as to permit the operation of the motor and that of the generator, means being provided for controlling the operation of the generator as effected under the tension of the motor spring in its movement effective transverse of the code elements for transmitting the call signals.

Means carried by the alternating current generator is effective to actuate latching members normally holding the code elements in the selected positions for releasing the latter successively so as to permit their return movement to normal unoperated position under control of a common speed governor following the transmission of the signals representing each digit in a given call designation.

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 assembly view shown in perspective;

Fig. 2 is a plan view shown with the casing and a number of operating parts with portions cut away;

Fig. 3 is a front elevation view showing the casing with portions cut away and the operating parts in normal non-operated position;

Fig. 4 is a side elevation view shown with the casing partly in vertical section and the operating parts in normal non-operated position;

Fig. 5 is a front elevation view showing the casing with portions cut away and the code elements moved in selected position preparatory to the operation of a handle lever for tensioning the motor spring mechanism;

Fig. 6 is a side elevation view of Fig. 5 showing the electromagnetic release mechanism in the operated position to start the transmitting of the call;

Fig. 7 is a partial view of the generator mounting, the guiding bar and the guiding bar support shown in cross section taken on line 7—7 of Fig. 4;

Fig. 8 is a partial rear view showing a latch serving to hold the current generator in position ineffective relative to the code elements during its movement transverse thereof to start position;

Fig. 9 is a partial rear view showing the code elements and their latching mechanisms in section taken on line 9—9 of Fig. 4;

Fig. 10 is a schematic view showing the numbering of one of the code elements in relation to the operating combination of the reeds in the generator;

Fig. 11 is a partial view of the code elements set in the position shown in Figs. 5 and 6 for operating the reeds of the generator for transmitting signals representing the call designation

$$\underset{9}{WXY}\ \underset{9}{WXY}\ 77311$$

and

Fig. 12 is a detail view of a clutching mechanism used for actuating a speed governor serving to control the return movement of the code elements to normal under the tension of their retractile springs.

According to this invention, a base 10 is provided for securing a pair of upright members 11 and 12 on which a shaft 13 shown in Figs. 2, 4 and 6 is journaled and on this shaft are mounted the arms S1, S2, S3, S4, S5, S6 and S7 which may vary in number according to the number of digits of the exchange to which the call transmitter of this invention is connected and on these arms are secured, as by welding, code elements in the form of sector members P1, P2, P3, P4, P5, P6

and P7 formed with groups of projections or teeth representing digits 1 to 0, inclusive, as shown in Figs. 4, 6, 10 and 11. Each sector member is formed with an arcuated slot S as shown in Figs. 4 and 6 for movement of the sectors concentric to the arcuated wall portion 14 of a casing 15 serving in cooperation with the base 10 to form a housing for the transmitter mechanism.

The code elements P1, P2, P3, etc., at their peripheries are provided with radially disposed finger holds in the form of fins 16 serving to facilitate the manual setting operation of the code elements relative to a common stop in the form of a projection 17Y formed with the casing 15 and against the resistance of retractile springs 19, these projections forming partitions between the groups of indexes and numerals 1 to 10 printed at the peripheries of the code elements P1, P2, P3, etc., as shown in Figs. 1, 2, 3, 4, 10 and 11, while a common stop bar SB serves to hold the arms S1, S2, S3, etc., collectively in normal non-operated position against the normal tension of their retractile springs 19.

The pivoted arms S1, S2, S3, as shown in Figs. 3, 4, 5, 6 and 9 are formed with sector portions A1, A2, A3, A4, A5, A6 and A7, respectively, and each sector portion is provided with ten ratchet teeth TH and gear teeth 17, the ratchet teeth TH cooperating with respective pawls 18 for holding the arms S1, S2, S3, etc., in each of their ten selective positions against the tension of their retractile spring 19 while the gear teeth 17 of these sector portions as shown in Figs. 2, 3, 5 and 12 engage with respective pinions as B1, B2, B3, B4, B5, B6 and B7 mounted for free rotation on a common shaft 19Y journaled at both ends on upright members 11 and 12 while one-way effective clutches operatively connect the pinions B1, B2, B3, etc., to the shaft 19Y, these clutches being in the form of helical springs 20 fitted over the hubs of pinions B1, B2, B3, etc., and onto bushings as 21, best seen in Fig. 12, keyed to the shaft 19Y.

The movement of shaft 19Y as effected by the successive return movement of arms S1, S2, S3, etc., from operated to normal position is controlled by a governor mechanism in the form of a fan-wheel 23, best seen in Figs. 2, 3 and 5, mounted on a spindle 24 formed with a pinion 25 engaging with a gear 26 keyed to the end of shaft 19Y, the spindle 24 being journaled at one end of an upright member 12 and its other end to a support 27 secured to the base 10 as by screws 10X.

According to this mechanism, the return movement of the pivoted arms S1, S2, S3, etc., and thereby the gear sectors A1, A2, A3, etc., carried thereby to normal position is effective to rotate the pinions B1, B2, B3, etc., for rotating the shaft 19Y through the spring clutches 20 and thereby the fan-wheel 23 acting as a governor for controlling the return movement of the code elements P1, P2, P3, P4, etc., following their release by the pawls 18 in a manner which will be hereinafter described in detail.

An alternating current generator device, shown in Figs. 3, 4, 6 and 9, consisting of a permanent magnet 28, a coil 31 and vibrative reeds R1, R2, R3 and R4 extending between the poles 29 and 30 of magnet 28, is secured as by screws 28X to the free end of a support 32 mounted for sliding movement on a shaft 33 of square cross section having its ends pivoted on upright supports 34 and 35 for permitting the engagement and disengagement of reeds R1, R2, R3 and R4 from the code elements P1, P2, P3, etc., and adjacent to one end of shaft 33, as shown in Figs. 4 and 6, is securely mounted a lever 36 having a vertically extending lug portion M1 hooked to one end of a spring 37 while the other end of this spring is hooked to an upright member 38 secured to the base 10, the function of spring 37 being to move and resiliently hold the support 32 against a guiding bar RB to cause the engagement of reeds R1, R2, R3 and R4 with the code elements S1, S2, S3, etc., upon the disengagement of a pawl 39 shown in Figs. 4, 6 and 8 from the free end of lever 36 carried by the shaft 33.

The disengagement of pawl 39 from lever 36 is effected upon the operation of a gear sector 41 from the position shown in Fig. 4 to the position shown in Fig. 6 under control of a handle lever 42 and against the tension of a motor spring 43 having one of its ends hooked to the sector and its other end to a stud Y1 laterally extending from an upright member 44 secured to the base 10, the gear sector 41 and the handle lever 42 being keyed on a common shaft 45 mounted for free rotation in a support 46 secured to the base 10 by a number of screws 47.

To upright support 11 is secured as by a number of screws SC an angle support AF provided for mounting an electro-magnet 64 disposed in attractable relation with an armature in the form of a spring-pressed pawl 48 shown in Figs. 4 and 6. This pawl is mounted on a stud ST supported at one end by a bracket BA, best seen in Figs. 2, 4, 5, 6 and 7, formed with the upright plate 11, while a stop member OP is provided to serve as an abutment for the pawl 48 against the normal tension of its retractile spring X3. The free end of pawl 48 is disposed for engagement with a stud or projection 49 carried by gear sector 41 upon the movement of this sector from the position shown in Fig. 4 to the position shown in Fig. 6 for preventing the return movement of this sector under the tension of motor spring 43 and thereby preventing the operation of a gearing mechanism serving for actuating the generator prior to the operation of pawl 48 by the energization of magnet 64 in a manner which will be hereinafter described in detail.

The gear sector 41 meshes with a pinion 50, best seen in Figs. 2 and 5, rotatable with a gear 51 as a unit on a spindle 52 supported at one end by upright support 11 and its other end is supported by an upright 73 in turn secured to the base 10. The movement of gear 51 is imparted to a pinion 53 keyed to one end of a shaft 54 journaled at one end to the upright support 11 and its other end in a bearing 55 of a support 56, best seen in Figs. 2, 4 and 5, secured to the base 10 and on this end of shaft 54 is keyed a miter gear 57 meshing with another miter gear 58 at one end of a spindle 60 rotatably mounted in a bearing 61 of support 56 and to the other end of the spindle 60 is keyed a pinion 62 meshing with a rack 63. This rack is secured to mounting 32 as by screws RY and serves for slidably moving the latter on shaft 33 and thereby the generator transverse of the code elements P1, P2, P3, etc., as effected from right to left by the manual operation of gear sector 41 and back to normal position by the tension of motor spring 43 following the operation of pawl 48 so as to release the gear sector 41 upon the energization of electromagnet 64 and thereby the operation of pawl 48 under control of a contact 65 closed upon the removal of the telephone hand-

set 17D indicated in dotted line in Fig. 4 from its cradle 66 and the consequent operation of plunger members 67 and 68 and the angle lever 69 operating the so-called switchhook spring of the set to which the contact 65 forms a part.

A speed governor consisting of a drum 70 mounted on support 73 and flyweights W mounted for rotation in this drum controls the speed of the generator in its movement transverse of the code elements P1, P2, P3, etc., as effected by motor spring 43. This governor is actuated by a spring-pressed pawl 71 carried by the gear 51 and engaging a ratchet wheel 72 secured to a sleeve on which the flyweights W of the governor are mounted, the pawl 71 being ineffective to rotate the ratchet wheel 72 upon the operation of pinion and gear units 50 and 51 during the operation of gear sector 41 as effected by handle lever 42.

In a typical example of operation, supposing that it is desired to transmit signals corresponding to the call designation WY–77311. The code elements P1, P2, P3, P4, P5, P6 and P7 which are now in normal non-operated position, as shown in Figs. 1, 3 and 4, are moved manually against the tension of their retractile spring 19 to the position shown in Figs. 5 and 6 wherein the letters W and Y and digits 77311 are placed in a row in alignment with the common finger stop 17Y where they are held in selected position by their respective pawls 18 engaging the ratchet teeth of sector portions A1, A2, A3, etc., formed with arms S1, S2, S3, etc., the set position of code elements P1 P2, P3, etc., being shown in Fig. 11 in relation to the digits they represent and in relation to the vibrative reeds R1, R2, R3 and R4 actuated thereby.

The alternating current generator is now in normal non-operated position to the right or adjacent the code element P7, the last digit of the call designations above mentioned and the handle lever 42 and the gear sector 41 in the position shown in Figs. 1, 3 and 4, while the alternating current generator is held in position by the cam portion CP of guiding bar RB against the tension of retractile spring 37 wherein the vibrative reeds R1, R2, R3 and R4 are out of engageable relation with the code elements P1, P2, P3, etc., and locked in that position by the pawl 39 engaging the arm 36 keyed on the square shaft 33. The operation of handle lever 42 from the position shown in Figs. 1, 2, 3 and 4 to the position shown in Figs. 5 and 6 is effective to rotate the pinion and gear unit 50—51 with the pawl 71 carried by the gear 51 sliding ineffectively over the teeth of ratchet wheel 72 and, therefore, flyweights W of the governor are not operated. The movement of gear 51, however, is effective to rotate the shaft 54 and thereby the miter gears 57 and 58 and the pinion 62 engaged by the gear rack 63 thus imparting a sliding movement to support 32 on shaft 33 and moving the generator to the left side of the code elements; that is, from the position shown in Figs. 2, 3 and 4 to the position shown in Figs. 5 and 6, the generator and therefore the vibrative reeds R1, R2, R3, etc., being, as above described, held out of engagement from the code elements P1, P2, P3, etc., during the movement of support 32 by the pawl 39 engaged with the arm 36 keyed to the shaft 33, while the cam X4 of the generator as shown in Fig. 4 is ineffective to engage the arms X5 formed with pawls 18 which now hold the code elements P1, P2, P3, etc., in selected position.

The movement of gear sector 41 from the position shown in Fig. 4 to the position shown in Fig. 6 and with magnet 64 deenergized permits the pawl 48 to move under the tension of its retractile spring X3, into engagement with the stud 49 carried by this sector for holding the latter and thereby the reed generator from returning to normal non-operated position under the tension of motor spring 41 until released as effected by the removal of the handset from its cradle to cause the operation of the switchhook contact 65, and thereby the energization of electromagnet 64 for removing the holding pawl 48 from the lug 49, as shown in Fig. 6, thus permitting the gear sector 41 to return to normal unoperated position under the tension of motor spring 43 actuating the pinion and gear unit 50—51, the shaft 54 and pinion 62 engaged with the rack 63 in the opposite direction and causing the pawl 71 carried by gear 51 to rotate the ratchet wheel 72 and thereby the governor weights W, the return movement of the generator to normal non-operated position causing the reeds R1, R2, R3 and R4 to successively engage with the teeth of code elements P1, P2, P3, etc., for generating and transmitting current signals representing the call designation WY–77311 above mentioned.

In the return movement of the generator the cam X4 formed with the permanent magnet 28 of the generator successively engages the arms X5 formed with pawls 18 to cause the disengagement of these pawls from the ratchet teeth TH of the sectors A1, A2, A3, etc., for permitting their successive return to normal unoperated position under the tension of their retractile spring 19, but controlled by the operation of the fan-wheel 23 geared to shaft 19Y in turn rotated by pinions B1, B2, B3, etc., engaged by the gear-toothed portion of sectors A1, A2, A3, etc., and the wire clutches 20. In the continued movement of support 32 following the transmitting of the signal corresponding to the last digit in the call designation above mentioned, the cam portion CP at the end of guiding bar RB, as shown in Fig. 2, causes a pivotal movement of shaft 33 against the tension of retractile spring 37 to move the arm 36 carried by shaft 33 in position to be engaged by pawl 39 prior to the engagement of gear sector 41 with stop Z1 and the transmitter is now ready for a successive operation by moving the code elements P1, P2, P3, etc., in selected position which may be effected either prior to or following the operation of handle lever 42 for actuating the gear sector 41 and tensioning the motor spring 43.

What is claimed is:

1. A call transmitter comprising a plurality of code elements representing digits movable from normal to selected position for setting a call, a retractile spring for each of said code elements tensioned by the setting operation of the latter for returning them to normal, means for retaining each of said code elements in selected position, an alternating current generator having vibrative reeds, a mounting for moving said generator transverse of said elements to cause the simultaneous vibration of a number of said reeds by different of said code elements for transmitting signals corresponding to the setting of said code elements, and means carried by said generator for actuating said retaining means to cause the return movement of said code elements to normal non-operated position successively under the tension of said retractile springs.

2. In a call transmitter, a plurality of pivoted code elements movable from normal to selected position for setting a call, latching means for

holding said code elements in each of said selected positions, an alternating current generator having vibrative reeds, means for moving said generator in direction transverse of said elements but in a path where said reeds are ineffective to engage said elements, means operable upon the movement of said generator for moving the latter in a path effective relative to said code elements upon the return movement of said generator to normal, means carried by said generator to successively actuate said latching means for permitting the return of said code elements to normal, a governor mechanism for controlling the operation of said generator in said effective path, a rotatable shaft, a plurality of one-way operable clutching devices for operatively connecting said elements to said shaft and a governor mechanism geared to said shaft for controlling the return operation of each of said elements to normal upon the operation of said latching means by said generator following the successive operation of said vibrative reeds for transmitting said signals.

3. In a call transmitter, a plurality of code elements manually movable from normal to any of a plurality of selected positions for setting a call, a retractile spring for each of said elements tensioned by the movement thereof, a sector member carried by each of said code elements, a ratchet-toothed portion and a gear-toothed portion formed with each of said sector members, pawls engaging said ratchet portions for holding said elements in each selected position against the tension of said retractile springs, an alternating current generator, a pivoted shaft, a mounting for said generator slidably engaging said pivoted shaft, manually operable means for moving said mounting and said generator on said shaft transverse of said code elements in a path ineffective thereto, a motor spring tensioned by the movement of said manually operable means for returning said generator to normal, latching means actuated by the movement of said manually operable means for permitting the pivotal movement of said shaft for placing said generator in position effective relative to said code elements, a stop bar disposed in line parallel to the movement of said generator for determining the effective position thereof relative to said code elements, a shaft, gears mounted for free rotation on said shaft engaging the gear-toothed portions of said sector members, one-way effective clutch mechanisms operatively connecting said gears to said shaft, means carried by said generator for successively operating said pawls to cause the return movement of said code elements to normal under the tension of said retractile springs, a governor mechanism actuated by said shaft for controlling the return movement of each of said code elements to normal, a second governor actuated by the tension of said motor spring for controlling the operation of said generator in position effective relative to said code elements for transmitting the call, and a cam carried by said stop bar for returning said generator to said ineffective position following the transmitting of the call.

4. In a call transmitter, a plurality of code elements manually movable from normal to selected position for setting a call, a pivoted shaft, a support mounted for sliding movement on said shaft and movable therewith, an alternating current generator carried by said support but normally in position ineffective relative to said code elements, a manually operable gearing mechanism for moving said support on said shaft in said position, said mechanism comprising a handle lever, a gear sector actuated by said handle lever, a pinion and gear unit rotated by the operation of said gear sector, a shaft rotated by the operation of said unit, angle gears actuated by the movement of said shaft, one of said angle gears having a spindle portion, a pinion mounted on said spindle portion, a gear rack secured to said support and engaging said last-mentioned pinion to move said support on said shaft and thereby said generator transverse of said code elements, means actuated by the movement of said gear sector to cause a rotary movement to said pivoted shaft for moving said generator in position effective to said code elements preparatory to the return movement of said support to normal and a motor spring tensioned by the movement of said gear sector by said handle lever for actuating said gearing mechanism in the opposite direction to cause the operation of said generator by said code elements for transmitting signals corresponding to the selected position of said elements.

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