

June 16, 1936.

L. DEVAUX

2,044,470

IMPULSE SENDER

Filed April 12, 1933

2 Sheets-Sheet 1

FIG. 1

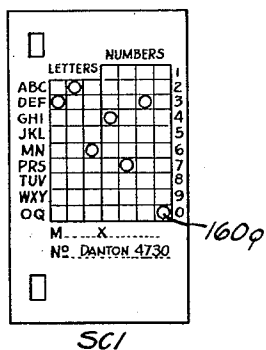


FIG. 2

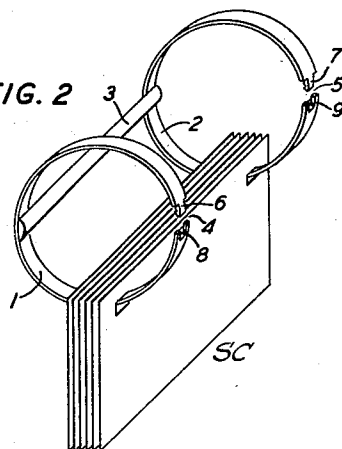


FIG. 3

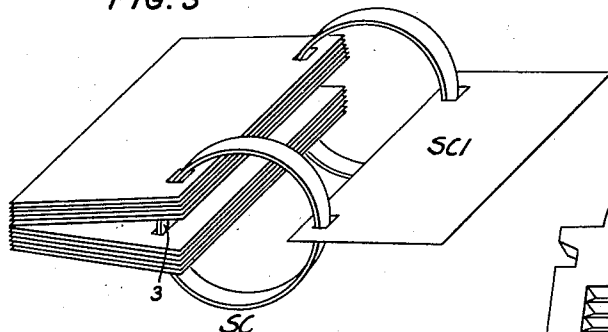
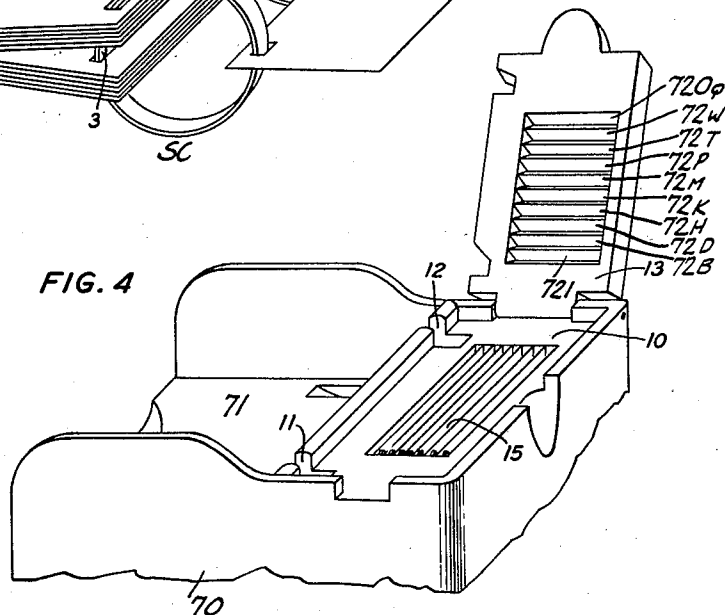


FIG. 4



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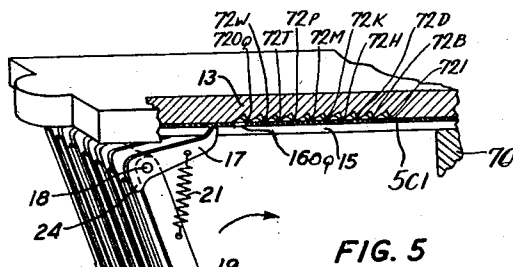


FIG. 5

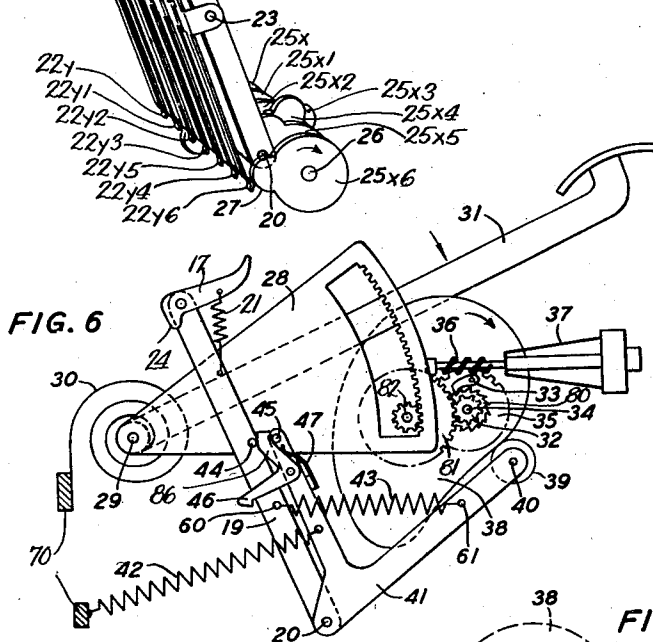


FIG. 6

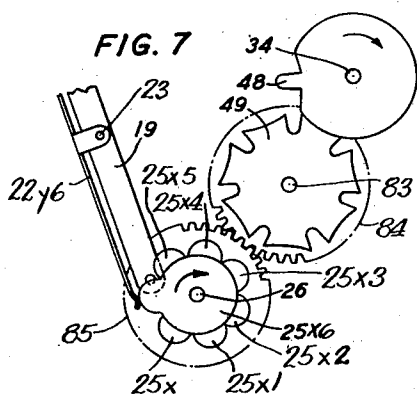


FIG. 7

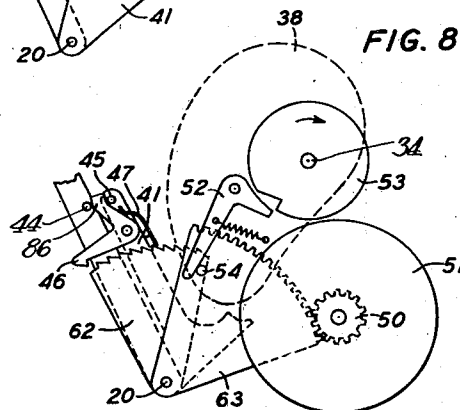


FIG. 8

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2,044,470

IMPULSE SENDER

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Application April 12, 1933, Serial No. 665,686
In France September 16, 1932

10 Claims. (Cl. 177—380)

This invention relates to impulse sending devices and more particularly to automatically operated pulsing devices of the type whereby a plurality of sets of impulses may be transmitted by a single manual operation to effect an automatic telephone connection.

The establishment of a telephone connection by a subscriber in a large automatic area necessitates the manipulation of a finger actuated device some seven or eight times depending upon the number of digits which constitute the telephone number of the subscriber's line with which connection is desired. This manual operation of the telephone dial is tiresome and particularly so in cases where a subscriber is called upon to communicate with a large number of clients or customers daily or several times daily.

It is accordingly the object of this invention to simplify the establishment of automatic telephone connections and to render the task of establishing connections with frequently called subscribers more easily accomplished.

This object is attained in accordance with a feature of the invention by the provision of a mechanism which is set in motion by a single manual operation to cause an impulse sender of the dial type to function to transmit a complete set of impulses corresponding to the telephone number of a subscriber's line.

For this purpose, the invention, according to another of its features, provides the use of cards on which the subscribers' numbers may be set up by means of suitable perforations; these cards are adapted to be introduced in a special device for exploring the perforations of the card and controlling automatically the sending of impulses according to the disposition and the number of these perforations.

These cards can be assembled by means of a binding device permitting the assembly of a large number of cards, thus giving the facility of calling automatically, by means of the device of the invention, as many subscribers as may be desired, since it suffices to have for every subscriber to be called, a corresponding perforated card. It will be noted that a card, when suitably perforated, may be used practically, an unlimited number of times to automatically send impulses corresponding to the perforations thereon.

The perforated cards employed are analogous to those used in statistical machines and their exploration is made by means of mechanical feelers. A practical form of the invention consists in having the card explored by one or several feel-

ers which cause a mechanical or electrical action when they meet a hole on the card.

One of the features of the invention resides in a device acting as a binder for assembling a large number of perforated cards, while presenting the possibility of separating any of these cards, without detaching it from the binder, in order to introduce it into the impulse sending device, for the purpose of sending impulses corresponding to the perforations on the card.

Such cards are very inexpensive, they occupy very little space and they can be prepared in as large a number as may be required, since several separate packs of these cards may be used with the same impulse sending device. The cards may bear, in addition to the perforated calling number, the name and address of the subscriber as well as any other useful information, thus adapting these cards to replace the usual telephone directory. For this purpose, the cards may be suitably disposed.

According to another feature of the invention, the card to be explored is placed in a receptacle, the bottom of which is provided with slots allowing the passage of feelers adapted to explore the various columns of the card to find the perforations which constitute the subscriber's number to be called.

According to another feature of the invention, the perforation of the cards can be facilitated by providing the cards with suitable indications such as lines, reticulations, letters, figures, etc. For instance, the perforations could be made in the suitable meshes of the reticulations. To facilitate the operation of perforating in precise places, the centre of reticulations provided for such perforations, can have a small hole to act as a guide for the perforating tool which would then be equipped with a central needle.

According to another feature of the invention, the receptacle is provided with a cover serving to maintain the card to be explored in place; this cover is provided with slits placed perpendicular to the slots allowing the passage of feelers for the purpose of determining the exact position of any feeler or stylus considered, when the latter is engaged in a perforation of the card to be explored.

According to another feature of the invention, the number of impulses transmitted depends upon the position of every feeler, after it has travelled its whole way by means of a suitable mechanism. The mechanism can be so arranged that when no hole is perforated in one or several columns of the card, no signal or impulse is sent.

The invention is capable of many different embodiments and in order that its nature may be fully understood, there is given herein below, by way of example, a detailed description of an embodiment, the principle of which consists in providing a plurality of feelers or styli which are successively brought into an exploring position and to cause the apparatus to count the number of steps that every feeler or stylus would have to cover after it has been stopped by a perforation, and to actuate the impulse sending mechanism according to this number:

The following detailed description is based on the accompanying drawings in which:

Fig. 1 shows one type of card for the impulse sender;

Figs. 2 and 3 show a type of binder used for uniting a certain number of cards;

Fig. 4 represents the upper part of an impulse sender incorporating features of the present invention;

Fig. 5 shows in detail the feelers used to explore the perforations of a card; and

Figs. 6, 7 and 8 represent details of the impulse sending mechanism.

The call transmitter operating mechanism of this invention is housed in a casing 70 shown in Fig. 4, the upper portion of which is provided with flat surfaces forming bases 71 and 10 for receiving a bundle or set of cards SC as shown in Figs. 2 and 3 with the separated card such as SC1 for example resting on the base 10. The cover plate 13 shown in Figs. 4 and 5 is hinged to the casing 70 and may be moved to rest in a flatwise position on the base 10 for holding the separated card SC1 firmly in adjusted position on this base. The cover plate 13 may then be locked in its closed position by the use of an ordinary latching device, not shown, and may be provided with an opening to permit at any time the identification of the card on the base 10.

The base 10 is provided with a plate 15 having parallelly disposed slots through which feeler members 17 shown in Figs. 5 and 6 extend for engaging perforations such as 160Q in the coordinate inscribed columns on the card SC1 upon the operation of their supporting arms 19 in a manner that will be hereinafter described in detail, feeler members 17 being normally held from contact with the card by tension springs 21 shown in Fig. 5.

Cover plate 13 is provided in its under side with a plurality of ratchet shaped teeth 72I, 72B, 72D, 72H, 72K, 72M, 72P, 72T, 72W and 720Q shown in Figs. 4 and 5 disposed at right angles to the slots 15 in the base 10 and therefore to that of the direction of movement of feeler members 17, these teeth being provided to serve as stops for the arms 19 whenever the feeler members 17 engage the teeth 720Q, 72W, 72T, etc., through the card perforations, which engagement is effected upon the operation of arms 19 subsequent to the tensioning of associated flat springs 22y, 22y1, 22y2, 22y3, 22y4, 22y5 and 22y6 in a manner that will be hereinafter described in detail.

Springs 22y, 22y1, etc., are pivoted as at 23 on the arms 19. These springs engage at one end the downward extending portions 24 of feeler members 17 and their other ends are disposed in operable relation with their respectively associated cams 25x, 25x1, 25x2, 25x3, 25x4, 25x5 and 25x6 disposed in helical relation on a rotatable shaft 26, a complete turn of shaft 26 being effective to cause the feeler members 17 to successively

engage the underside of the card SC1 placed on the base 10 against the tension of their retracting springs 21.

The arms 19 which correspond in number to that of the ordinate inscribed columns on the card are mounted for pivotal movement on the shaft 20 and each of these arms is operatively connected to an angularly shaped lever 41 by a tension spring 43 shown in Fig. 6, these levers being in turn loosely mounted on shaft 20.

Each angle lever 41 is provided with a pivot 40 for mounting a roller 39 engaging the periphery of a cam 38 through the tension of a retractile spring 42 having one end hooked to one arm of angle lever 41 and its other end to any convenient portion of the casing 70 as shown in Fig. 6, movement of cams 38 being effective to impart collectively oscillatory movements to the arms 19 and the feeler members 17 carried thereby to permit these feeler members to successively engage under control of the helically disposed cams 25x, 25x1, 25x2, etc., any hole from 1 to 0 as 160Q which may be punctured in the ordinate columns of the card.

The cams 38 are securely mounted on a rotatable shaft 34 which is operated through a one-way clutching device in the form of a ratchet wheel 80 and a pawl 33 shown in Fig. 6, this pawl being mounted on a worm gear 35 which in turn is secured on the shaft 34.

The ratchet wheel element 80 of the clutching device is securely mounted on the hub portion of a pinion 32 loosely mounted on the shaft 34. Pinion 32 engages with a gear 81 securely mounted on the shaft portion of a pinion 82 in turn engaging a gear toothed sector 28 mounted on a shaft 29. This shaft is actuated by a manually operable lever member 31, the operation of which in the direction indicated by the arrow is effective to tension a motor spring 30, the ratchet wheel 80 being rotated in the direction of pawl 33 and therefore ineffective to impart movement to shaft 34 during the downward movement of handle lever 31.

The movement of lever 31 and the gear sector 28 in the direction opposite to that indicated by the arrow under the tension of motor spring 30 causes the engagement of ratchet wheel 80 with the pawl 33 carried by the worm gear 35 for rotating the shaft 34 and the cams 38 carried thereby under control of a governor 37 through the engagement of a worm 36 with worm gear 35, the gear ratio from gear sector 28 and pinion 32 on shaft 34 being such as to impart to this shaft and the cams 38 an angular movement of 2520 degrees or seven turns for a forty-five degree angular movement of sector 28.

The cam shaft 26 is operatively connected to shaft 34 by an intermittent gear mechanism shown in Fig. 7 consisting of a one-toothed driving gear 48 secured on shaft 34 and a seven-toothed star wheel 49. Star wheel 49 is secured on a spindle 83 together with a spur gear 84 in turn engaging another spur gear 85 securely mounted on shaft 26, the operation of this gear mechanism being effective to operate the shaft 26 and the cams 25x, 25x1, 25x2, etc. carried thereby intermittently as to tension one of the springs 22y, 22y1, 22y2, etc. upon each complete turn of cams 38 and therefore for each complete oscillatory movement of arms 19, the tensioning of these springs being effected upon the return movement of angle levers 41 to normal position.

On shaft 20 and adjacent each angle lever 41 is securely mounted a ratchet toothed sector 62 75

shown in Fig. 8 each having a number of teeth corresponding to the number of teeth 720Q, 72W, 72T, etc. and on the end of shaft 20 is secured a gear sector 63 provided for a purpose that will be hereinafter described in detail.

On each angle lever 41 is mounted a pawl 46 for engagement with its respectively associated ratchet toothed sector 62 under the tension of a flat spring 47. Pawls 46 are each provided with an upward extending portion 86 for engagement when in normal position as shown in Fig. 8 with pins 45 carried by angle levers 41 and pins 44 carried by the arms 19, the pins 44 serving to hold the pawls 46 out of engagement with the sectors 62 through the tension of retractile springs 42 acting against the tension of springs 47, and pins 45 serving to limit the disengaging movement of pawls 46 and thereby positioning the angle levers 41 with respect to arms 19. It is to be noted, however, that upon the relative movement of angle levers 41 under control of cams 38 with respect to their associated arms 19, pawls 46 are moved free from pins 44 for engaging the ratchet shaped toothed sectors 62 under the tension of springs 47 and thereby rotating the shaft 20 and the gear sector 63 which in turn actuates a pinion 50 secured to the main shaft of the call transmitter 51 shown in Fig. 8 for setting its impulse mechanism and winding its motor spring in the ordinary manner an amount corresponding to the relative movement of angle levers 41 with respect to arms 19, such relative movement being due to the stopping of these arms when the feeler members 17 engage the teeth 720Q, 72W, 72T, etc., through the perforations of the card and the continued movement of angle lever 41 under control of the cams 38 against the tension of retractile springs 42 and 43.

Gear sector 63 carries a pin 54 provided for controlling the engagement of a pawl 52 with a one-toothed disc 53 secured at the end of shaft 34. The engagement of pawl 52 with disc 53 is effective to momentarily arrest the movement of shaft 34 and the cam 38 in the position shown in Figs. 6 and 8, as to permit the pinion 50 to return to normal position under the tension of the call transmitter motor spring where the pin 54 reengages the pawl 52 for disengaging it from the disc 53 and thereby permitting the continued movement of shaft 34 and the cams 38 under control of governor 37 timed substantially to the rate of speed of call transmitter 51, the cycle of operation above described being repeated during the complete return movement of handle lever 31 to normal position.

In a typical example of operation the downward movement of handle lever 31 and gear sector 28 actuated thereby is effective to rotate the shaft 29 for tensioning the spiral motor spring 30. The movement of gear sector 28 rotates the pinion 82, the gear 81, the pinion 32 and the ratchet wheel 30 in a direction ineffective with respect to pawl 33 carried by worm gear 35. The cams 38 and the governor 37 therefore are not operated during the downward movement of manually operable lever 31. However, upon the return movement of lever 31 to normal position under the tension of motor spring 30 and the consequent reverse movement of pinion 32 and the ratchet wheel 80 through the gear train above described, this ratchet wheel engages the pawl 33 for actuating the worm gear 35 and thereby its supporting shaft 34 under control of governor 37.

The movement of shaft 34 and the cams 38 in

the direction indicated by the arrow is effective to impart oscillatory movements to angle levers 41 and to their respective associated levers 19 connected thereto by the tension springs 43, the gear ratio from sector 28 to shaft 34 as above mentioned is such as to impart seven turns to shaft 34 for a forty-five degree angular movement of gear sector 28, the cams 38 therefore imparting seven complete oscillatory movements to angle levers 41 and the arms 19 upon each operation of handle lever 31. The rotation of shaft 34 is effective to impart through the Geneva gearing mechanism above described an intermittent movement to shaft 26 and the cams 25x, 25x1, 25x2, etc. carried thereby for tensioning the springs 22y, 22y1, 22y2, etc. in sequence corresponding to the position of cams 25x, 25x1, 25x2, etc., for successively engaging the feeler members 17 with the under disposed surface of card SC1 and consequently in the teeth 721, 72B, 72D, etc. against the resistance of their retractile springs 21. But it is to be noted that only one of the feeler members 17 is rendered effective with respect to the punctured card for each collective oscillatory movement of angle levers 41 and that of arms 19 for each turn of cams 38 through the tensioning of their associated springs 22y, 22y1, 22y2, 22y3, etc. by the cams 25x, 25x1, 25x2, 25x3, etc. as the case may be. As shown in Figs. 5 and 7 the cams 25x6, for example, is positioned as to tension its associated springs 22y6 and thereby forcing its associated feeler member 17 against the under surface of the card so as to cause the engagement of this feeler member in the tooth or stop 720Q shown in Figs. 4 and 5 corresponding to that of the punctured hole 160Q in the card so as to prevent any further movement of this arm while its associated angle lever 41 continues its movement under the action of its operating cam 38 against the tension of retractile springs 42 and 43. Upon a relative movement of angle lever 41 with respect to arm 19, the spring 47 shown in Figs. 6 and 8 forces the pawl 46 in engagement with its associated ratchet toothed sector 62 for rotating the gear sector 63 secured on shaft 20 and thereby rotating the pinion 50 securely mounted on the operating shaft of call transmitter 51 for operating it, an angular distance corresponding to the effective movement of angle lever 41, that is, from the point wherein the pawl 46 engages the ratchet toothed segment 62 as defined by the perforations 160Q in the card to the limit of movement of angle lever 41 under control of cam 38.

Upon the operation of gear sector 63 and the engagement of pawl 52 with the one-toothed disc 53, the movement of shaft 34 and that of the cams 38 carried thereby is prevented until the pinion 50 on the dial shaft is returned to its normal non-operated position under the tension of its own motor spring when the pawl 52 is thereby disengaged from disc wheel 53, thus permitting the continued movement of shaft 34 and thereby that of the cam shaft 26 in the sequence of operations as above described until the lever 31 has reached its non-operated position shown in Fig. 6, thus preparing the device for a subsequent operation.

What is claimed is:

1. In a device for controlling the operation of a call transmitter having a variably operable element, a card having perforations in coordinately inscribed columns, a mounting, a base in said mounting for receiving said card, a plate

carried by said mounting for securing said card on said base, said plate having indentations registering with the coordinate columns inscribed on said card, a cam shaft, a plurality of feeler members positioned by the movement of said cam shaft and operable in line with the ordinate columns inscribed on said card for successively engaging the indentations in said plate according to the perforations in said card, and means automatically operable upon the engagement of said means with said indentations for causing the operation of said element according to the perforations in said card.

2. In a device for controlling the operation of a call transmitter having a variably operable shaft, a card having perforations, a mounting having a base for receiving said card, a plate for securing said card on said base, a cam shaft, operable feeler elements controlled by the operation of said cam shaft for engaging the perforations in said card, a plurality of lever members, spring means for operatively connecting said members to said elements, a plurality of cams for actuating said members relative to the engaged positions of said elements as defined by the perforations in said card, and means for actuating the call transmitter shaft upon the engagement of said elements.

3. In a device for controlling the operation of a call transmitter having a variably rotatable shaft, a card having a plurality of perforations representing a predetermined number, a mounting for said card, a plate for securing said card on said mounting, a plurality of normally ineffective feeler members, means operable for successively rendering said members effective with respect to said card, a camming mechanism for imparting oscillatory movements to said members collectively to cause the effective feeler member to engage a perforation in said card, and a gearing mechanism operable upon the engagement of said feeler member with said card for actuating the call transmitter shaft according to the position of the engaged perforation in said card.

4. In a device for controlling the operation of a call transmitter having a variably operable shaft, a card having perforations disposed in coordinately inscribed columns, the ordinate columns representing a number and the coordinate columns representing the number of digits included in the number, a mounting having a base for receiving said card, a plate for securing said card on said base, feeler members normally ineffective with respect to said card, supporting arms for said members, means for actuating said arms a number of times corresponding to the number of digits in the number and at a distance corresponding to said ordinate columns, said plate having ratchet teeth registering with the coordinate columns inscribed on said card for engagement with said feeler members for stopping the movement of said arms, a plurality of rotatable cams, lever members actuated by said cams, yieldable means operatively connecting said arms to said lever members for moving said lever members with respect to said arms, and means operable upon the relative movement of said arms and said levers for actuating the call transmitter shaft according to the perforations in said card.

5. The combination with a call transmitter having a variably operable rotating shaft, of a card having perforations along coordinately inscribed rows representing the digits included in

a predetermined number, a mechanism operable according to the perforations in said card for actuating the transmitter shaft, said mechanism including a plurality of pivoted arms, a feeler member carried by each of said arms, a plurality of pivoted levers, spring means operatively connecting each of said arms to each of said levers, a rotatable shaft, a plurality of cams carried by said shaft for actuating said levers, spring means normally holding said feeler members in position ineffective with respect to said card, means actuated by said rotatable shaft for successively engaging said feeler members with said card, a plate having ratchet elements for stopping the movement of said arms upon the engagement of said feeler members in the perforations in said card, and clutch mechanisms operable upon the relative movement between said arms and said levers for operating the call transmitter shaft according to the position of the engaged perforations in said card.

6. In a device for controlling the operation of a call transmitter having a variably operable shaft, a card having perforations in coordinately inscribed columns, a mounting having a base for receiving said card, a plate for securing said card on said base, a plurality of pivoted arms, a plurality of lever members, one for each of said arms, a ratchet element carried by each of said arms, a roller carried by each of said members, a cam engaging each of said rollers for actuating said arms in the direction of the ordinate inscribed column on said card, ratchet elements carried by said plate and cooperating with the first mentioned ratchet elements for positioning said arms according to the perforations in said card, means operable automatically upon the continued movement of said levers with respect to said arms for operating the call transmitter shaft according to the stop position of said arms, means for returning said arms to normal position upon a predetermined movement of said cams, and a plurality of means for controlling the operation of said cams.

7. In a device for controlling the operation of a call transmitter having a variably operable element, a stationary card having perforations in coordinately inscribed columns representing digits, a mounting having a base for receiving said card, a plate for securing said card on said base, said plate having a number of ratchet teeth corresponding to the coordinate columns inscribed on said card, a plurality of pivoted arms, a plurality of normally ineffective means carried by said arms operatively associated with said plate, a camming mechanism for collectively actuating said arms a number of times corresponding to the number of perforations on said card, another camming mechanism intermittently operable for rendering one of said means effective upon each collective movement of said arms for successively engaging the perforations in said card and the corresponding teeth in said plate for arresting the movement of said arms, and means automatically operable upon the stopping operations of said arms for successively actuating the call transmitter shaft according to the perforations in said card.

8. In a device for controlling the operation of a call transmitter having a variably operable element, a card having a plurality of perforations representing digits contained in a predetermined number, a mounting having a base for receiving said card, a plate hinged to said mounting for securing said card on said base, said plate hav-

ing a row of equally spaced ratchet teeth in its side adjacent said card and coinciding with said perforations, normally ineffective feeler members for engaging the teeth in said plate upon their engagement with the perforations in said card, means operable for rendering said members successively effective with respect to the perforations in said card, means for collectively imparting oscillating movements to said feeler members to cause the latter when rendered effective to engage the teeth in said plate through the perforations in said card for stopping the movement of said members, a gearing mechanism operatively connecting the call transmitter shaft and ratchet mechanisms automatically operating upon the engagement of said feeler members with the teeth of said plate and the continued movement of the second mentioned means for controlling the operation of said gearing mechanism for variably actuating the call transmitter operating element according to the position of the perforations on said card.

9. In a device for operating a call transmitter having a variably operable element, said device comprising a card having a perforation representing a digit, a support, means for securing said card against movement on said support, a pair of movable members, yieldable means operatively connecting said members, a camming mechanism for actuating said members, means cooperating with said card for controlling the operation of one of said members, means actuated by the continued movement of the other member for actuating the call transmitter operating element according to the relative movement between said members, and a plurality of oper-

able means for controlling the operation of said camming mechanism.

10. In a device for controlling the operation of a call transmitter having a variably operable shaft, a card having perforations representing the digits contained in a number disposed in coordinately inscribed columns, a mounting having a base for receiving said card, a plate hinged to said mounting and movable for securing said card on said base, said plate having ratchet teeth disposed in parallel relation and adjacent to the coordinate columns on said card, pivoted arms, normally ineffective feeler members carried by said arms, a plurality of pivoted angle levers, one for each of said arms, a plurality of springs operatively connecting each of said levers to each of said arms, means including a cam shaft for actuating said levers, and other shaft, a plurality of cams disposed in helical relation on said shaft, gearing mechanism operatively connecting said cam shaft with said other shaft for intermittently actuating the last mentioned shaft, spring means tensioned by said helically disposed cams for successively rendering said feeler members effective for engaging the perforations in said card and the teeth of its securing plate for successively arresting the movement of said feeler members, a gearing mechanism connecting the call transmitter shaft, and a ratchet mechanism automatically operable upon a relative movement of said angle levers and said arms for actuating said gearing mechanism for successively actuating the call transmitter shaft according to the perforations in said card.

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