May 4, 1943. M. DEMEULENAERE ET AL 2,318,467

AUTOMATIC DIAL OPERATOR

Filed Jan. 2, 1941 4 Sheets-Sheet 1

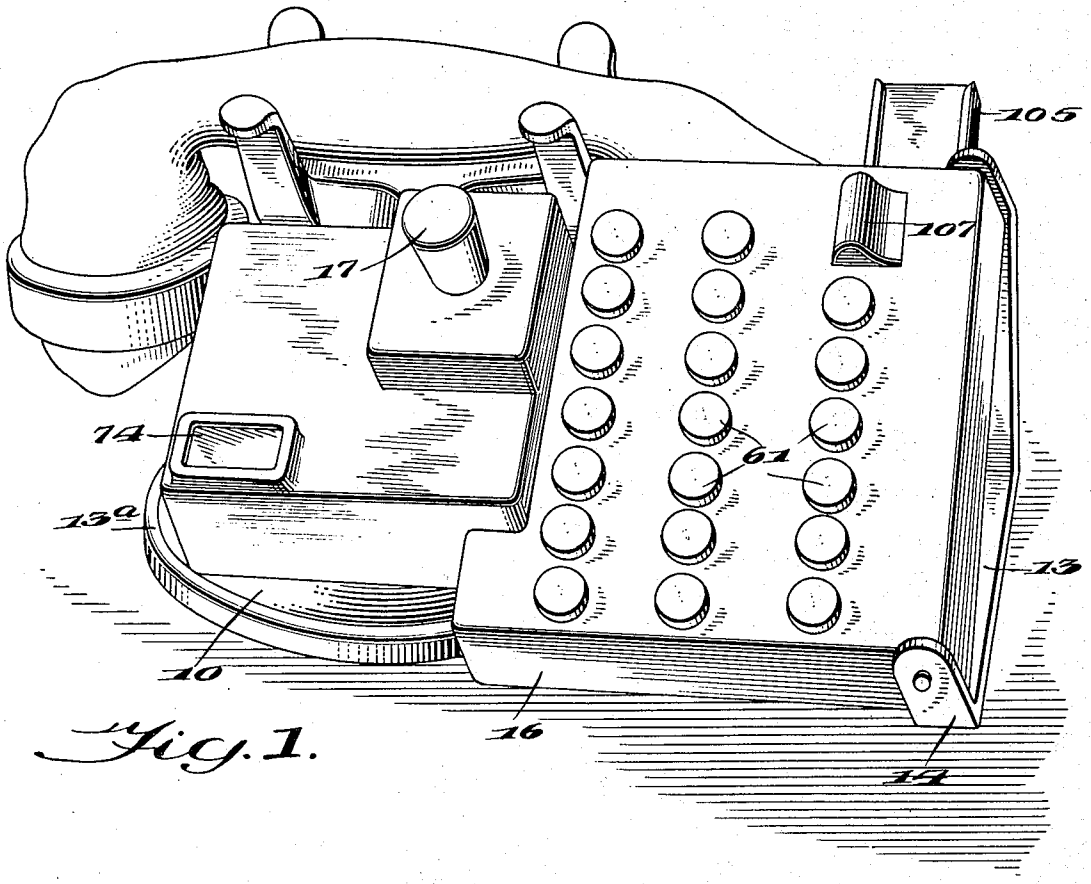


Fig. 1.

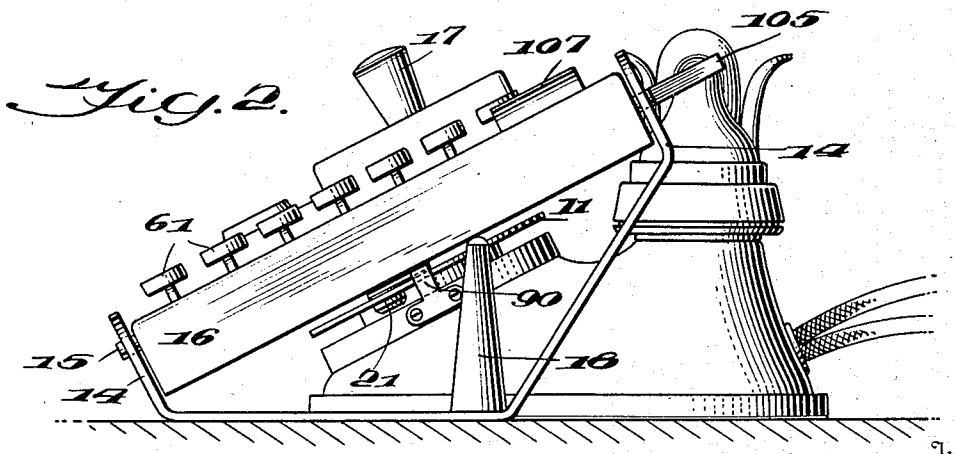


Fig. 2.

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AUTOMATIC DIAL OPERATOR

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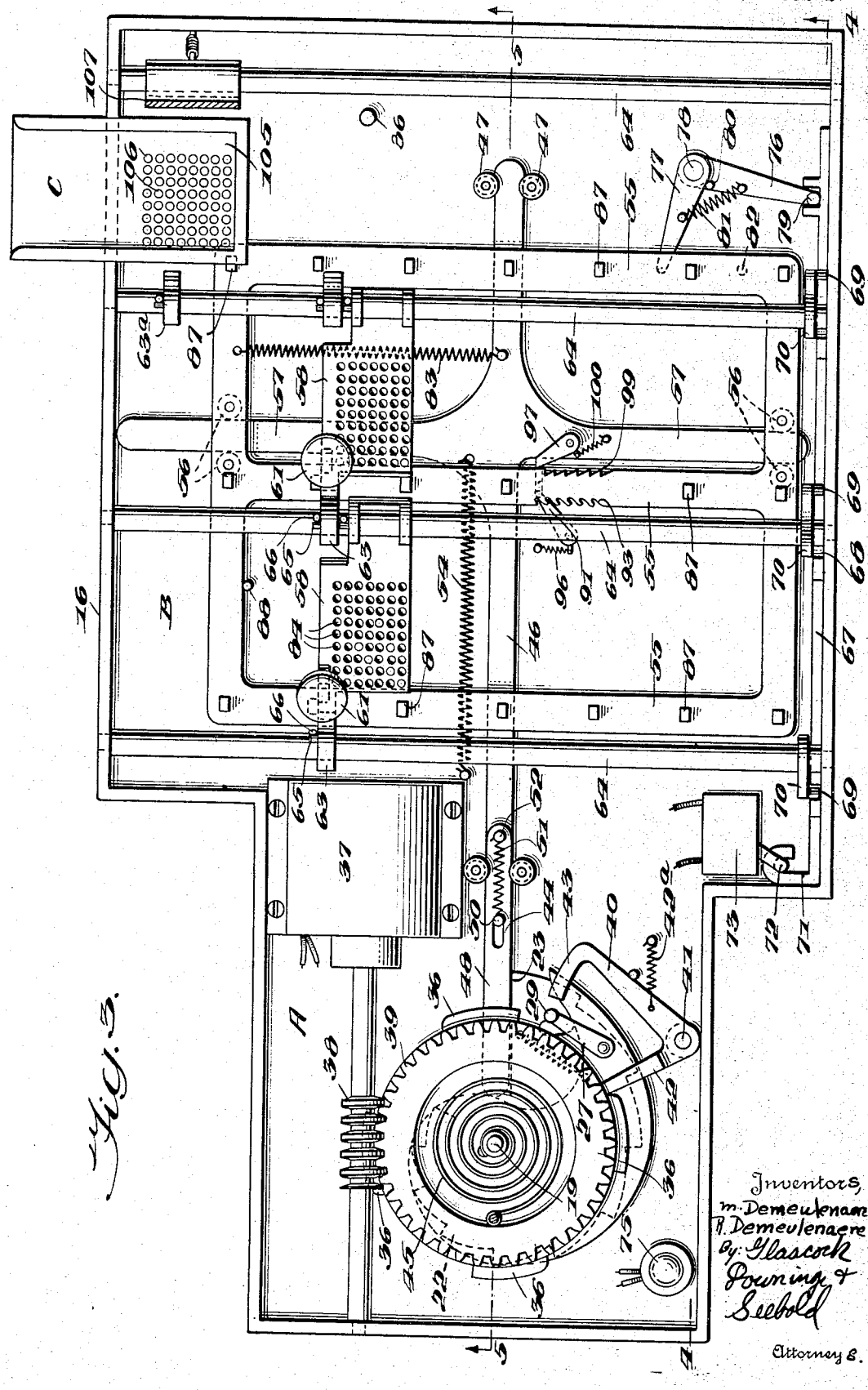


Fig. 2.

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AUTOMATIC DIAL OPERATOR

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Fig. 4.

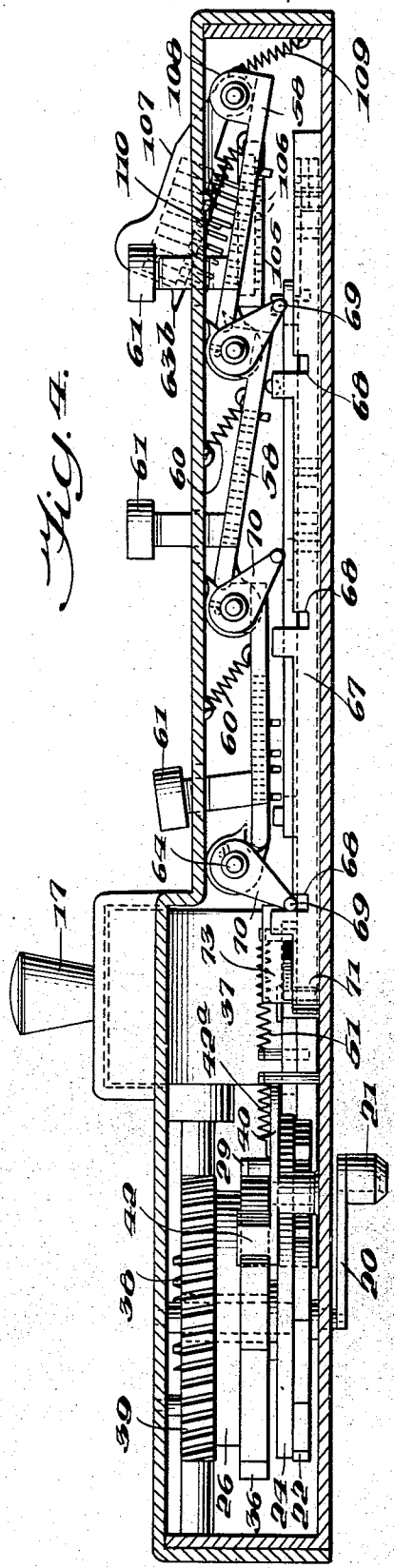
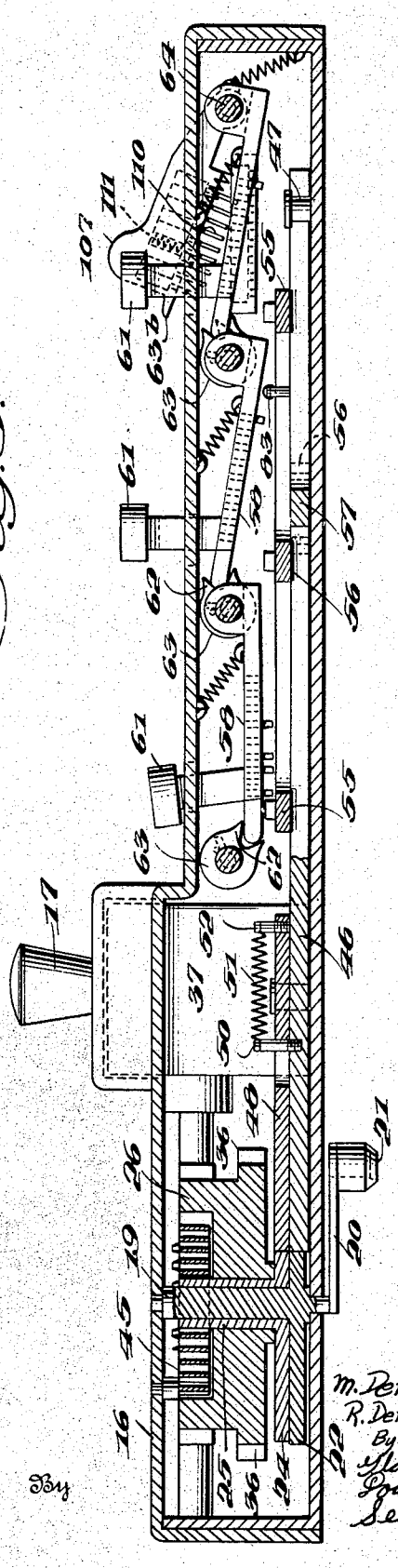


Fig. 5.



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AUTOMATIC DIAL OPERATOR

Filed Jan. 2, 1941 4 Sheets-Sheet 4

Fig. 9.

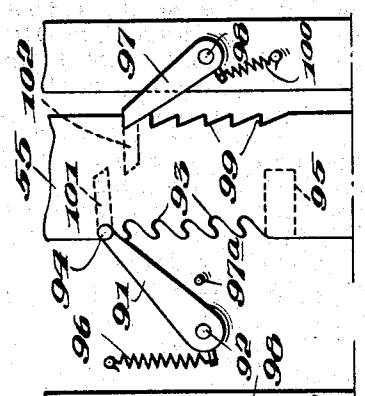


Fig. 8.

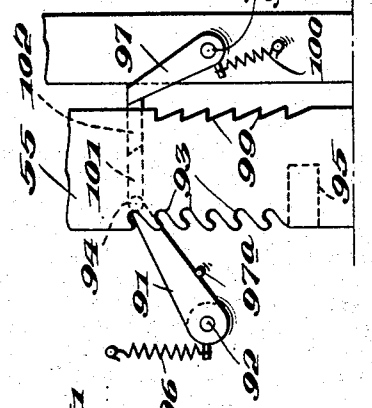


Fig. 10.

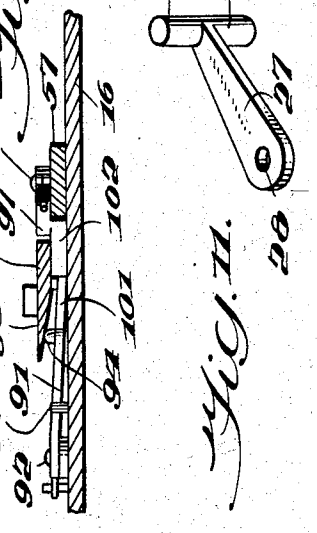


Fig. 11.

Fig. 7.

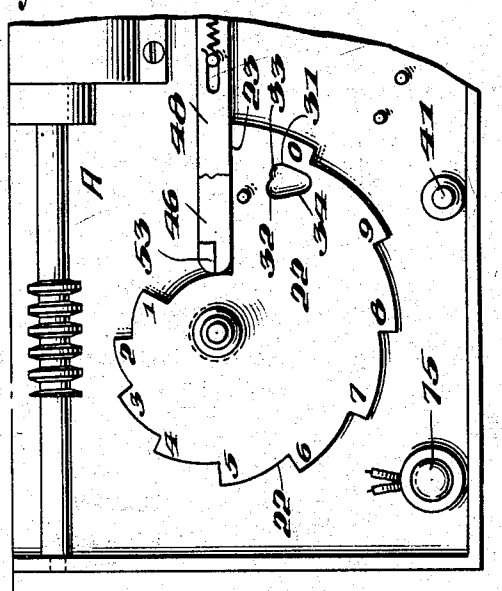
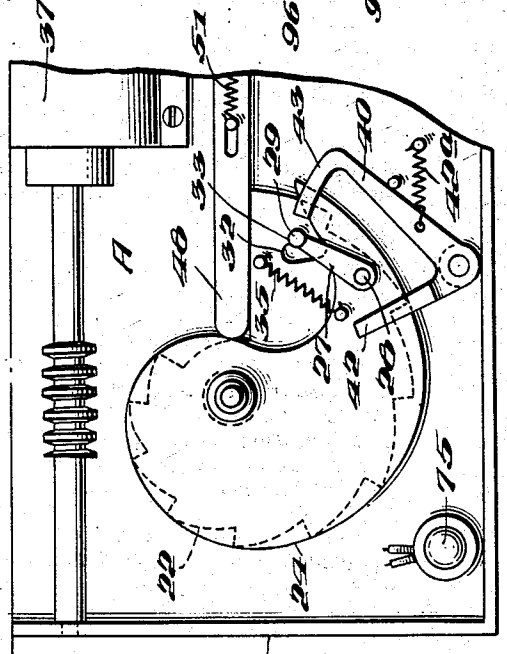


Fig. 6.



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Patented May 4, 1943 2,318,467

UNITED STATES PATENT OFFICE

2,318,467

AUTOMATIC DIAL OPERATOR

Marcel Demeulenaere and Robert Demeulenaere,
Flushing, N. Y.

Application January 2, 1941, Serial No. 372,912

11 Claims. (Cl. 179—90)

This invention relates to a device for use in conjunction with dial telephones by which an unlimited number of telephone numbers may be automatically dialed.

An object of the invention is the provision of a device of this character which will save the user the time and inconvenience of manual operation of the dial and insure accuracy of dialing operations by totally obviating the errors which naturally occur when the user is compelled to rely upon memory even when dialing freqeuently used numbers.

Another object is to provide an arrangement having a keyboard, the individual keys of which when separately depressed initiate operation of the telephone impulse dial and manipulate the latter in such manner as to dial the particular number with which the depressed key corresponds.

A still further object is to provide a manually settable perforated card sensing device by which the dial operator may be controlled independently of the keys to dial various numbers in dependence upon the disposition of perforations provided in private or business cards.

In the accompanying drawings:

Fig. 1 is a perspective view of the automatic dial operator applied to a dial telephone set;

Fig. 2 is a side elevation thereof;

Fig. 3 is a top plan view of the invention removed from the telephone and with the top of the casing detached;

Fig. 4 is a longitudinal section on the line 4—4 of Figure 3;

Fig. 5 is a longitudinal sectional view on the line 5—5 of Figure 3;

Figs. 6 and 7 are detailed views showing, respectively, the specific structure of the spiral driving cam and the spirally stepped stop wheel;

Figs. 8 and 9 are detailed views in top plan of the carriage feed device;

Fig. 10 is a transverse sectional view through Fig. 8 showing the relation of the parts;

Fig. 11 is a perspective view of the coupling lever.

Referring to the drawings in detail, Fig. 1 shows the invention applied to a conventional telephone set provided with the usual base 10 and rotatable impulse wheel 11 having the usual openings 12 therein. In one convenient embodiment of the invention a base member 13 is provided with rim 13a conforming in shape to and receiving the base 10 of the telephone set in such manner as to retain the dial operator in proper position against accidental displacement. The base 13 is provided with bracket arms 14 by means of which the dial operator casing 16 is pivotally supported on a pin 15. A portion of the casing 16 overlies the impulse disc 11 and by swinging the entire casing about the pivot pin 15 the subscriber may have access to the dial for the usual manual manipulation thereof. For this purpose, a knob 17 provided on the left hand portion of the casing and an upright post 18 is provided on the base 13 for supporting the casing and preventing the weight thereof from being imposed on any part of the telephone set.

The dial operating mechanism A and control mechanism B therefor are housed in the casing 16. The dial operating mechanism is composed of a central shaft 19 rotatably mounted in the top and bottom of the casing 16 and provided at its lower terminal with a dial operating crank arm 20, the crank pin 21 of which is of suitable size and shape to be received within the apertures 12 of the impulse disc 11. A spiral stop wheel 22 is rigidly connected with the shaft 19 and rotatable therewith and is provided with ten radial stop shoulders designated 1, 2, 3, 4, 5, 6, 7, 8, 9, 0. These stop shoulders correspond with the usual markings on the dial of a dial telephone set and they are spaced 30° apart in accordance with the spacing of the apertures in the conventional impulse disc. The radial stop shoulders are arranged in a series disposed spirally of the axis of rotation of the stop wheel 21 and an oppositely facing stop shoulder 23 is provided to arrest the return rotational movement of the stop wheel. The shoulders 1 and 23 are spaced apart a distance of 60° and the purpose of this arrangement will be more clearly understood from the following description.

A spiral driving cam 24 is arranged immediately above the stop wheel 22 and is provided with a tubular hub 25 rotatably supporting the toothed drive wheel 26. The cam surface of the driving cam 24 is of spiral form and approximately conforms in shape and size to the tips of the spiral series of stop shoulders 1–0. A releasable coupling lever 27 is pivotally connected at 28 to the driving cam 24 and is provided at one end with oppositely directed pins 29 and 30. The lower pin 30 is movable in a substantially triangular opening 31 provided in the underlying portion of the stop wheel 22. The wall of the opening 31 is provided with notches 32 and 33 adapted to alternatively receive the lower pin 30 of the coupling lever 27 and the edge 34 of said opening nearest adjacent the axis of the stop wheel constitutes a cam surface cooperating with

the pin 30 to swing the coupling lever 27 outwardly under conditions to be hereinafter more fully explained. The stop wheel 22 is connected with the driving cam 24 by a spring 35, the tension of which tends to retain said parts in a definite angular position determined by the engagement of the pin 30 in the notches 32 and 33.

The drive wheel 26 is provided with peripheral teeth 36 preferably four in number, which are adapted to engage the top pin 29 of the coupling lever 27 when the lower pin thereof is engaged in the notch 32. Clockwise rotary motion is continuously imparted to the drive wheel 26 during periods of operation of the dial operator by means of an electric motor 37 and a worm drive 38—39. A pawl 40 is pivotally mounted at 41 in the casing 16 and is provided with an arm 42 normally held in the path of the teeth 36 of the drive wheel by a spring 42a. The opposite end 43 of the pawl is adapted, when the end 42 thereof is struck and turned by the teeth 36, to strike the pin 29 and shift the latter from the position shown in Fig. 3, into the notch 32. In this position the upper pin 29 is disposed in the path of the teeth 36 of the constantly revolving driving wheel 26 and the latter thus imparts rotary movement to the driving cam 24 and stop wheel 22 through the lever 27 and the spring 35 coupling said wheel and cam. Incident to this rotary movement of the stop wheel 22, the crank arm 21 and impulse disc 11 engaged therewith are turned through an angle which is determined by the control mechanism B. Following this operative rotational movement of the cam 24 and wheel 22 in the clockwise direction, the pin 29 of the coupling lever 27 is disengaged from the drive wheel tooth 36 in a manner which will be hereinafter more fully described and the spiral setting cam is restored to initial position under the influence of a coil spring 45 connected at one end to the top of the casing 16 and at its other end to the tubular hub 25 of said spiral cam.

The mechanism B for controlling the dial operating mechanism A is composed essentially of a carriage actuating slide 46 disposed radially of the shaft 19 and mounted for rectilinear movement between pairs of friction reducing guide rollers 47 mounted in the casing 16. The actuating slide 46 is disposed in the same plane with the stop wheel 22 and in the initial position of said wheel the radial shoulder 23 thereof bears against the adjacent edge of the slide 46. A yieldable pressure bar 48 is slidably mounted on the top surface of the slide 46 and is provided with a slot 49 receiving a pin 50 secured to said slide. A spring 51 is secured at one end to the pin 50 and at the other end to a pin 52 rigid with the bar 48, whereby the bar 48 is normally held in a position projected toward the driving cam 24 in the plane of which latter the bar 48 is situated. Thus, during rotary movement of the spiral driving cam 24, longitudinal movement is imparted to the bar 48 and this motion is transmitted to the slide 46 through the spring 51 which latter, however, permits of limited relative displacement of the bar 48 and slide 46 under conditions to be hereinafter more fully explained. The recessed end 53 of the slide 46 is variably positioned by the control mechanism so as to engage selected shoulders 1—0 of the spiral stop wheel 22 in dependence upon the number to be dialed and the adjacent end of the bar 48 is rounded or otherwise constructed to reduce the friction between it and the spiral edge of the cam 24. The slide 46 and bar 48 mounted thereon are normally urged toward the left of the casing by a spring 54 whereby contact is maintained between the terminal of said bar and the edge of the driving cam 24.

A carriage 55 in the form of an open frame is provided with pairs of guide rollers 56 engaging opposed lateral extensions 57 of the slide 46, whereby the longitudinal movement of said slide is imparted to the carriage 55. The carriage 55 is, however, capable of movement in a direction perpendicular to that of the slide 46 by means of the rollers 56 engaging the lateral extensions 57 and thus the carriage is capable of two movements perpendicular to each other.

In order to control the movements of the carriage and slide 46 whereby the terminal 53 of said slide is properly positioned to arrest the motion of the stop wheel 22 when the latter has traveled through a predetermined angle in dependence upon the movement to be dialed, a plurality of stop pin plates 58 are pivotally mounted on supporting rods 64 fixed in the upright walls of the casing 16. The plates 58 are arranged in two or more rows over the carriage 55 and are normally held in raised inoperative position by springs 60. The plates are lowered to operative position by the depression of keys 61 arranged in rows at the right side of the casing 16 as shown in Fig. 1. The plates 58 of each row are engaged at the free ends in recesses 62 provided in collars 63 which are rotatably mounted on a supporting shaft 64. Each collar is provided with a pin 65 engaging a pin 66 on the shaft 64 whereby the stop pin plate 58 associated with one key 61 may be depressed without causing depression of the remaining plates.

At one end of the shaft 64 supporting the several rows of stop pin plates 58 a universal bar 67 is arranged and is provided with recesses 68 coacting with the pins 69 of crank arm 70 fixed to the ends of the respective shafts 64. Thus, when a key 61 in one row is depressed, the related shaft 64 is rocked and in so doing the pin 69 enters the recess 68 thereby shifting the universal bar 67 longitudinally. In this position the top edge of the universal bar forms an obstruction to the crank pin 69 of the other shafts 64, thereby preventing depression of the keys in the other rows.

The universal bar 67 is hooked as indicated at 71 at one end and engaged with the pin 72 of the operating arm of an electric switch 73. The switch 73 is interposed in the circuit supplying current for the motor 37.

The depression of any one of the keys 61 for initiating operation of the dial operator produces a rocking movement of one of the shafts 64 and through the crank 70, pin 69 and slot 68, the motion imparted to the universal bar 67 closes the switch 73 thereby setting the motor 37 in operation. A window 74 is provided in the casing 16 through which a signal lamp 75 is visible throughout the entire period of operation of the dial operator which affords visible indication of the completion of the dialing operation.

The universal bar 67 is restored to initial position to open the switch 73 at the completion of a dialing operation by a two-armed lever 76—77 pivotally mounted at 78 in the casing 16. The arm 76 is coupled at 79 with the universal bar and the other arm 77 is normally held in engagement with a pin 80 by means of a spring 81. During the upward step-by-step motion of the

carriage 55 which is effected by a mechanism which will be more fully hereinafter described, the arm 77 of the lever is deflected by a pin 82 but during the subsequent return motion of the carriage under the influence of the return spring 83, the pin 82 strikes the lever arm 77 and acting through the pin 80 rocks the arm 77 thereby displacing the universal bar 67 to a position in which the switch 73 is opened thereby interrupting operation of the motor 37 and extinguishing the lamp 75.

Assuming that the automatic dial operator is intended for use in a telephone system wherein the call numbers are composed of 7 figures, each stop pin plate 58 is provided with seven rows of pin holes 84 in which the stop pins 85 are positioned in a manner depending upon the particular telephone number related to the key 61 associated with the stop pin plate.

The automatic dial operator is intended for use in connection with a ten impulse dial telephone and accordingly each row 84 is composed of nine holes corresponding with the dial numbers 1 to 9. In the position of the carriage corresponding with the 0 of the dial, the movement of the carriage in arrested by a stop 86 fixed to the casing 16. Beneath each stop pin plate 58 the carriage 55 is provided with a stop lug 87 which in the initial position of the carriage is disposed in line with the stop pin openings 84 of the first row. The initial position of the carriage is determined by a stop 88 with which the carriage is held in engagement by the tension of the return spring 83. It will also be noted that in the initial position of the carriage indicated in Fig. 3 the stop lug 87 associated with each stop pin plate is spaced from the first stop pin holes of the several rows a distance corresponding to that which the carriage traverses in passing from one pin in each row to the next pin. During this motion of the carriage from the initial position to that in which each stop lug 87 is presented to the pin located in the first pin holes, the slide 46 and also the carriage 55 are displaced by that portion of the spiral driving cam 24 lying between the first shoulder 1 and the return stop shoulder 23. This limited free movement of the carriage 55 is provided in order to accommodate the usual rotary motion of the dial through an angle of 60° before the finger opening 1 therein comes into position in which the motion thereof is arrested by engagement of the operator's finger with the finger stop 90.

The step-by-step feed movement of the carriage for successively bringing each stop lug 87 into alignment with the several rows of stop holes 84 is effected by a shift pawl 91 pivoted at 92 and co-acting with a series of 6 notches 93 provided in the adjacent member of the carriage 55. The active end of the pawl 91 is provided with a pin 94 adapted to enter the notches 93 and the body of the pawl is formed of flexible strip material whereby the terminal carrying the pin 94 may be moved downwardly beneath the adjacent member of the carriage 55 at the completion of the seven stepwise movements of said carriage when the pin 94 is engaged with the inclined surface 95 and flexes said pawl downwardly. The pawl is normally urged towards the notches 93 by a spring 96 and the movement thereof is limited by a stop pin 97a engageable with the underside of the pawl. The carriage is held in its advanced position following each stepped movement thereof by a holding pawl 97 pivoted at 98 to the lateral extension 57 of the slide 46 and normally urged toward the ratchet teeth 99 on the carriage 55 by a spring 100. The pawl 91 is provided with an extension 101 and the pawl 97 is provided with the similar extension 102 which, when the pawl 91 is flexed and is moved to the position shown in Fig. 10 engages and rocks the pawl 97 to inoperative position, the tension of the spring 96 overcoming that of the spring 100. During this releasing movement of the pawl 97 the pawl 91 is held in engagement with the stop pin 97a and the adjacent ends of the extensions 101 and 102 are preferably beveled so as to insure against accidental lifting of the pawl 91.

At the initiation of operation of the dial operator when the slide 46 and the carriage 55 are moved toward the right by the spiral driving cam 24, the carriage moves along the stop roller 88 and in sliding off of the extension 101 of the spring pawl 91 the latter springs upwardly by its own resiliency thereby positioning the pin 94 so as to engage in the first notch 93 upon the return movement of said carriage and slide under the influence of the return spring 54. The return movement of the carriage is limited by engagement of the slide 46 with the surface of the stop wheel 22 lying intermediate the radial shoulder 1 and the return stop shoulder 23 but slightly in advance of the arrest of the carriage, the pin 94 enters the first notch 93 and is swung about the pivot 92 of the pawl 91 thereby effecting a stepwise movement of said carriage with relation to the slide 46 and positioning the carriage stop lug 87 in alignment with the second row of stop holes 84. At this moment, the pawl 97 which has been disengaged from the extension 101 is moved into engagement with the first ratchet tooth by the spring 100 and thereby retains the carriage in its adjusted position against the tension of the spring 83. During the next working stroke of the carriage, the pin 94 is disengaged and is moved into engagement with the stop pin 97a wherein the pin 94 is aligned with the second notch 93 so that, upon the subsequent return movement of the carriage the pin 94 engages the second notch 93 and thus effects a second stepwise movement of the carriage. These stepwise movements of the carriage occur in succession until the carriage is moved to its extreme position in which the pin 94 passes under the inclined edge 95 and disengages the pawl 97, thus releasing said carriage to permit its return to initial position under the influence of the spring 83 as above described.

For the purpose of explaining the operation of the invention it will be assumed that the stop pins 85 in the upper left hand stop plate 58 have been so set as to dial the number 12–6–3400. That is to say, the first pin 85 is inserted in the first hole 84 from the lower left hand corner of the plate 58; the second pin 85 is inserted in the second hole of the second row from the bottom, the third stop pin is inserted in the 6th hole of the third row; the fourth pin is inserted in the third hole of the fourth row and the 5th pin is inserted in the fourth hole of the fifth row. No pins are set to arrest the carriage in the position corresponding with the O on the dial since the stop member 86 limits the full stroke movement of the carriage.

Thus, when the key 61 associated with the stop plate 58 having the pin arranged therein as above described, is depressed, the universal bar 67 is displaced by the rotary motion imparted to the shaft 64 by the collar 63, the crank pin 69 en-

gaging in the related slots 68. The switch arm 72 is thus actuated to close the switch 73 and the electric motor 37 is set in operation and the signal lamp 75 is lighted.

The switch 73 is preferably of the snap type and thus, when it is moved to closed position it retains the universal bar 67 in the position in which the latter is moved by the depressed key 61 and said key is retained in depressed condition by engagement of the crank pin 69 in the recess 68 of the universal bar. The motion of the motor is transmitted to the toothed drive wheel 26 by the worm and gear connection 38, 39 and the first tooth 36 thereof in advance of the arm 42 of the setting pawl 40 turns the latter about its pivot 41 thereby causing the angular extremity 43 of said pawl to engage the pin 30 and cause the latter to move from the notch 33 into the notch 32. In this manner, the pin 29 is moved into the path of the teeth 36 of the drive wheel 26 and the spiral driving cam is carried along with said drive wheel together with the spiral stop wheel 22, the latter being drawn along by the spring 35. Due to the rotary motion of the driving cam 24, the bar 48 together with the slide 46 are moved outwardly with relation to the axis of the cam and in degree proportional to rotary movement of said driving cam, the tension of the spring 51 yieldably retaining the bar 48 and the slide 46 against relative movement. During the first 60° of rotation of the cam 24 the carriage 55 is displaced to such extent as to move each stop lug 87 from its initial position into a position immediately adjacent the first holes of the several rows 84 in the stop plate. Since a stop pin 85 is located in the first hole of the first row of holes, the lug 87 is stopped thereby arresting the movement of the carriage 55 and the slide 46. At this moment, the notch 53 of the slide 46 is disposed in the path of the radial shoulder 1 of the stop wheel 22 and consequently the rotary movement of the latter together with the crank pin 21 is arrested. However, the driving cam 24 continues to move with the tooth 36 of the drive wheel 26 and in so doing the spring 35 is tensioned and the lower pin 30 of the coupling lever 27 moves along the inclined edge 34 and is cammed outwardly so as to disengage the tooth 36. Incident to the above described rotation of the stop wheel 22, movement is imparted to the impulse dial 11 so as to correctly position the latter to dial the number "1." When the driving cam 24 is released from the tooth drive wheel 26, the spring 35 effects relative rotary movement of the driving cam and stop wheel thereby re-engaging the lower pin 30 in the notch 33 and coincident therewith the tension of the coil spring 45 returns the stop wheel 22 and driving cam 24 to initial position with the return stop shoulder 23 of the stop wheel engaging the slide 46. The spring 54 also returns the slide 46 and the carriage 55 to initial position and in so doing the first notch 93 is caused to engage the pin 94 and thereby swing the pawl 91 upwardly around its axis 92 so as to cause a stepwise movement of the carriage and position the stop lug 87 for coaction with the pin located in the second row of holes 84, the carriage being retained in this position by the coaction of the pawl 97 and the ratchet teeth 99. The sensing of the second pin 85 is effected in the manner above described except that the location of the stop pin 85 in the second hole of the plate 58 permits the carriage 55 to travel a somewhat greater distance so that, when arrested, the notched end 53 of the slide 46 is disposed so as to engage the radial stop shoulder 2 and thereby arrest the movement of the stop wheel 22 when the crank 21 thereof has moved the dial 11 to the position corresponding with "2." These operations are continued in succession until the entire 7 rows of pins have been sensed, the switch operating pin 82 moving upwardly above the arm 77 to operatively position said pin with respect to said arm. Following the last sensing movement of the carriage 55, the latter is returned by the spring 54 together with the slide 46, the inclined face 95 of the carriage being positioned to engage and depress the flexible pawl 91 whereby its extension 101 engages the extension 102 of the pawl 97 and thereby disengages the latter from the teeth 99. The carriage being thus released is restored to initial position under the influence of the spring 83, the pin 82 engaging and swinging the arm 77 together with the arm 76 and through the connection thereof with the universal bar 67, the latter is shifted to open the switch 73 and restore the crank pin 69 and shaft 64 to initial position and permit the stop pin plate 58 together with the related key 61 to be lifted under the influence of its spring 60.

As an alternative means for effecting operation of the telephone dial the perforated card sensing device designated at C may be employed. This device is composed of a card holder 105 having perforations 106 therein in number and arrangement corresponding to all possible combination of perforations in a card inserted therein. A member 107 is pivotally mounted at 108 above the card holder 105 and is normally retained in raised position by a spring 109, rows of stop pins 110 are movably mounted in the hinged member 107 and are normally retained in outwardly projecting positions by springs 111. Thus, when the hinge member is swung downwardly the pins 110 which are presented to the openings in the card pass therethrough and also through the opening 106 in the holder 105 and project below the bottom surface of said holder. One of the stop lugs 87 is provided on the carriage 55 in a position having the same relation to the stop pins 110 as the stop pins 85 in the pin plates 58.

The shaft 64 supporting the stop plates 58 nearest adjacent the perforated card holder 105 is provided with a recessed collar 63*a* coacting with an extension 63*b* on the member 107 and thus when the member 107 is manually depressed in the act of sensing a card, the shaft 60 is oscillated and its crank pin 69 coacting with the universal bar 67 closes the switch 73 and initiates operation of the motor 37. During the period of operation of said motor the lamp 75 remains illuminated and, as will be understood, the member 107 is retained in depressed position by the switch 73 coacting with the universal bar 67 until the carriage 55 has returned to initial position under the influence of the spring 83 and actuated the lever 76—77 by means of the pin 82.

The tension of the spring 45 is relatively light and only sufficient to overcome the inertia of the stop wheel 22 and the driving cam 24 and return the latter with the crank pin 21 to initial position at substantially the same speed as the normal return movement of the impulse dial 11 under the influence of the usual spring return drive.

It will be understood that the carriage 55 is

swiftly returned to initial position by the spring 83 when the 7 strokes thereof have been completed and the pawl 97 is disengaged from the teeth 99. The dialing crank pin 21 however, returns to initial position at substantially a slower speed and therefore the carriage operates to open the switch 73 through the levers 76—77 and universal bar 67 before the pin 29 of the coupling lever 27 resumes its position opposite the angular end 43 of the pawl 40.

It is apparent from the foregoing that the use of the automatic dial operator will in no way mar, injure or produce any other detrimental effect upon the telephone set or its efficient operation. On the contrary, it promotes efficiency and prolongs the life of the equipment because the manipulation of the telephone dial 11 by the operating crank 21 is smooth and uniform and the telephone is thus protected from such abuses as they are frequently subjected by manual operation such, for instance, as the practice of users in attempting to hasten completion of a call, of accelerating the return movement of the dial by the manual application of pressure thereto.

What we claim is:

1. An automatic dial operator comprising a member operatively engageable with a telephone dial for effecting variable angular displacements thereof, means for effecting a succession of displacements of said member and for controlling the angular magnitude of each displacement of said member in dependence upon the telephone number to be dialed, said means including a slide for arresting the movement of said member in various angular positions thereof, a carriage movable in one direction with said slide and in another direction independently thereof, means normally urging said carriage in the second mentioned direction and means for moving said carriage stepwise, the last mentioned means including a pawl for effecting stepwise movement of the carriage, a pawl for retaining the carriage in adjusted position and means on the first pawl at the end of the movement of the carriage to engage and displace the second mentioned pawl and release said carriage.

2. An automatic dial operator comprising a rotatable dial actuating member, shiftable stop means for variably limiting the rotary movements of the actuating member in one direction, a cam for shifting said stop means, means for intermittently driving said cam and said actuating member in said direction and rendered ineffective in dependence upon stoppage of said actuating member by said stop means, and manually controlled selective means for determining the extent of each of a series of shifting movements of said stop means.

3. An automatic dial operator comprising a rotatable dial actuating member, shiftable stop means for variably limiting the rotary movements of the actuating member in one direction, manually controlled selective means for determining the extent of each of a series of shifting movements of said stop means, a rotatable cam for shifting said stop means, yieldable motion transmitting means between said cam and said stop means, and means for intermittently driving said cam and said actuating member in said direction and rendered ineffective in dependence upon stoppage of said actuating member by said stop means.

4. An automatic dial operator comprising a rotatable dial actuating member, shiftable stop means for variably limiting the rotary movements of the actuating member in one direction, a cam for shifting said stop means, manually controlled selective means for determining the extent of each of a series of shifting movements of said stop means, a yieldable drive coupling between said cam and said actuating member, a drive member, and releasable drive means between said drive member and said cam rendered ineffective in dependence upon stoppage of the actuating member by said stop means.

5. An automatic dial operator comprising a rotatable dial actuating member, shiftable stop means for variably limiting rotary movements of the actuating member in one direction, manually controlled selective means for determining the extent of each of a series of shifting movements of said stop means, a rotatable cam for shifting said stop means, yieldable motion transmitting means between said cam and said stop means, and yieldable means for driving said actuating member through said cam and rendered ineffective in dependence upon stoppage of said actuating member by said stop means.

6. An automatic dial operator comprising a rotatable dial actuating member, shiftable stop means for variably limiting the rotary movements of the actuating member in one direction, a cam for shifting said stop means, manually controlled selective means for determining the extent of each of a series of shifting movements of said stop means, a rotary uni-directional drive member, a coupling member carried by said cam and operable to establish a driving connection between the latter and said driving member, means actuated by said driving member to render said coupling member effective, a yieldable coupling between said cam and said actuating member, and means for rendering said coupling member ineffective in dependence upon stoppage of said actuating member and subsequent relative movement of the said actuating movement and said cam.

7. An automatic dial operator comprising a rotatable dial actuating member, two part shiftable stop means, one part of said stop means being operable to variably limit the rotary movements of the actuating member in one direction, a cam coacting with the other part of the said stop means for shifting the latter, a yieldable connection between said parts, means for intermittently driving said cam and said actuating member in said direction and rendered ineffective in dependence upon stoppage of said actuating member by said stop means, and manually controlled selective means for determining the extent of each of a series of shifting movements of said stop means.

8. An automatic dial operator comprising a rotatable dial actuating member, a stop slide shiftable in one direction for variably limiting the rotary movements of the actuating member, drive means common to the stop slide and the actuating member and rendered ineffective in dependence upon stoppage of said actuating member by said stop slide, a carriage shiftable with said stop slide and movable stepwise in a direction perpendicular thereto, means for effecting stepwise movement of said carriage, projections on said carriage, a plurality of independently movable plates, rows of stop pins on each plate coacting with one of said projections for determining the extent of each of a series of shifting movements imparted to said slide and carriage by said drive means.

9. An automatic dial operator comprising a rotatable dial actuating member, a stop slide shiftable in one direction for variably limiting the rotary movements of the actuating member, drive means common to the stop slide and the actuating member and rendered ineffective in dependence upon stoppage of said actuating member by said stop slide, a carriage shiftable with said stop slide and movable stepwise in a direction perpendicular thereto, means for effecting stepwise movement of said carriage, projections on said carriage, a plurality of independently movable plates, rows of stop pins on each plate coacting with one of said projections for determining the extent of each of a series of shifting movements imparted to said slide and carriage by said drive means, a plurality of manually operable members for moving said plates to operative position, a common support for the several manually operable members, and means including said support and actuated by any one of said manually operable members upon actuation thereof to render the remaining manually operable members ineffective.

10. An automatic dial operator comprising a rotatable dial actuating member, a stop slide shiftable in one direction for variably limiting the rotary movements of the actuating member, drive means common to the stop slide and the actuating member and rendered ineffective in dependence upon stoppage of said actuating member by said stop slide, a carriage shiftable with said stop slide and movable stepwise in a direction perpendicular thereto, means for effecting stepwise movement of said carriage, projections on said carriage, a plurality of independently movable plates, rows of stop pins on each plate coacting with one of said projections for determining the extent of each of a series of shifting movements imparted to said slide and carriage by said drive means, manually actuated members for moving the plates to operative position, a common support for the several manually actuated members, a control switch for the drive means rendered operative by said support in dependence upon actuation of the manually actuated members, and means actuated by the carriage upon completion of a series of shifting movements thereof for rendering said switch inoperative.

11. An automatic dial operator comprising a rotatable dial actuating member, a stop slide shiftable in one direction for variably limiting the rotary movements of the actuating member, drive means common to the stop slide and the actuating member and rendered ineffective in dependence upon stoppage of said actuating member by said stop slide, a carriage shiftable with said stop slide and movable stepwise in a direction perpendicular thereto, means for effecting stepwise movement of said carriage, projections on said carriage, a plurality of independently movable plates, rows of stop pins on each plates coacting with one of said projections for determining the extent of each of a series of shifting movements imparted to said slide and carriage by said drive means, manually actuated members for moving the plates to operative position, a common support for the several manually actuated members, a control switch for the drive means rendered operative by said support in dependence upon actuation of the manually actuated members, and means actuated by the carriage upon completion of a series of shifting movements thereof for rendering said switch inoperative, and restoring the manually actuated means to initial position through said common support.

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