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COMPLETE SPECIFICATION.

An Improved Number Dial for Automatic and Semi-automatic Telephone Systems.

We, SIEMENS BROTHERS & COMPANY LIMITED, of Caxton House, Westminster, S.W., in the County of London, Electrical Engineers, and EARL ALEXANDER PETITHORY, of 17, St. John's Park, Blackheath, London, S.E., Electrical Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The invention relates to improvements in number dials for automatic and semi-automatic telephone systems, which allow a longer interval of time between the actuation of the dial and the transmission of the first current impulse, than is obtained in previously known constructions of these instruments.

In this apparatus the subscriber himself sets up a connection with a wanted line by first removing his receiver from the switch book and then placing his finger in a hole corresponding to the first digit of the number of the wanted line and rotating the dial until the finger stop is reached. When the finger is removed the dial returns to its normal position and in so doing sends out to the line current impulses corresponding to the number set. As soon as a first selector has been set by these current impulses and before the impulses corresponding to the second digit place of the number of the wanted line are transmitted by a similar manipulation of the dial, a free line from this selector to the next selecting device must be automatically found by the selecting devices at the exchange. In the usual construction the dial is divided into twelve spaces and the finger stop is placed at a distance of $1\frac{1}{2}$ of such spaces from the first hole, so that the first current impulse of any series of impulses is sent out almost immediately after the release of the dial. The switches may have to hunt over as many as 10 or even 20 and in some cases a still larger number of bank contacts to find a disengaged line. It is usually arranged that by means of a governor the return motion of the dial is regulated, so that ten impulses are sent per second, but there is no such speed limit imposed on the forward motion of the dial and if the subscriber manipulates the dial immediately after he has removed his receiver, or has sent out the first set of impulses it may very well happen that the first impulse of the series arrives before a disengaged line has been found and that a false connection or no connection at all is set up.

As the present tendency in automatic and semi-automatic systems is to use larger groups of apparatus, involving more bank contacts, and also to use call seekers, which hunt over contacts to find the calling subscriber's line, the difficulties mentioned become more serious.

These drawbacks are obviated according to the present invention, in which a space is arranged on the dial between figure 1 hole and the finger stop, equal to four times the interval between two adjacent figure holes and means are provided for preventing any impulses from being sent out until nearly the whole of this space has been traversed by the number dial in its return movement to

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the normal position. Also an improved method is described for preventing the dial from returning too rapidly to its normal position.

In the accompanying drawings, Fig. 1 is a front elevation of the number dial instrument, Fig. 2 is a rear elevation, and Fig. 3 is a plan view partly in section.

Fig. 4 is a front elevation with certain parts removed, showing the impulse transmitting and governing mechanism.

Fig. 5 is a perspective view of the dial and its toothed gear.

Fig. 6 is a detail view of a coupling plate.

In Fig. 1, 1 is the dial plate, 11 the finger holes and 3 the spindle to which the dial plate is secured, extending through the apparatus to the rear side, where it is notched as shown at 12 (Fig. 5) to receive one end of the driving spring 13 (Fig. 3), the other end of which is secured to a projection 14 (Fig. 2) of the back plate 15. On the spindle 3 (Fig. 5) and secured to the dial plate 1 is the wheel 2, which has driving teeth 6, on its outer circumference and ratchet teeth 16 for engaging a pawl 5 (Fig. 6) on its inner circumference. The number of ratchet teeth is the same as that of the equal spaces into which the dial can be divided, in this case 14, corresponding to the figures 0—9 and the space between the first hole and the finger stop, which as stated above is equal to four times the space between two adjacent figures.

Turning freely on the main spindle 3, is a sliding plate 4 (Figs. 3 and 6) to which is secured the pawl 5, which is pressed into engagement with the teeth 6 of the gear wheel 2 by a spring 7, the other end of which is secured to the plate 4. A slot 17, in the plate 4, receives a pin 10 (Figs. 3 and 4) mounted on one face of the impulse gear wheel 9, which engages with a pinion 29 (Fig. 4) mounted on a small shaft 30 (Fig. 2), extending through the back plate 15 and carrying the device 31 for actuating the springs 32. This device is made of insulating material such as ebonite or vulcanised fibre and is formed with two diametrically opposite extensions, which at every half revolution pass between and separate two contact springs, which are normally in contact and thereby transmit the current impulses to the line. The number of teeth in the pinion 29 and in the gear wheel 9 is such, that the number of impulses transmitted corresponds with the number set on the dial.

The back plate 15 (Fig. 3) is pressed so that a cup shaped space is formed at the centre to receive the gear wheel 9, and other parts, and is secured by three lugs 33 (Fig. 2) to the casing. A boss 18 (Fig. 3) on the plate 15 or which the wheel 9 turns forms also a bearing for the shaft 3. The plate 15 has also an outer rim 34 (Fig. 3) to which is attached a piece of cardboard or paper 38 on which is printed the numbers 0—9 and which is held in position by a strip of celluloid or other transparent material. The numbers are placed, so that they appear opposite the corresponding finger holes 11 and can be seen through them. A stop pin 36 (Fig. 5) on the dial 1 normally rests against the finger stop 35 (Fig. 1), which is secured to the back plate 15. A guard ring 37 (Fig. 3) protects the internal parts from injury, without hiding the numbers on the strip 38.

The governing mechanism for controlling the rate of the return of the dial to normal and consequently the rate of transmission of the current impulse, comprises a pinion 19 (Fig. 3) engaging with the gear wheel 2 and secured to a spindle 20, on which a worm wheel 21 is loosely mounted. One end of a spiral spring 22 is connected to the worm wheel and the other end of the spring is wound tightly around the shaft 20 so as to grip it so that when the spindle revolves by the dial being rotated by the subscriber, the spring 22 tends to unwind and no longer grips the shaft so that the worm wheel 21 does not revolve, but when the spindle 20 revolves in the opposite direction on the return movement of the dial, the spring tightens on the spindle and revolves thereby driving the worm wheel 21. The worm wheel engages with a worm 23 (Fig. 4) on the axle of which two governor springs 24 are secured at 26. The outer

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free ends of the springs are weighted and revolve in the casing 25 (Fig. 4). Any increase in the speed of the worm 23 beyond the normal rate will cause the weighted ends of the springs 24 to press against the casing 25 and thereby act as a brake during the return movement, on the worm and spindle, the worm wheel 21, pinion 19 and dial 7.

The worm and governor are mounted in a frame 27 (Fig. 4), which is secured to the inside of the back plate 15 and protects the moving parts from any chance of injury.

An aperture 28 (Fig. 2) gives access to the mechanism for the purpose of regulation.

The action is as follows:—When the dial is to be set, the finger is placed in the hole corresponding to the number of impulses to be transmitted and the dial is rotated clockwise until the finger reaches the finger stop 35, this movement winds up the spring 13 and rotates wheel 2.

The end 39 (Fig. 6) of slot 17 in plate 4 is normally resting against pin 10 of the impulse wheel 9 and pawl 5 is in gear with the teeth 16 of wheel 2, so that the sliding plate 4 moves with the spindle 3 until the end 40 of slot 17 strikes pin 10; as pin 10 is secured to the impulse wheel 9, which is prevented from moving in this direction, the sliding plate 4 stops and the gear wheel 2 rides past pawl 5 for the rest of the motion of the dial 1.

When the dial 1 is released and is returned to its normal position by the spring 13, the pawl 5 in mesh with the teeth 16 of the gear wheel 2 will cause the sliding plate 4 to return with it, but the impulse wheel 9 will not move until the sliding plate 4 has moved back through the length of the slot 17 and caused the end 39 of the latter to engage with the pin 10. When this point has been reached the impulse wheel 9 will also rotate and the contact breaker 31 will cause the springs 32 to intermittently open and close the circuit and transmit the required number of current impulses.

The length of the slot 17 is related to the space between the finger hole 11 and the finger stop 35 on dial 1 in such a manner, that the first impulse will be transmitted, when the hole in which the finger has been placed reaches the dotted line A. B. (Fig. 1) on the return movement of the dial and the first impulse will then be transmitted. The minimum interval of time, during which the selector can hunt for a disengaged line, or a call finder can set itself on the calling line, is that taken in moving the dial over a space equivalent to passing over four holes in the forward motion of the dial, and 3 holes in the return movement.

The minimum time allowed according to the present invention for hunting the bank contacts is thus increased to about three times the minimum obtained in previous constructions and is sufficient to allow a very large number of bank contacts to be wiped without any risk of a false connection.

The impulse transmitting device according to the invention is equally adapted for both the two or three wire systems, slight changes in the connections and in the number of springs being only required.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A number dial instrument for automatic and semi-automatic telephone systems, in which the first current impulse is not transmitted until the dial has traversed a distance in its return movement equivalent to at least more than twice the space between adjacent finger holes.

2. A number dial instrument according to Claim 1, in which the space on the dial between the first finger hole and the finger stop is at least more than twice the space between adjacent finger holes.

3. A number dial instrument according to Claim 1, in which gearing attached to the dial is connected with the impulse wheel by means of a coupling, which

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allows the dial, when released, to be moved through the required space, before the motion is imparted to the impulse wheel.

4. A number dial instrument according to Claim 3, in which a disc carrying a pawl gearing with teeth on a wheel attached to the dial is provided with a slot, into which a pin secured to the impulse wheel projects, substantially as described. 5

5. In a number dial instrument according to Claim 3, a gear wheel secured to the dial plate provided with driving teeth on its outer circumference and ratchet teeth on its inner circumference.

6. In a number dial instrument according to Claim 1, a spring forming a friction clutch between the driving mechanism and the governor, which controls the intervals of time between the transmission of the succeeding current impulses, by which the governor is only caused to rotate during the return and not during the forward movement of the dial, substantially as described. 10

7. A number dial instrument for automatic and semi-automatic telephone systems, substantially as described with reference to the accompanying drawings. 15

Dated this 23rd day of June, 1913.

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Agents for the Applicants. 20

FIG. 1.

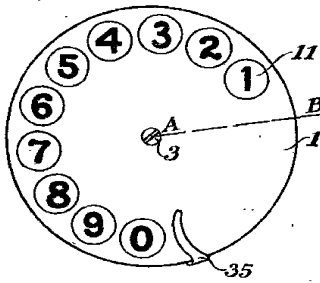


FIG. 3.

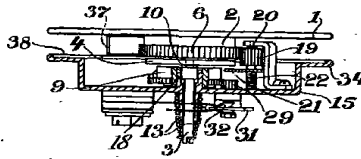


FIG. 4.

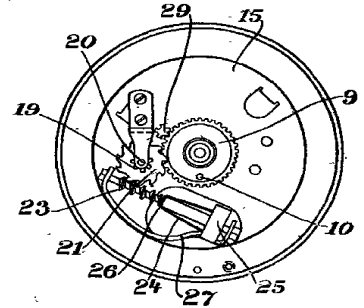


FIG. 2.

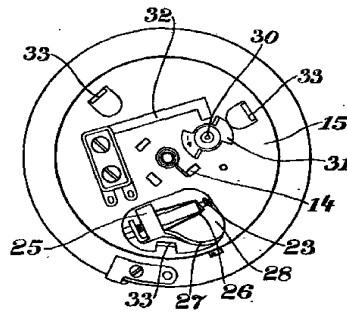


FIG. 5.

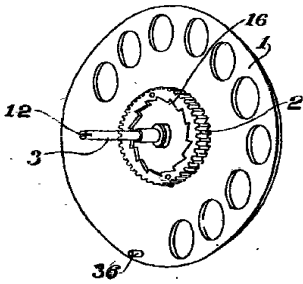
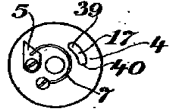


FIG. 6.



[This Drawing is a reproduction of the Original on a reduced scale.]

FIG. 1.

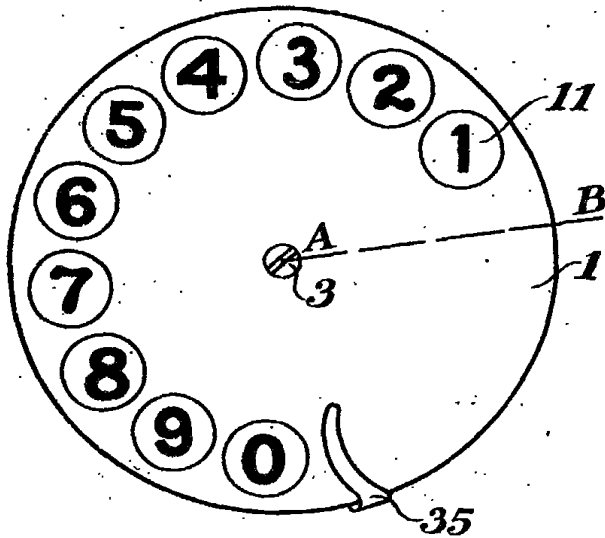


FIG. 3.

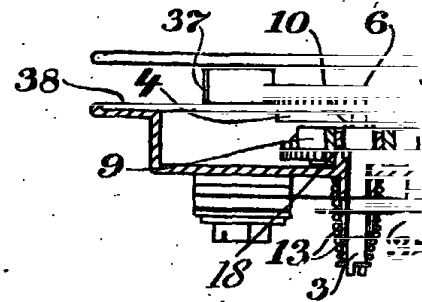


FIG. 2.

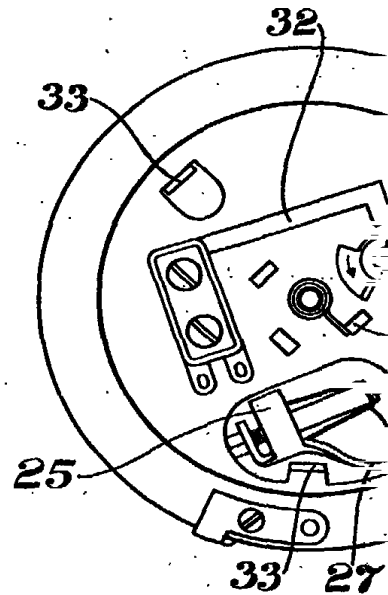


FIG. 5.

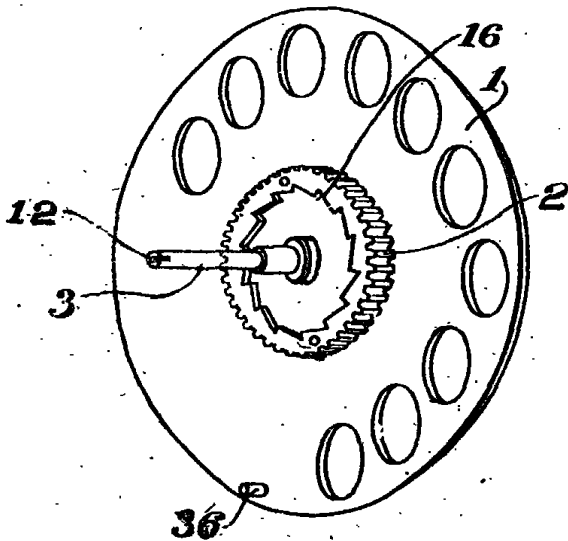


FIG. 4.

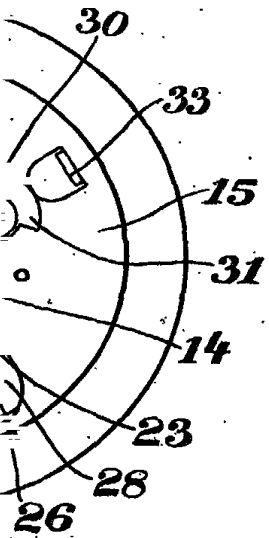
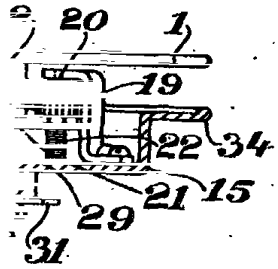
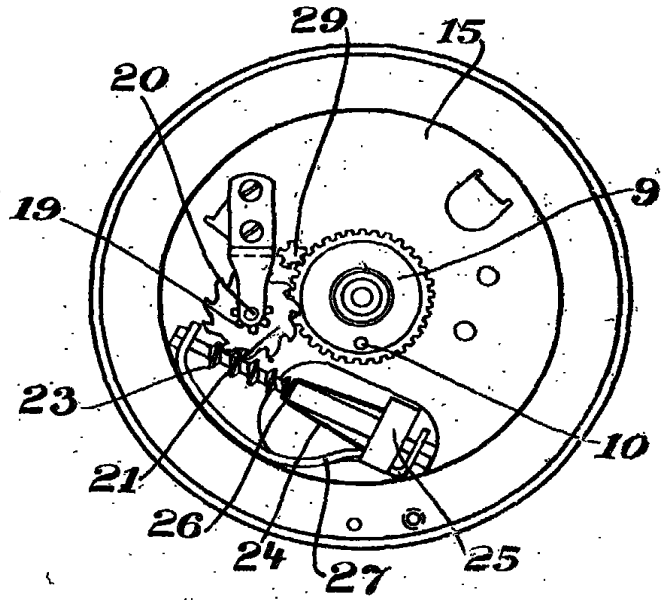


FIG. 6.

