April 11, 1950 B. J. BRANDER 2,503,542

SLIDABLE CALL TRANSMITTER WITH SPINDLE MECHANISM

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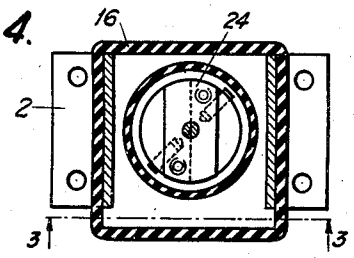
Fig. 4.



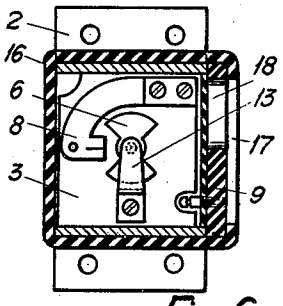


Fig. 6.

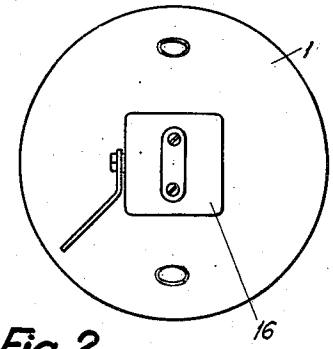


Fig. 2

Fig. 3

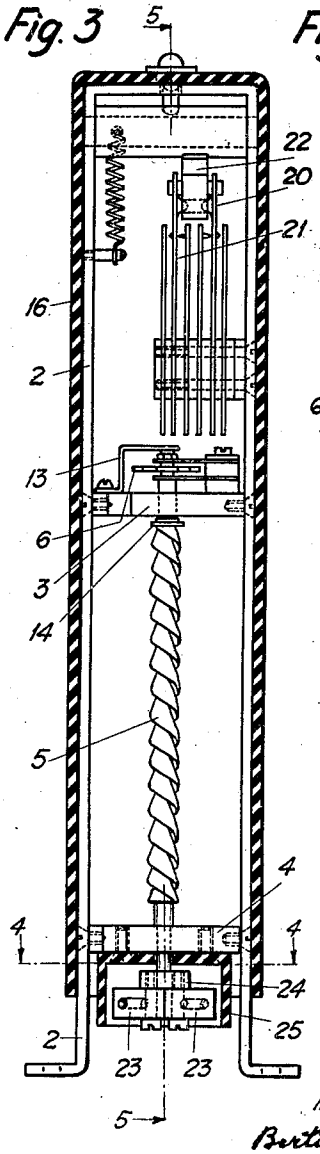
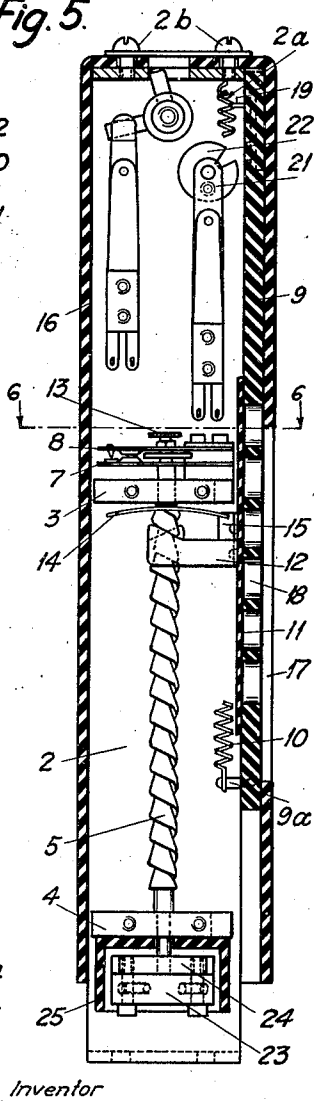


Fig. 5.



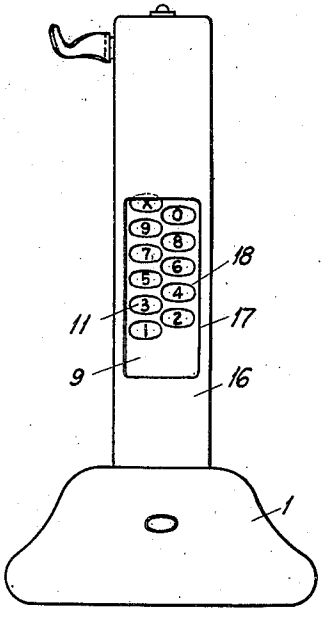


Fig. 1

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SLIDABLE CALL TRANSMITTER WITH SPINDLE MECHANISM

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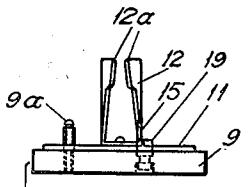


Fig. 7

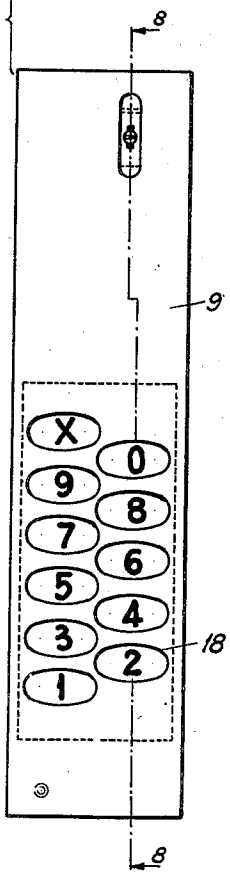
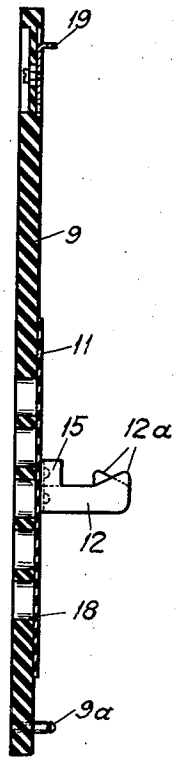


Fig. 8



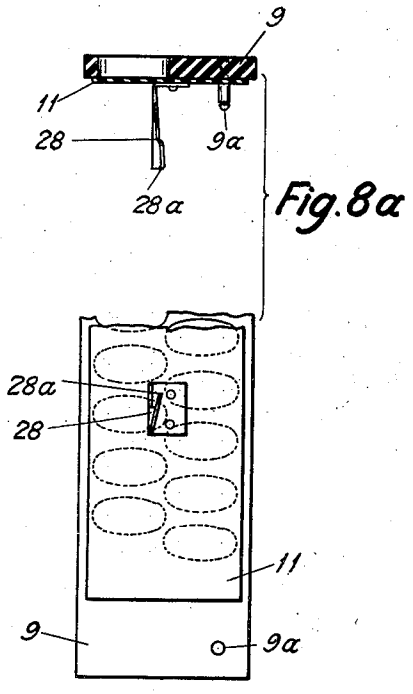


Fig. 8a

Fig. 9

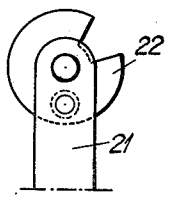
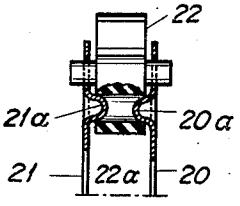


Fig. 10



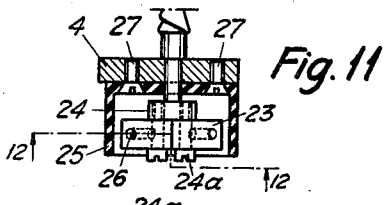


Fig. 11

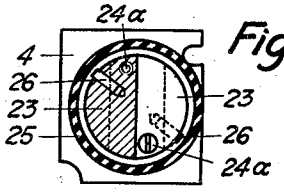


Fig. 12

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UNITED STATES PATENT OFFICE

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SLIDABLE CALL TRANSMITTER WITH SPINDLE MECHANISM

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Application August 4, 1949, Serial No. 108,443
In Sweden November 26, 1948

12 Claims. (Cl. 179—90)

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This invention relates to calling devices or so-called dials for automatic telephone systems and particularly to the type of dial using a finger-hole plate in the form of an elongated slide with a straight-lined motion, in place of the commonly used circular dial.

The principal object of the invention is to provide a calling device with an impulse-sending mechanism of extreme simplicity, which also affords an easier and faster dialing than the usual circular dial. A feature of this improved calling device is the absence of gear wheels, the only rotatable member of the mechanism being an elongated threaded spindle engaging with the slide and adapted to actuate the impulse-sending contact.

The elongated design of this calling device makes it particularly suitable for mounting in the column of a substation table set of the pedestal type, but it may also come in useful for other types of substation sets as well as for mounting in the panel of manual switchboards.

The accompanying drawings illustrate the application of the invention to a substation table set of the pedestal type.

Fig. 1 shows a front view of said instrument with the hand set removed.

Fig. 2 is a plan view of the same.

Fig. 3 shows a vertical section of the column with the slide removed.

Fig. 4 is a cross section of the column near its bottom, relative to Fig. 3.

Fig. 5 is a vertical section of the complete column at right angles relative to Fig. 3.

Fig. 6 is a cross section of the column relative to Fig. 5.

Fig. 7 shows front and end views of the slide.

Fig. 8 shows a section of the slide, Fig. 8*a* shows a modified detail.

Figs. 9 and 10 show two elevations of a portion of a change over switch actuated by the slide.

Figs. 11 and 12 show sectional views of a centrifugal governor applied to the lower end of the rotatable threaded spindle.

The base 1 of the instrument, shown in Fig. 1, consists of a shell of Bakelite containing the usual transformer, a small ringer or buzzer with condenser, and other details, which are well known and not shown on the drawing as they are independent of the invention.

The column, fixed to the base 1, has a skeleton frame 2 in the form of an inverted U preferably made of a piece of flat iron. Between the shanks of the frame 2 are fixed two shelves 3, 4 serving as bearings for the threaded spindle or elongated screw 5 rotatably mounted in said bearings.

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To the upper end of the spindle 5 protruding above the shelf 3, is fixed a small cam wheel 6 of insulating material, two wings of which, when the spindle 5 is rotating, pass in sequence between two contact springs 7, 8, causing these springs to open and close alternately their contact in substantially the same manner as is well known in connection with other dials or impulse-sending devices.

At the lower end of the spindle 5, which is extended below the shelf 4, is arranged a centrifugal governor described in detail below.

The slide 9 is adapted to glide vertically on two of the long edges of the frame 2 and it is further guided and held in its place by the outer covering or cap 16. An helical spring 10, stretched to about the same length as the slide 9, has its upper end fixed to the frame 2 by means of a small hook 2*a* or the like while its lower end is slipped on a small stud 9*a* fixed to the lower end of the slide 9. Thus the spring 10 always tends to pull the slide 9 towards its normal position shown in Fig. 5.

The slide 9, which is preferably carried out in the form of a plane rectangular piece of molded Bakelite, is provided with eleven oval finger-holes 18 arranged in two vertical rows. These finger holes are on the inside of the slide 9 covered up by means of a thin plate 11 of cellon or plastic, which is tightly pasted to the inside of the slide or molded together with same. The plate 11 is provided with the usual numbers 1–0, visible through the finger holes of the slide, while the eleventh hole at the top of the left row is marked with an X. The number-plate 11 is preferably white in color and the figures black, making them distinctly visible through the finger holes of the slide. On the inside of the slide 9 with its number plate 11 is, by means of small rivets or screws, fixed a double ratchet 12 made of a double-bent flat steel spring which at its free ends is provided with bevelled lugs 12*a* adapted to engage with the thread of the spindle. The spindle 5 is provided with two parallel threads and the ratchet 12 embraces it in such a way that each lug 12*a* catches into one of the threads, the upper edge of the lugs 12*a* being bevelled to an angle which coincides with the inclination of the thread. As shown in Figs. 7 and 8, the shanks of the ratchet 12 are somewhat twisted so that only the bevelled edges of the lugs 12*a* catch into the threads of the spindle, with the object that a minimum of friction shall arise during the movements of the slide and the spindle. With regard to the cooperation of the slide and the spindle, it is obvious that the ratchet 12 during the downward movement of the slide will

glide down across the threads without causing any rotation of the spindle, but during the spring driven return movement of the slide the ratchet 12 will act as nut and set the spindle in rotation. To facilitate the downward movement of the ratchet along the spindle, the thread is carried out in an unsymmetrical angular form, giving the profile of the spindle the character of a ratch.

For the purpose of attaining a definite normal position of the spindle 5, a cross aisle 14, preferably made of thin sheet metal, is fixed on the spindle 5 below the shelf 3 and designed to cooperate with a projecting wing 15 fixed to the slide 9. When the slide 9 returns to its normal position, the rotation of the spindle 5 is stopped by the cross-aisle 14 striking against the wing 15 with the one or the other of its arms, thus preventing the spindle 5, owing to its inertia, to pass its proper home position. The wing 15 is preferably made in one piece with the bifurcated spring forming the ratchet 12, a suitable material for same being tempered steel. The spindle 5 may be made of bronze, brass or even Bakelite.

The ratchet 12, acting as two separate spring members catching into the threads on opposite sides of the spindle, evidently produces a pair of forces for the rotation of the spindle during the return movement of the slide 5, resulting in an easy movement of the spindle and a minimum of friction in its bearings. The axial component of said driving forces is reacted by means of a small bracket 13 fixed on the shelf 3. If ball bearings are provided for the spindle 5, the bracket 13 may be omitted. It is of course possible to use a single spring or ratchet in place of the two-legged ratchet 12, particularly if ball bearings are provided, but the double ratchet is in any case preferable.

The outer covering of the column is carried out in the form of an elongated cap 16, preferably made of Bakelite or the like. It has a square or substantially rectangular cross section in conformity with the structure of the frame 2 but somewhat widened at one side for the slide 9, so that a channel or sliding path is provided for the slide between two long edges of the frame 2 and the corresponding side of the cap 16, sufficient play being allowed for the slide to move easily up and down in said channel. The cap 16 is at its upper end fixed to the frame 2 by means of two screws 2*a*, while the lower end of the cap fits tightly in a bead of the base 1. The cap 16 has a rectangular opening 17 in front of the finger-holes of the slide 9, said opening terminating below with an edge of the cap 16 which serves as a stop for the finger when inserted in one of the finger-holes 18 and moved down with the slide.

With regard to the moment of force causing the rotation of the spindle 5 during the return movement of the slide 9, it is of course dependent on the diameter of the spindle and the pitch of its thread. A suitable combination of these factors has proved to be: diameter of spindle 6 mm., pitch of thread 10 mm. The angle of inclination of the thread is in this case about 32°, and the movement of the slide is 5 mm. for each impulse or half turn of the spindle. The depth of the thread is approximately 1 mm. From the above is is obvious that the small spacing of the finger-holes of the slide has a favorable influence on the movements of the finger, resulting in a saving of time and energy. The short range of the slide required for the ordinary ten impulses also makes it possible to arrange the additional step X for sending 11 impulses, as well as two so-

called "blind-steps" which do not produce any impulses but are required in some automatic systems for extending the intervals between the switching operations.

To bring about said "blind-steps" the slide 9 is provided with a projecting nab or a small bracket 19 adapted to actuate a kind of change over switch comprising a set of contact springs and a small cam wheel 22 of insulating material, rotatably mounted between the two long contact springs 20, 21. These springs have each a small wart 20*a*, 21*a* which normally are located in a transverse opening 22*a* in the cam-wheel 22 which, when rotated a small angle, like a wedge forces the springs 20, 21 apart, thereby causing certain changes in the electric circuits, so that the impulse contact 7, 8 is cut in and at the same time the receiver cut out. (These changes of the circuits are well known in connection with other calling devices and for this reason the circuits are not shown in the drawing.) Said rotation of the cam-wheel 22 is caused by the bracket 19 catching into the sectorlike space of the cam-wheel 22, when the slide has been pulled down two steps or about 10 mm. In the same position of the slide during its return movement the bracket 19 will again catch into the cam-wheel 22 restoring it to its normal position, thereby cutting out the impulse contact 7, 8 for the rest of the return movement of the slide.

With regard to the centrifugal governor attached to the lower end of the spindle 5 and shown in detail in Figs. 11 and 12, it is designed with particular consideration to the fact that the spindle 5 rotates rather slowly—about 5 revolutions per second—as compared with the governor generally used in calling devices. The governor shown in the drawing is in its outlines of a well known type. It comprises a cross piece 24 fixed to the lower end of the spindle 5, carrying two semi-cylindrical clogs 23 which are rotatably mounted on two pivots 24*a* inserted in the cross piece 24, while a cylindrical receptacle 25 is fixed to the under side of the shelf 4 by means of two screws 27. In each of the clogs 23 is inserted a small pin of graphite 26 the outer end of which protrudes from the clog so as to slide on the inside of the concentrical receptacle 25 when the spindle is set in rotation. In order that the pins 26 shall press against the receptacle 25 with a greater force than they would do if they were located in the middle line of the clog, they are placed close to the pivots 24*a*. By this arrangement the clogs 23 will press the tips of the pins 26 against the receptacle 25 with a considerably increased force, the clogs acting as powerful levers on account of the short distance of the pins 26 from the pivots relative to the appropriate distance of the centre of gravity of the clogs. This arrangement of the pins 26 may seem a simple measure, but it solves efficiently the problem of attaining sufficient braking effect of the governor in spite of the low speed of the spindle 5.

The described calling device may of course be modified in various details without departing from the main features of the invention. For instance the spindle 5 may have an ordinary flat thread in place of the unsymmetrical angular thread, although the latter is preferable.

The spindle 5 may be provided with a single thread only. In this case the legs of the double ratchet will catch into the single thread alternately, one of the legs serving for odd numbers of the slide and the other leg for even numbers,

If this calling device should be used in connection with an automatic exchange with very fast working switches—for instance a relay system—the centrifugal governor may be omitted. In this case it may be suitable to give the threaded spindle a larger diameter, for instance 8–10 mm., while the pitch of the thread is retained at about 10 mm. An increased friction will then arise between the ratchet and the spindle, due to the reduced steepness of the thread, producing a sufficient braking effect.

As above mentioned, the ratchet fixed to the slide, may be carried out as a single spring, and this modification is in the drawing illustrated in Fig. 8*a*. This spring 28 is identical in shape with one leg of the two-legged ratchet and is also provided with a lug 28*a* with an inclined edge for the cooperation with the spindle.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A calling device for automatic telephone systems, comprising an elongated threaded spindle, rotatably mounted in bearings fixed in an elongated skeleton frame, an elongated slide lengthwise movable on a sliding path parallel with said threaded spindle and adapted to be moved manually by means of finger holes in one direction and by spring force in the opposite direction, a resilient member fixed perpendicularly to the rear side of said slide and catching into the thread of said spindle by means of an inclined edge coinciding with the inclination of the thread, an elongated cap enclosing said skeleton frame and said slide and provided with a rectangular opening in front of the finger holes of said slide, and an impulse-sending electric contact adapted to be opened and closed by said threaded spindle when set in rotation by the movement of the slide.

2. A calling device as claimed in claim 1, said threaded spindle being provided with two parallel threads, while the resilient member fixed to the slide, is carried out as a two-legged spring embracing the spindle, each of its legs catching into one of the threads by means of an inclined edge coinciding with the inclination of the thread of said spindle.

3. A calling device as claimed in claim 1, said threaded spindle being provided with two parallel threads, while the resilient member fixed to the slide, is carried out as a single spring member catching into the one or the other of the threads by means of an inclined edge coinciding with the inclination of the thread of said spindle.

4. A calling device as claimed in claim 1, said spindle being provided with a single thread, while the resilient member fixed to the slide, is carried out as a two-legged spring embracing the spindle, its two legs catching alternately into the single thread of the spindle by means of an inclined edge coinciding with the inclination of the thread of the spindle.

5. A calling device as claimed in claim 1, said threaded spindle carrying a fixed cross-aisle cooperating with a projecting wing fixed to the rear side of the slide, said cross-aisle adapted to strike against said wing at the termination of the return movement of the slide, thereby stopping the spring driven movements of the spindle and the slide in their respective normal positions.

6. A calling device as claimed in claim 1, said skeleton frame being carried out as an upright

in the form of an inverted U with broad shanks, two edges of these shanks forming the sliding path for the flat slide, for which an outer guide is formed by that side of the elongated and in cross-section substantially rectangular cap which is provided with the rectangular opening in front of the finger holes of the slide.

7. A calling device as claimed in claim 1, said slide being provided with a projecting nab on its rear side, adapted to engage with a cam-wheel of insulating material, which is rotatably mounted between two springs in a set of contact springs and adapted to wedge said two springs apart when revolved by means of said projecting nab of the slide, catching into a space of said cam-wheel, thereby causing said contact springs to switch in the impulse-sending contact during the movement of the slide.

8. A calling device as claimed in claim 1, said threaded spindle being provided with two parallel threads of an unsymmetrical angular form with a diameter of 6 mm. and a pitch of 10 mm., while said resilient member, fixed to the slide, is carried out as a two-legged ratchet embracing the spindle, each of its legs catching into one of the threads with an inclined edge coinciding with the inclination of the thread.

9. A calling device as claimed in claim 1, said threaded spindle being provided with a single thread of an unsymmetrical angular form with a diameter not exceeding 8 mm. and a pitch not exceeding 12 mm., while said resilient member, fixed to the slide, is carried out as a two-legged ratchet embracing the spindle, its two legs catching alternately into the thread of the spindle with an inclined edge coinciding with the inclination of the thread.

10. A calling device as claimed in claim 1, said threaded spindle being provided with two parallel threads of unsymmetrical angular form with a diameter not exceeding 8 mm. and a pitch not exceeding 12 mm., while said resilient member, fixed to the slide, is carried out as a single ratchet adapted to catch alternately into the one or the other of the threads of the spindle with an inclined edge coinciding with the inclination of the thread.

11. A calling device as claimed in claim 1, said threaded spindle being provided with a centrifugal governor comprising a cross-piece fixed to the spindle, on said cross-piece two excentrically pivoted brake clogs adapted to be flung out against a stationary cylindrical enclosure, each clog being provided with an outstanding pin of graphite adapted to glide on the inside of said enclosure during the rotation of the spindle, said pins being located at a shorter distance from the pivots than the centre of gravity of the clogs, with the object of attaining a reinforced pressure of said graphite pins against the enclosure by the lever-action of the clogs.

12. A calling device as claimed in claim 1, said threaded spindle being provided with a two-winged cam-wheel engaging with the impulse-sending contact springs and adapted to open and close the impulse-sending contact once for each half revolution of the spindle corresponding with the space between two finger holes of the slide with consecutive numbers.

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No references cited.