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CALLING DIAL OF THE DEAD-ANGLE TYPE

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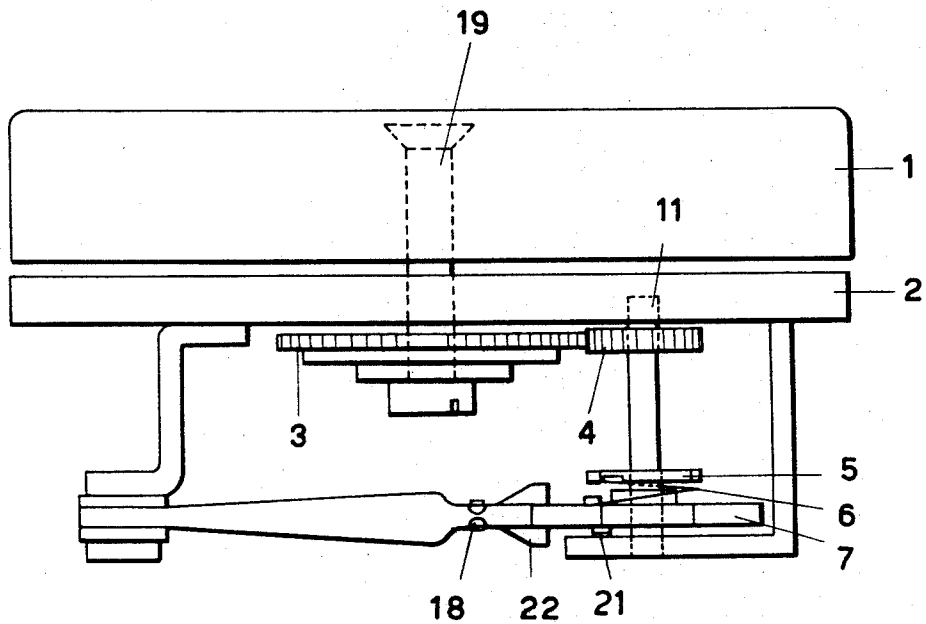


Fig. 1

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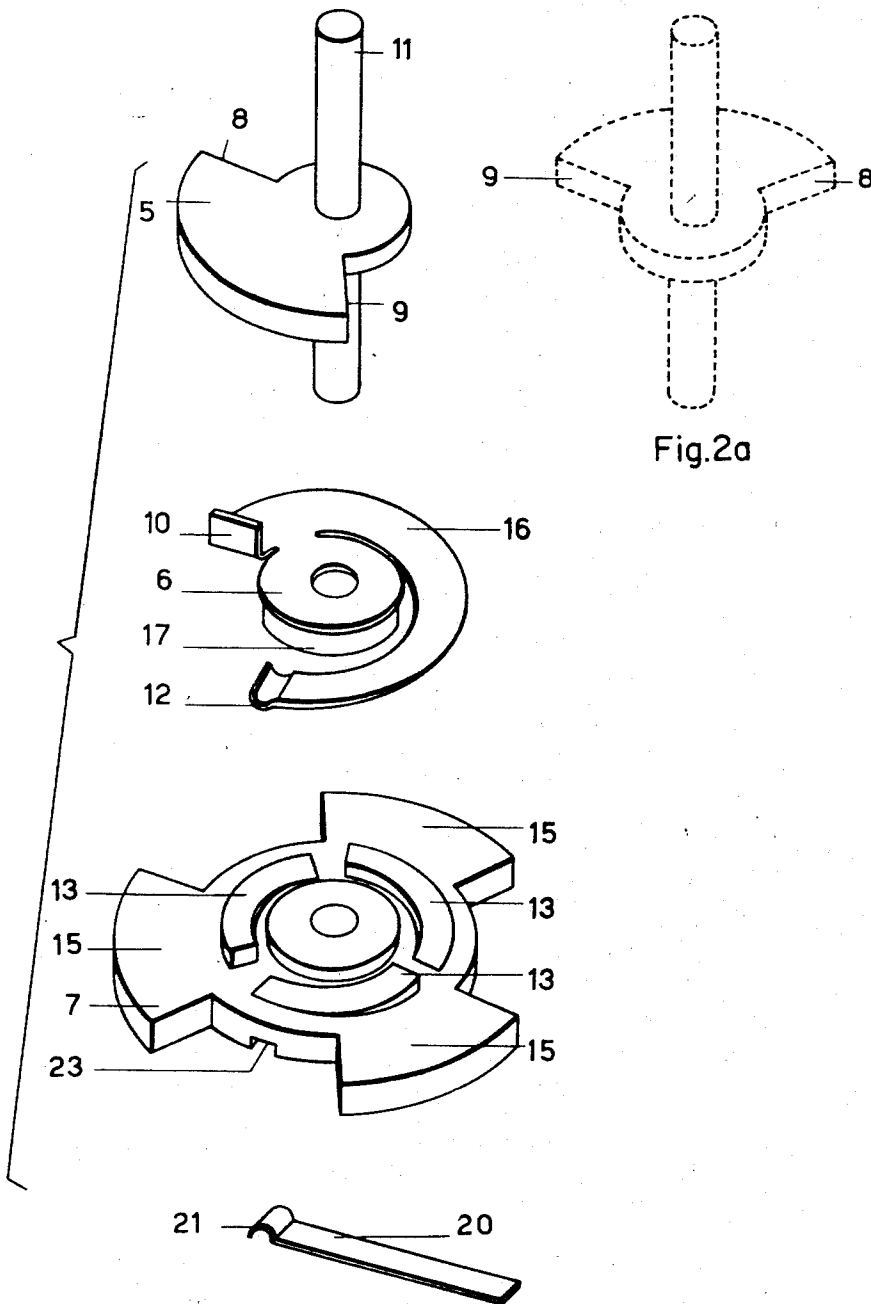


Fig. 2a

Fig. 2

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CALLING DIAL OF THE DEAD-ANGLE TYPE

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4 Claims

Int. Cl. H04m 1/34, 1/23

ABSTRACT OF THE DISCLOSURE

A calling dial has a finger plate that turns a rotor bearing two abutments spaced apart by a dead angle. A one-way clutch turns an impulse rotor in one direction only. The one-way clutch does not move the impulse rotor when the number is dialed; but when the dial is released, the abutments on the rotor move through their dead angle before one of them contacts the one-way clutch to rotate the impulse rotor.

This invention relates to calling dials of the dead-angle type. In such dial mechanisms, a number is dialed by turning the calling dial, after which the calling dial is released. The dial mechanism transmits a signal corresponding to the number or letter which has been dialed, the signal varying according to the angular distance through which the dial has been turned. However, in order to allow adequate time for the automatic switching equipment to respond to the dialed number or letter, it is necessary to provide a time lag between the dialing and the transmission of the dialed datum.

A number of dialing devices known heretofore ensure the necessary delay by providing a dead angle for the dial return. This means that, upon return movement of the dial, the dial first moves through an angle during which the dial transmits none of the dialed data. The time interval occupied by the dial turning back through this dead angle ensures that the dialed datum will not encroach on a previously dialed datum.

The known mechanisms for effecting such a delay between dialing and transmission suffer from one or more of a number of disadvantages. They are expensive; they increase the overall dimensions of the equipment; they require precise calibration to secure the desired results; they are inefficient; and/or they easily become disarranged.

Accordingly, it is an object of the present invention to provide a calling dial of the dead-angle type which avoids the above disadvantages.

It is another object of the present invention to provide a calling dial of the dead-angle type which will be relatively simple and inexpensive to construct, easy to install, maintain and repair, and rugged and durable in use.

Other objects and advantages of the present invention will become apparent from a consideration of the following description, taken in connection with the accompanying drawings, in which:

FIGURE 1 is a side elevational view of a calling dial mechanism according to the present invention;

FIGURE 2 is an exploded perspective assembly view of a portion of the structure shown in FIG. 1; and

FIGURE 2a shows a portion of FIG. 2 in a different position.

Referring now to the drawings in greater detail, and more particularly to FIG. 1, the calling dial mechanism shown there comprises a finger plate 1 which is fixed to and rotatable with a first spindle 19. A gear 3 is fixed to spindle 19 and meshes with a gear 4 carried by a second spindle 11. Spindles 11 and 19 are mounted for rotation on and relative to a base plate 2.

The other principal components of the assembly comprise a sector-shaped member 5 fixedly secured to spindle 11, one-way clutch means 6 mounted for rotation on and relative to spindle 11, an impulse rotor 7 also mounted for rotation on and relative to spindle 11, and an impulse contact 18 intermittently engaged by impulse rotor 7.

In greater detail, as best seen in FIG. 2, member 5 has abutments 8 and 9 thereon, which are radially outwardly extending shoulders or opposite peripheral edges on member 5 spaced apart an even fraction of the arc of a circle, in the illustrated embodiment 120°.

One-way clutch means 6 comprises a central annular boss 17, to which is fixed spring means generally arcuate in configuration about the spindle 11 and having an up-standing end 10 and spiralling downward about a spring portion 16 to an opposite end in the form of a pawl 12. Spring portion 16 is helical so that end 10 and pawl 12 are spaced apart a distance axially of spindle 11.

Impulse rotor 7 has a plurality of detents 13 thereon which are wedge-shaped to permit movement of pawl 12 counterclockwise thereover but to prevent movement of the pawl 12 clockwise therealong as seen in FIG. 2. Impulse rotor 7 also has a number of radially extending projections 15 thereon equal in number of detents 13 and, on its face opposite detents 13, a number of recesses 23 equal in number to detents 13. Detents 13, projections 15 and recesses 23 are all spaced equally peripherally about rotor 7. A resilient stop spring 20 is fixedly secured to the fixed structure that supports spindle 11, and has a pawl 21 that resiliently snaps into each successively presented recess 23, thereby releasably to retain rotor 7 in any of a plurality of positions spaced 120° of arc apart.

Impulse contact 18 is provided with an end 22 that yieldably contacts each successive projection 15, so that the rotation of impulse rotor transmits a signal by means of impulse contact 18, each time a projection 15 deflects the end 22.

In operation, let it be assumed that the parts have the full-line position shown in FIG. 2. Let it also be assumed that the dial, as usual, is rotated clockwise as seen from the top of FIG. 1 to dial a desired number or letter, and that the gear ratio of gears 3 and 4 to each other is such that gear 4 is turned through one complete rotation for every three dial intervals. Let it also be assumed that there is a dead angle in the dial mechanism of two intervals. In other words, to dial the first number or letter, the dial is moved clockwise through three dial intervals; to dial the second number or group of letters, the dial is moved through four intervals, etc. If there are ten finger positions, then there is a maximum of twelve dial intervals.

Thus, if member 5 is at rest as in the position shown in full line in FIG. 2, then upon dialing the numbers one, four, seven and zero, the member 5 will be brought by clockwise movement of dial 1 to the full-line position shown in FIG. 2, through one, two, three and four full revolutions of spindle 11, respectively. Upon dialing three, six and nine, however, member 5 will be brought to the dotted line position shown in FIG. 2a; while upon dialing two, five and eight, member 5 will be brought to the

position which is 120° removed from both the full line and the dotted line positions of FIGS. 2 and 2a.

It should also be remembered that, by virtue of the gear train 3, 4, clockwise movement of dial 1 and hence gear 3 causes counterclockwise movement of gear 4 and hence spindle 11 and member 5. Therefore, if the parts at rest are positioned as in FIG. 2, with abutment 8 against end 10, and pawl 12 just at the sharp dropoff of a detent 13, and not yet embarked on the incline of the next succeeding detent 13 in a counterclockwise direction in FIG. 2, and the pawl 21 of spring stop 20 is engaged in a recess 23, then the clockwise rotation of dial 1 will result immediately in a counterclockwise rotation of member 5.

As member 5 rotates counterclockwise, abutment 8 moves away from end 10 and abutment 9 moves counterclockwise toward end 10. However, as abutments 8 and 9 are spaced apart 120° of arc, abutment 9 must move through 240° of arc (equal to two dial intervals) before abutment 9 reaches end 10, that is, before member 5 assumes the phantom line position shown in FIG. 2a.

Further movement of member 5 counterclockwise, once it is in contact with end 10, moves one-way clutch means 6 counterclockwise. Until that time, clutch means 6 remains stationary because impulse rotor 7 is held stationary by stop spring 20 and pawl 12 is in frictional contact with rotor 7, the spindle 11 turning within clutch means 6 and there being insufficient frictional contact between clutch means 6 and spindle 11 to turn clutch means 6 when spindle 11 turns.

When abutment 9 of member 5 contacts end 10 and turns clutch means 6, pawl 12 simply rides up and over the detents 13 in succession. The frictional contact between pawl 12 and detents 13 is insufficient to move rotor 7 against the releasable spring contact of pawl 21 in recess 23.

When member 5 stops, it will always stop in one of the three positions spaced apart by 120° , described above. This means that pawl 12 will always stop immediately after it has fallen from the elevated end of a detent 13. Therefore, both at the beginning of dialing and at the end of a dialing operation, before the dial has returned with a counterclockwise motion, all of the parts 5, 6 and 7 will have either the position shown in FIG. 2 or else a position spaced 120° of arc in one or the other direction from that shown in full line in FIG. 2.

At the end of dialing in a clockwise direction, abutment 9 will contact end 10. Upon the release of the dial, for a return movement in the counterclockwise direction, the spindle 11 and hence the member 5 will immediately begin to turn in a clockwise direction, thanks to the gear trains 3, 4. If clutch means 6 is in the position shown in FIG. 2, then at the onset of return movement of dial 1, the member 5 will have the position shown in phantom line at the upper right of FIG. 2. At the beginning of return movement of dial 1, therefore, member 5 will turn through 240° of arc (corresponding to two dial positions) before the abutment 8 contacts end 10. The dead angle of spindle 11 is accordingly 240° , and that of dial 1 is two dial positions, in the illustrated embodiment.

As soon as abutment 8 contacts end 10, clutch means 6 is turned clockwise. Pawl 12, however, is in contact with the steep end of a detent 13, and thereupon moves rotor 7 clockwise. This clockwise movement of rotor 7 is under a sufficiently strong impetus from pawl 12, thanks to the contact between pawl 12 and the steep end of the associated detent 13, that pawl 21 is popped out of recess 23 and rotor 7 is moved through a number of increments of 120° of arc equal to the number dialed. That is to say, that if the number one was dialed, then there was a total dial movement of three dial spaces and a total rotation of member 5 through 360° upon dialing; however, as 240° of return movement of member 5 are dead, thanks to the 240° gap between abutments 8 and 9, member 5 upon the return of the dial will move

clutch means 6 and hence rotor 7 through only 120° of arc, which corresponds to one increment of movement of rotor 7 and one impulse delivered to impulse contact 18, because only projection 15 moves past end 22. It should also be noted that upon return movement of clutch means 6, there is no lost motion between clutch means 6 and rotor 7 because pawl 12 is just at the steep end of the associated detent 13.

Correspondingly, if the number two was dialed, then member 5 moves through 240° plus 240° equal 480° of arc upon dialing and moves back through 480° of arc upon return movement of the dial; but clutch means 6 and impulse rotor 7 move through only 240° of arc upon dial return, as they remain stationary through the first 240° which is the dead angle of spindle 11. These 240° of arcuate movement of impulse rotor 7, however, are just exactly sufficient to transmit two impulses by passage of two projections 15 past end 22 of impulse contact 18. The same principle of operation holds true for the other dialed numbers and intervals.

From a consideration of the foregoing disclosure, therefore, it will be evident that all of the initially recited objects of the present invention have been achieved.

Although the present invention has been disclosed and illustrated in connection with a preferred embodiment, it is to be understood that modifications and variations may be resorted to without departing from the spirit of the invention, as those skilled in this art will readily understand. For example, it will be evident that, although a particular ratio of gears 3 and 4 has been disclosed, other ratios may be used as convenient. For example, the illustrated embodiment shows dial intervals corresponding to 120° of arc on spindle 11, so that abutments 8 and 9 are spaced apart by one-third the total arc about spindle 11. However, other even numbers of angular increments for the mechanism of FIG. 2 may be selected, with corresponding numbers of detents 13, projections 15 and recesses 23, and corresponding dimensions of clutch means 6, for example, two, four, five, six, etc. Similarly, although the dead angle of dial 1 is shown as being two intervals, it is obvious that one, three, four, etc. intervals may be chosen to be dead, depending on the lag time needed by the switching equipment between signals. Similarly, it is obvious that it is unnecessary to interpose gear train 3, 4 in the mechanism, and that member 5, clutch means 6 and rotor 7 can all be carried by spindle 19. The interposition of gear train 3, 4 merely gives greater flexibility and sensitivity to the mechanism.

These and other modifications and variations are considered to be within the scope of the present invention as defined by the appended claims.

Having described our invention, we claim:

1. A calling dial comprising a spindle, a rotatable finger plate for rotating the spindle, an impulse rotor, a pair of abutments on and rotatable with the spindle spaced apart an angular distance corresponding to a dead angle, one-way clutch means for rotating the impulse rotor in one direction only, one of said abutments engaging said one-way clutch means to turn said one-way clutch means in a direction which will not rotate the impulse rotor upon clockwise movement of said finger plate while upon counterclockwise movement of said finger plate said one abutment leaves said one-way clutch means and said abutments rotate through said dead angle until the other said abutment contacts said one-way clutch means to rotate said one-way clutch means in a direction that will rotate said impulse rotor, whereby at the beginning of counterclockwise movement of said finger plate there is no movement of said impulse rotor until said spindle and its abutments have turned through said dead angle.

2. A calling dial as claimed in claim 1, said abutments being peripherally opposite edges of a sector-shaped member carried by said spindle.

3. A calling dial as claimed in claim 1, said one-way

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clutch means including spring means with which said abutments are engageable, and detents on said impulse rotor with which said spring means is engageable, said spring means riding over said detents when the finger plate turns clockwise but engaging with the detents to turn the impulse rotor when the finger plate turns counterclockwise.

4. A calling dial as claimed in claim 3, and means releasably retaining the impulse rotor in such a position, when the finger plate turns clockwise, that there is substantially no lost motion between the spring means and

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the detents when the finger plate begins to turn counterclockwise.

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