

Oct. 6, 1931.

B. L. BOBROFF

1,826,501

SIGNALING SYSTEM

Filed July 11, 1927

4 Sheets-Sheet 1

FIG. 1

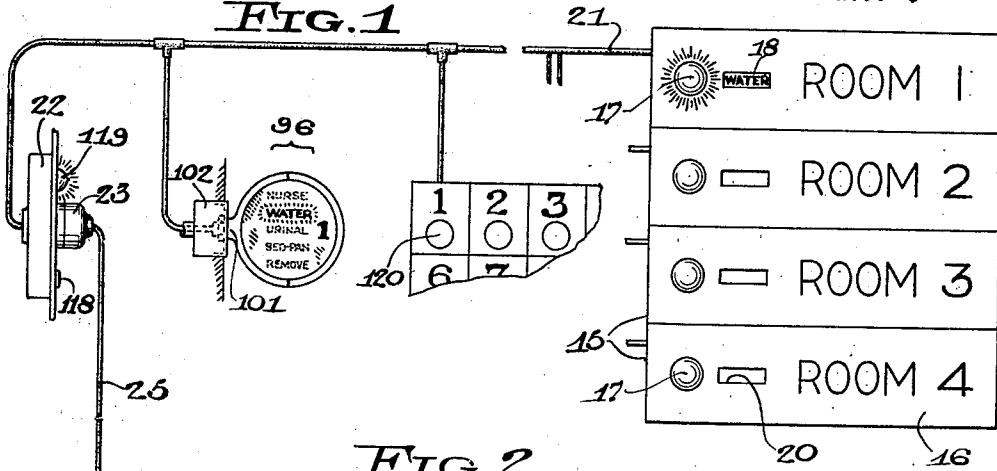


FIG. 2

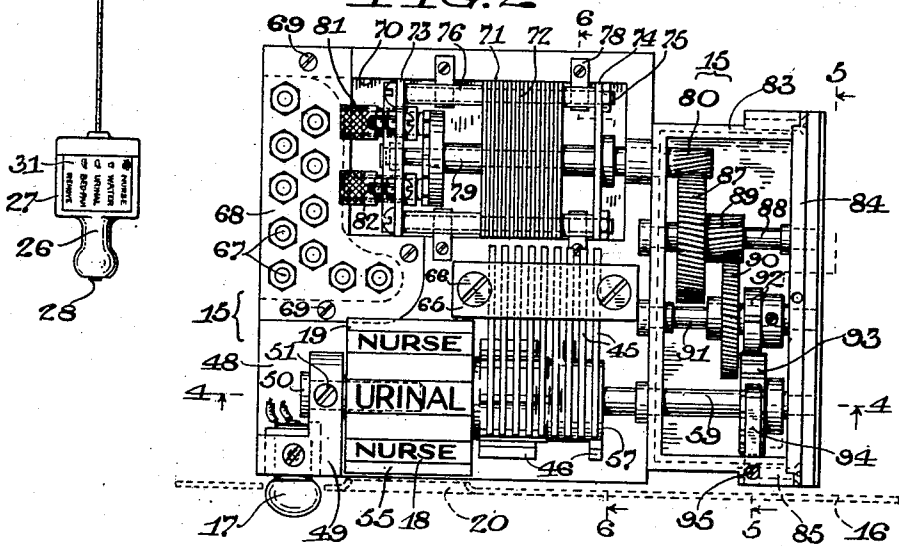
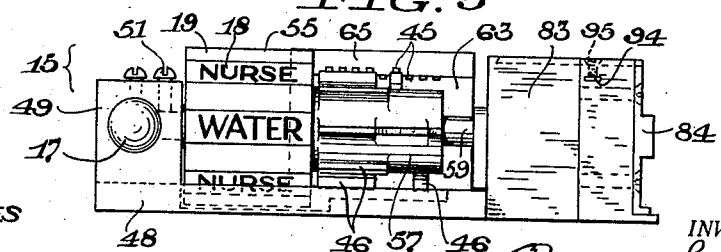


FIG. 3



WITNESSES

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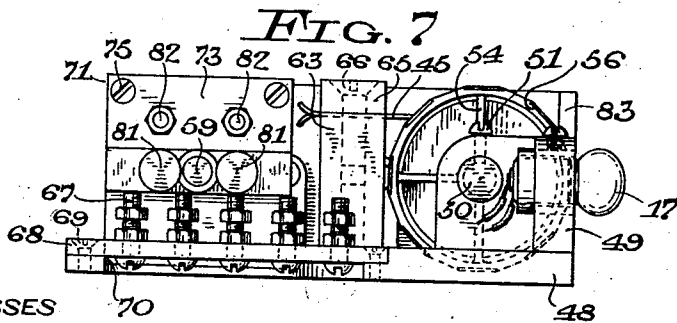
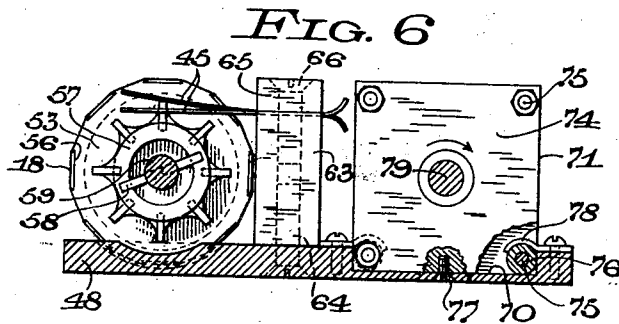
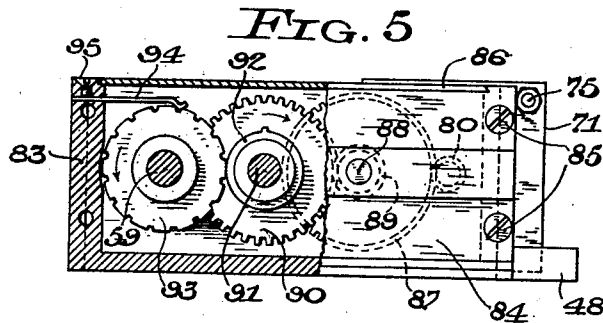
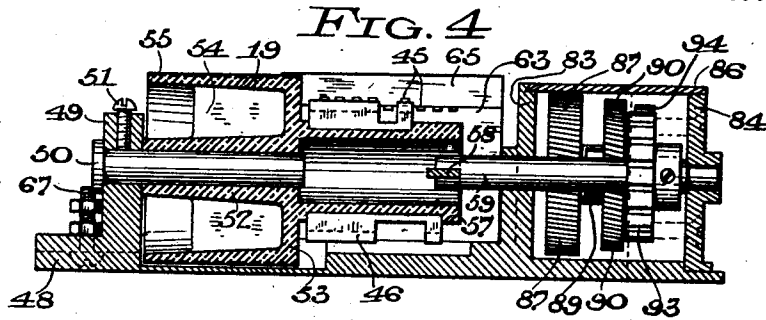
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4 Sheets-Sheet 2



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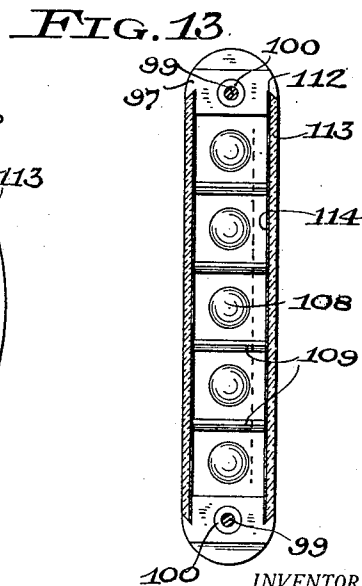
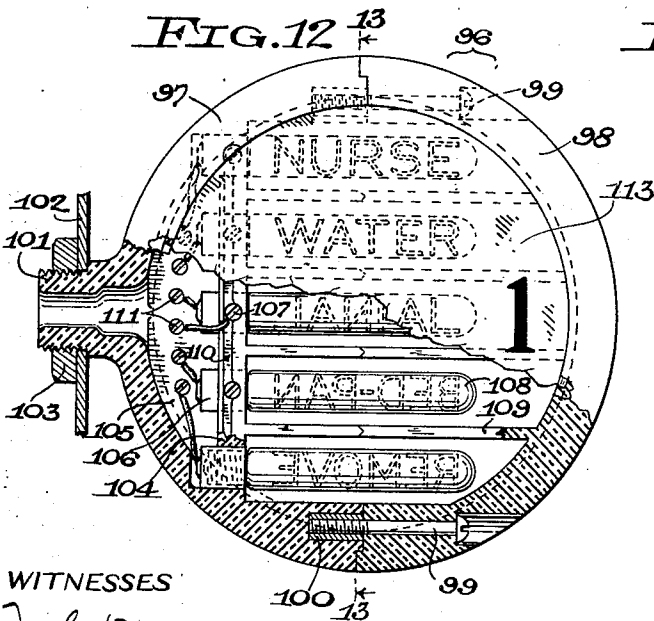
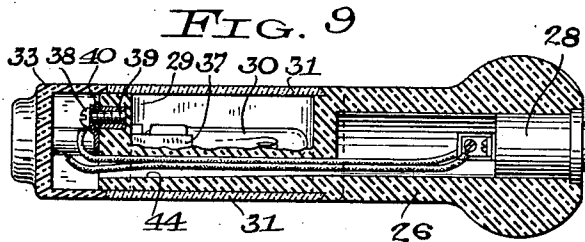
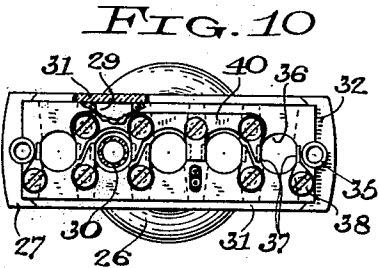
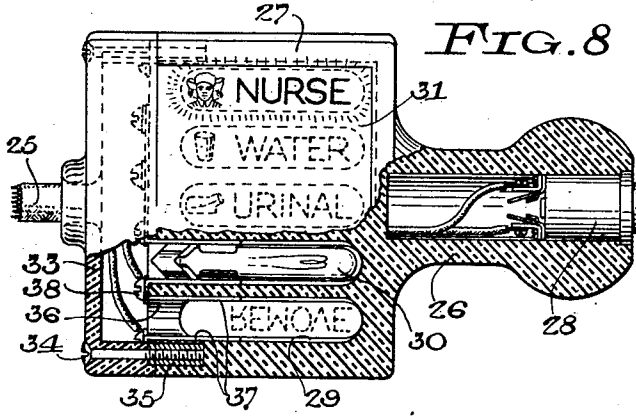
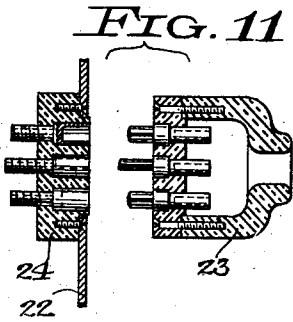
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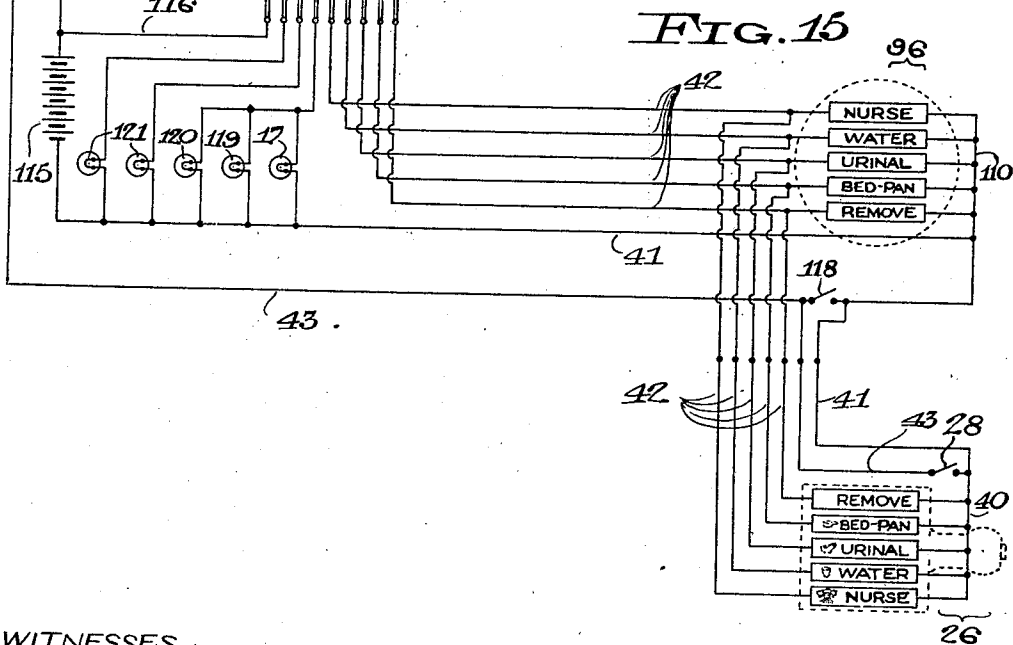
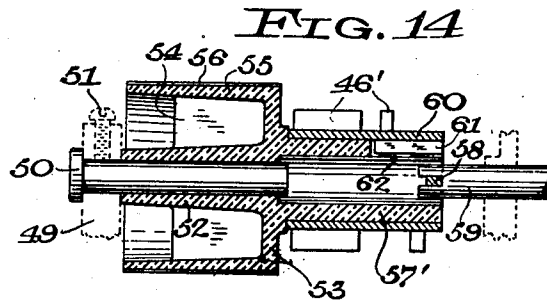
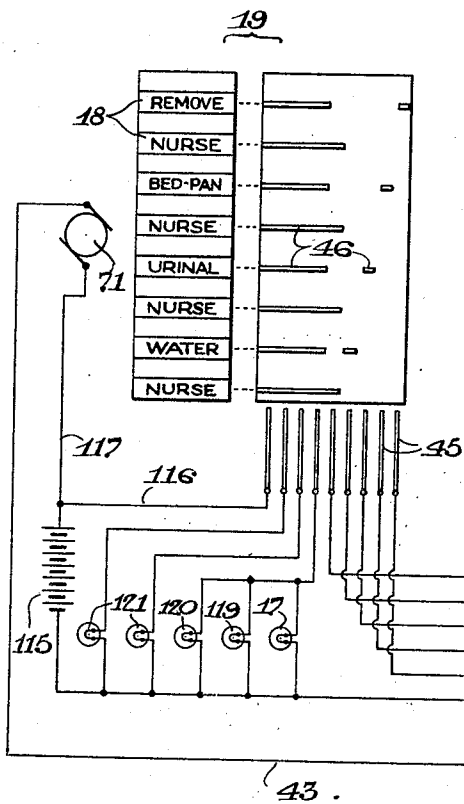
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# UNITED STATES PATENT OFFICE

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## SIGNALING SYSTEM

Application filed July 11, 1927. Serial No. 204,892.

The invention relates to signaling systems in which any one of a plurality of signals may be transmitted for indication on one or more responsive devices, and is more particularly intended for use in hospitals, sanitariums, and other institutions.

An object of the invention is to provide a signaling system for hospitals, sanitariums, and the like, including an annunciator of the answer-back type and a plurality of responsive means controlled by the annunciator to display the same confirmation signal at different locations, and a more specific object is to constitute one of said responsive means an indicator placed at the exterior of each room from which the signal is transmitted whereby the needs of the occupant of the room may be made known to nurses or attendants passing the room, thus affording an opportunity for prompter service to the patient and minimizing trips to the main annunciator board.

Another object of the invention is to provide such a system with a motor-driven annunciator including a rotary member and a transmission of simple and compact construction to effect the intermittent rotation of said member to indicating and blank positions, said transmission being of such character as to accurately effect the intermittent operation of the rotary member even though the successive increments of rotation of said member are comparatively small.

A further object is to provide an annunciator of this character in which the rotary member is driven by a gear co-acting with detent means capable of universal operation on various gears having a different number of teeth.

A further object is to provide an annunciator including an electric driving motor and means for simply but accurately locating the motor in its operative position.

A further object is to provide the motor with an insulating end frame or plate for facilitating the insulation of the brush gear and terminals.

A further object is to provide an annunciator including a rotary drum of insulating material, preferably a phenolic condensation

product, thereby facilitating the mounting on the drum of the contact means controlling the distant indicating devices.

A further object is to effect improvement and simplification of the rotary annunciator drum.

A further object is to perfect details of construction of the indicating device for the exterior of each room.

A further object is to provide a signaling system including a push-button holder equipped with confirmation responsive elements to apprise an operator of the existence of the proper signal at the annunciator, each responsive element comprising an electric lamp which illuminates otherwise invisible indicia including a pictorial representation of the signal for the convenience of illiterates.

A further object is to effect improvements on the signaling system disclosed in my co-pending application entitled Hospital signaling system, Serial No. 750,302, filed November 17, 1924, now Patent No. 1,751,972, issued March 25, 1930, to the end of simplifying constructional details and rendering the annunciator units more compact.

The invention further consists of the several features hereinafter set forth and more particularly defined by the annexed claims.

In the accompanying drawings,

Fig. 1 is a diagrammatic illustration of a hospital signaling system embodying the invention;

Fig. 2 is a top plan view of one of the annunciator units;

Fig. 3 is a front elevation thereof;

Fig. 4 is a longitudinal sectional elevation of the annunciator unit taken on the line 4—4 of Fig. 2;

Fig. 5 is a sectional elevation taken on the line 5—5 of Fig. 2;

Fig. 6 is a sectional elevation taken on the line 6—6 of Fig. 2;

Fig. 7 is a side elevation of the annunciator unit;

Fig. 8 is a plan view, partly in section, of a push-button holder;

Fig. 9 is a longitudinal sectional view of the push-button holder;

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Fig. 10 is an end view of the push-button holder, the cap thereof being removed and parts being broken away and shown in section;

5 Fig. 11 is a longitudinal sectional view of a cable plug and its associated receptacle;

Fig. 12 is an elevation of a room or doorway indicator, parts being broken away and parts being shown in section;

10 Fig. 13 is a sectional elevation of the doorway indicator taken on the line 13—13 of Fig. 12;

Fig. 14 is a longitudinal sectional view of a modified form of annunciator drum; and

15 Fig. 15 is a schematic diagram of the circuit connections of one annunciator unit.

In these drawings, the numeral 15 indicates each of a row or tier of annunciator units adapted for hospital use, there being one for each room, or one for each bed where there is more than one bed in a room. These annunciator units are placed in one or more tiers at a nurse's station and each includes a front plate 16 which is designated with a room number or with a bed number, as the case may be. If desired, the front plates of several annunciator units may be integrally formed of a single piece of material. A signal lamp 17 is visible through the front plate of each annunciator unit and name plates 18 carried on an intermittently rotatable annunciator drum 19, as hereinafter described, are successively visible through an opening 20 in the front plate to signal the various needs of the patient.

Each annunciator unit is connected by a cable 21 with an outlet box 22 in the wall of the room designated on the annunciator front plate, or close to the bed so designated. An attachment plug 23 is adapted to fit into a suitable receptacle 24 provided for it in the outlet box 22 to establish connections between the various conductors of the cable 21 and several corresponding conductors in a flexible extension cable 25 connected to the terminals of the attachment plug. The attachment plug 23, shown in detail in Fig. 11, is so constructed that it will enter the receptacle 24 in only the one position in which the proper connections are established.

A push-button holder 26, preferably in the form of a pear push-button with an enlarged flat indicating portion 27, as shown, is attached to the free end of the extension cable 25 and carries a push-button or circuit closer 28 in its pear-shaped end. Transverse slots 29 are formed through the flat portion 27 of the push-button holder to receive indicating lamps 30 therein, the slots being covered on opposite sides by glass plates 31 having the various needs of the patient placed thereon in register with the slots and preferably including corresponding pictorial designations for the convenience of illiterates.

65 The end of the flat indicating portion 27

of the push-button holder 26 is provided with a marginal rabbet 32 to receive the edges of a removable rectangular cap 33, which is secured into bushings 35 embodied in the molded insulating material, preferably, a phenolic condensation product, of which the push-button holder is formed. Each of the transverse slots 29 communicates with a circular opening 36 at the end of the holder adjacent the cap 33, and lamp contact strips 37 extend along opposite sides of each opening to form receptacles for the indicating lamps 30, the contact strips 37 being secured to the flat end of the holder by means of screws 38 threaded in bushings or studs 39 embedded in the holder. In the present instance one set of contact strips 30 is connected together by a metal strap 40, which forms a common return for the lamps.

The free end of the cable 25 passes through a central opening in the push-button holder cap 26 and its several conductors are separated and connected with the various terminals, a common conductor 41 connecting each of the lamps 30, while other conductors 42 connect the individual lamps, and a conductor 43, together with a continuation of the conductor 41, passing through a tubular opening 44 in the push-button holder to connect with the push-button 28. The common conductor 41 thus constitutes a common return for the push-button circuit as well as for the lamp circuits. Each of the indicating lamps 30 with its respective conductor 42 and the common return conductor 41 forms a separate lighting circuit controlled by the engagement of spring fingers 45 with contact ribs 46 on the annunciator drum 19 as hereinafter described.

Besides enclosing the wiring connections the cap 33 of the push-button holder serves to retain the beveled glass plates 31 in the undercut grooves of the holder. The glass plates are preferably only translucent so that the word designations, as well as the corresponding pictorial designations, contained therebeneath will only be in evidence when illuminated by the indicating lamps 30. In the present instance the word designations "Nurse", "Water", etc., are accompanied by a picture of a nurse, a glass of water, etc.

Each annunciator unit 15 includes a metal base plate 48 conveniently of die-cast construction, which has integrally formed thereon near one forward corner a standard 49. A headed horizontal bearing pin 50 is fixedly secured in the standard 49 by a set screw 51 and extends parallel to the forward edge of the face plate. The annunciator drum 19, which is preferably formed of a phenolic condensation product, is provided with a hub 52 journaled on the bearing pin 50, one end of the hub having a thrust engagement with the standard 49 and the other end being pro-

vided with an outstanding disk-shaped flange 53, which, together with radial reinforcing ribs 54, supports a concentric cylindrical shell 55 preferably having a polygonal exterior and provided with shallow dovetailed or undercut slots 56 removably receiving the name plates 18. A tubular sleeve 57 coaxial with the hub 52 projects from the flange 53 in a direction away from the hub and has embedded therein inserts forming the radial contact ribs 46 hereinbefore noted, as seen in Figs. 4 and 6. The free end of the sleeve 57 has diametrically secured therein a driving bar 58, which is received into the diametrically slotted end of a driving shaft 59 concentric with the bearing pin 50 and restraining the drum 19 against axial displacement. The base plate 48 is recessed to receive the lower portion of the annunciator drum in order to reduce the height of the unit as much as possible and thereby permit compact tiering of a group of units.

In the modified form of annunciator drum shown in Fig. 14 the inserts forming the separate radial contact ribs 46 are replaced by a metal sleeve 60 pressed onto the sleeve portion 57' of the drum and carrying integral contact ribs 46', an integral interior key 61 being formed on the sleeve 60 to enter a keyway 62 in the sleeve portion 57' of the drum for properly locating the contact ribs 46' with respect to the name plates 18 on the drum.

The spring contact fingers 45 hereinbefore noted are mounted in the transversely grooved upper surface of an insulating block 63, which is secured to the upper face of the base plate behind the annunciator drum by means of screws 64. A strip 65 of insulating material is secured to the upper face of the insulating block 63 by screws 66 and serves to clamp the contact fingers 45 in place. The spring contact fingers are suitably connected to several of a group of terminal screws 67 which are mounted in an insulating plate 68 secured at one side of the base plate by screws 69, the base plate being cut away beneath the screws for clearance, as seen in Fig. 7.

The rear portion of the base plate 48 of each annunciator unit is provided in its upper surface with a parallel sided channel 70, which receives therein against lateral displacement a small electric motor 71 including a laminated field frame 72 to which end plates or frames 73 and 74 are secured by screws 75, spacers 76 being interposed between the end plates and the field frame. The motor is held in place in the channel 70 by a screw 77 clamping the base plate 48 to the field frame 72, or by hold-down clips 78 engaging the spacers 76, or both although the use of the screw 77 alone is sufficient. A motor armature 79 has its shaft journaled in the end plates 73 and 74, one end of the shaft projecting from the end plate 74 and being provided with a helical pinion 80, the teeth

of which may be formed integrally with the shaft. The motor end plate 73 is of insulating material, preferably a phenolic condensation product, and has mounted therein brush holders 81 and terminal screws 82. The use of suitable insulating material for this purpose is very advantageous in a small motor as it eliminates the use of several insulating bushings and washers and is inexpensive to manufacture.

The base plate 48 of the annunciator unit has formed thereon three upstanding walls defining part of a rectangular lubricant-receiving transmission casing 83, a fourth side of the casing being formed by a removable plate 84 secured in place by screws 85, and the upper end of the casing being closed by a dovetailed plate 86. The pinion 80 at the end of the shaft of the motor armature 79 projects laterally into the transmission casing 83 and meshes with a gear 87 secured on a shaft 88 journaled in the end plate 84 and in the opposite wall of the casing 83. The shaft 88 has secured thereto a pinion 89, which meshes with a gear 90 mounted on a shaft 91 journaled in the end plate 84 and the opposite wall of the transmission casing. The shaft 91 also carries a one-toothed pinion or arm 92, which meshes with a gear 93 mounted on the driving shaft 59 for the annunciator drum, the shaft 59 also being journaled in the end plate 84 and the opposite wall of the transmission casing. A resilient detent arm 94 is secured by a screw 95 in one end wall of the transmission casing and has its free end engageable in the notches between the teeth of the gear 93 to retain the gear against rotation in the intervals between successive impulses imparted to the gear by the one-toothed pinion 92. The amount of entrance of the tooth on the pinion 92 into the gear 93 is so selected that the gear 93 with its coaxial annunciator drum will be turned through the arc desired, such arc being  $\frac{1}{16}$  of a revolution in the present instance. In case a greater number of designations is desired on the annunciator drum, this can be done by substituting another gear 93 having the proper number of teeth, without other changes in the transmission, and it is possible by means of this construction to accurately provide for relatively small increments of rotation.

An indicating device 96 is placed at the exterior of each room to be visible along the corridor on which the room opens, and this device is preferably placed directly above the door of the room although any other adjacent location may be used. The indicating device 96 comprises casing sections 97 and 98 assembled together into a ring-shaped casing by screws 99 in one of the casing sections entering metal inserts 100 in the other casing section, the casing sections being preferably formed of a phenolic condensation product.



The casing section 97 is provided with an exteriorly shouldered and threaded boss 101, which enters the cover of a junction box 102, against which it is held by a lock nut 103.

5 A vertical bridge or bar 104 is formed integral with the insulating material of the casing section 97 and is reinforced by a web 105 disposed at one side of the casing section. The bridge or bar 104 is apertured at intervals to receive spaced lamp sockets 106 held in place by terminal screws 107 and receiving elongated horizontal electric lamps 108. The lamps 108 are separated from each other by compartment-forming partitions 109 formed integrally with the casing sections and interlocking at their adjacent ends. A common terminal strip 110 connects the terminal and attaching screws 107 of the sockets 106 and is connected to one of a series of terminal screws 111 formed in the web 105, the other terminal screws 111 forming individual connections for the respective sockets. The inner edge portions of the casing sections 97 and 98 are provided with registering dovetailed or undercut recesses 112 at opposite sides to receive a circular transparent or translucent glass light 113, each of which has formed on its inner face the designations "Nurse", "Water", etc., corresponding to similar designations on the annunciator drum 19 and the push-button holder 26. These designations may be conveniently formed on a film negative 114 carried on the inner face of each light 113 and the designations on the push-button holder may be provided in a similar manner. The indicating lamps 108 of the indicating device 96 are arranged in parallel with the corresponding indicator lamps 30 of the push-button holder 26, as seen in the schematic diagram Fig. 15, the terminal screws 111 of the indicating device forming a convenient place at which to effect the parallel connection. Instead of connecting these lamps in parallel it will be obvious that a series connection could be employed as an alternative.

In the schematic wiring diagram of Fig. 15 a battery 115 or other source of current supply has one terminal connected with the common return wire 41 and the other terminal connected by a conductor 116 with one of the spring contact fingers 45 and a conductor 117 with one terminal of the motor 71. The other terminal of the motor is connected with the wire 43 from push-button 28 and another push-button 118 in parallel therewith, the latter of which is carried by the wall box 22 adjacent the bed served by the push-button holder. Besides those of the contact fingers 45 which are connected to each indicating lamp in the push-button holder 26 and indicating device 96, there are other contact fingers for controlling signal circuits to different parts of the building where it is desired to indicate that a signal has been given.

These auxiliary circuits are desired to be closed in each signaling position of the annunciator drum and the contact ribs 46 are accordingly alike as to that portion necessary for the operation of such circuits. The other portions of the contact ribs are in stepped relation for causing the indicator lamps of the push-button holder and indicating device to be operated successively. The so-called auxiliary signal lamps controlled by the portions of the contact ribs which are in common may include the annunciator signal lamp 17, the wall box lamp 119 in the wall box 22, a lamp 120 in the superintendent's office, and one or more other lamps 121 in the supply room, or wherever else it is desired to display the signal.

In order to insure attention to the patient when he is so weak that he is only able to momentarily depress the push-button 28 in the push-button holder, auxiliary contact ribs 46 are interposed between the other contact ribs in order to establish a circuit for effecting a "Nurse" indication alternately with each of the other signals. The blank places between the contact ribs are accordingly relatively short and several "Nurse" indications may be obtained during a single rotation of the annunciator drum, thus avoiding the necessity for completely rotating the drum to effect such indication.

When the patient desires attention he presses the push-button 28 in the push-button holder 26, which serves to establish a motor circuit including the battery 115, the conductor 117, annunciator motor 71, conductor 43, push-button 28 and conductor 41, back to the battery. The motor 71 is thereupon started in operation, which, through the transmission gearing in the transmission casing 83, serves to effect the slow intermittent rotation of the annunciator drum 19 to bring the name plates 18 successively in position for display through the opening 20 in the annunciator front plate 16. At the same time the rotation of the drum causes the operation of the contact finger switches controlling the circuits through the indicating lamps 30 and 108 in such a way that circuits will be closed through these lamps to illuminate the name on the push-button holder 26 and indicating device 96 corresponding to the name shown through the opening in the annunciator front plate. At the same time each indicator signal is illuminated the signal lamps 17, 119, 120 and 121 are also illuminated, as hereinbefore noted.

The lighted indicating lamp 30 in the push-button holder indicates to the patient the signal which he has caused to be displayed on the annunciator 15 and indicating device 96 and if that is not the signal desired to be given he merely holds the push-button 28 depressed to light successive lamps until the desired signal is indicated. He then removes



his finger from the push-button, thus opening the motor circuit and allowing the annunciator drum to remain in that indicating position until the nurse arrives at the patient's bedside and presses the resetting button 118 to restore the annunciator drum to the succeeding blank position where no indicating lamp circuits are closed. The blank position is indicated to the nurse as soon as the lamp 119 in the wall box 22 becomes extinguished.

The wall box light 119, the light 120 in the superintendent's office, and the instrument light 17, which all apply to one transmitting device, may have their conductor wires connected to the same contact finger 45. The supply room light and other lights 121 require connection to separate contact fingers since they are preferably connected in common with all the instruments on the floor.

By means of this invention the patient is enabled to signal at once his desires without necessitating the delay incident to requiring the nurse to visit the bedside of the patient in order to learn what is wanted. Furthermore, the signal as given remains until the signal system is reset by the nurse at the bedside after responding to the signal. The patient knows just what signal he has given because of the illumination of the indicating lamp in the push-button holder and it is not necessary for him to learn a code of signals. If he desires to cancel a signal or to change it after it has been given, it is only necessary for him to press the push-button 28 again and so start the motor-driven annunciator drum in operation until the succeeding blank position is reached or the desired signal is indicated. A patient in weakened condition may signal for a nurse by depressing the push-button for a comparatively short period of time since such indication may be effected intermediately between each pair of the other signals.

With the provision of the corridor indicating device 96 the indicating function of the annunciator drum 19 becomes of secondary importance, except for purposes of supervision, since the nurses on duty need only observe the corridor lights outside of the respective rooms to learn the needs of the patients. This feature makes it unnecessary to visit the main annunciator board at the nurse's station, thus saving many steps and affording an opportunity for prompt service to the patient.

The construction of the push-button holder is such that the signal indications may be examined from either side thereof and the words may be so arranged that they are upright when either face of the push-button holder is turned to the front while the device is held in the same hand, or so that one face reads correctly when the device is held in one

hand, and the other face when the device is held in the other hand.

While the signaling system of this invention is more particularly intended for use in hospitals and the like, it is also adaptable to other applications when needs or wants are to be signaled.

What I claim as new and desire to secure by Letters Patent is:

1. In a signaling system, the combination of a signal rotor formed of molded insulating material, and contact elements mounted on said rotor, and having axially spaced contact portions.

2. In a signaling system, the combination of a signal rotor formed of molded insulating material, and contact elements embedded in said rotor the successive angularly spaced contact elements having axially spaced contact portions.

3. In a signaling system, the combination of a signal rotor formed of molded insulating material, and contact ribs embedded longitudinally in said rotor and having axially spaced contact portions.

4. In a signaling system, the combination of a signal rotor formed of molded insulating material, and exteriorly notched contact strips embedded longitudinally in said rotor.

5. In a signaling system, the combination of a signal rotor formed of molded insulating material, and a contact-rib-carrying sleeve mounted on an end portion of said rotor.

6. A drum for signaling systems, comprising an apertured bearing hub and a contact-carrying sleeve formed in tandem coaxial relation, an integral disk-like flange projecting outwardly from the intermediate part of said hub-and-sleeve assembly, and an annunciator shell formed integral with said flange to concentrically surround said hub portion.

7. A drum for signaling systems, comprising an apertured bearing hub and a contact-carrying sleeve formed in tandem coaxial relation, an integral disk-like flange projecting outwardly from the intermediate part of said hub-and-sleeve assembly, an annunciator shell formed integral with said flange to concentrically surround said hub portion, and radial reinforcing arms integrally connecting said hub and shell.

8. A drum for signaling systems, comprising a rotary member including a contact-carrying sleeve portion and a driving bar diametrically secured in said sleeve portion in relatively fixed relation.

9. A drum for signaling systems, comprising a rotary member including a contact-carrying sleeve portion of insulating material and a driving bar diametrically secured in said sleeve portion in relatively fixed embedded relation.

10. In a signaling system, a signaling device comprising a base member having a channel therein, a rotary signaling member

mounted on said base member, an electric driving motor having an operative connection with said rotary member and fitting in said channel against angular displacement for positioning said motor in predetermined position, and means for fixedly securing said motor in said channel.

11. A drum for signaling systems, comprising an apertured contact-carrying hub portion, an integral flange projecting outwardly from said hub portion, and an annunciator shell formed integral with said flange to surround said hub portion.

In testimony whereof, I affix my signature.

BORNETT L. BOBROFF.

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