March 25, 1958 E. E. ANDERSON 2,828,359

SIGNALING DEVICES

Original Filed March 13, 1945

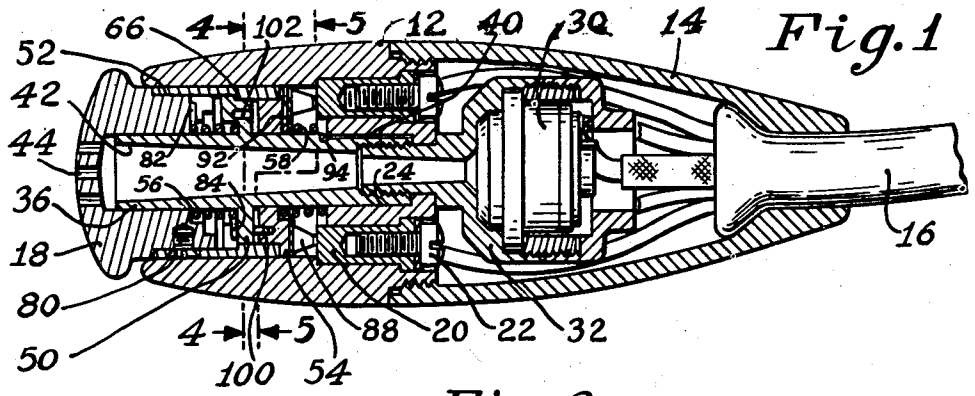


Fig. 1

Fig. 2

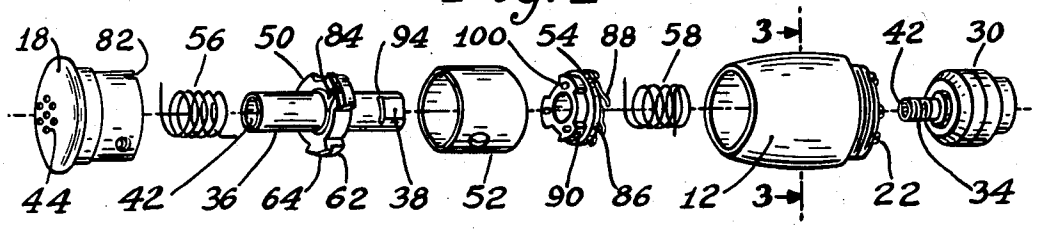


Fig. 3

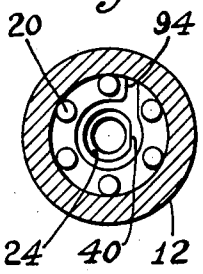


Fig. 4

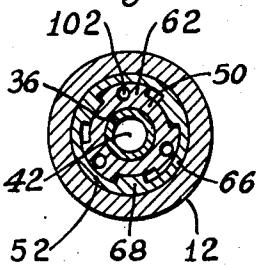


Fig. 5

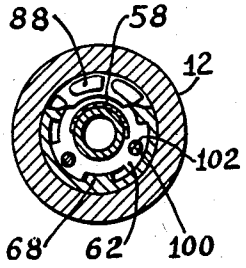


Fig. 6

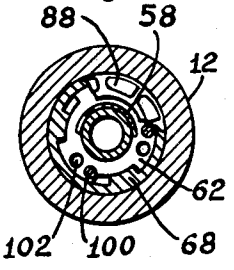
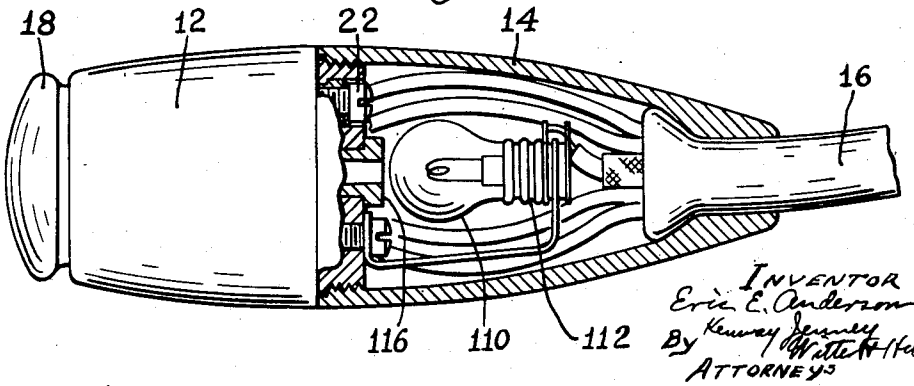


Fig. 7



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SIGNALING DEVICES

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Application March 30, 1949, Serial No. 84,362, which is a continuation of application Serial No. 582,466, March 13, 1945. Divided and this application November 26, 1952, Serial No. 322,780

3 Claims. (Cl. 179—1)

The present invention relates to signaling devices particularly adapted for use in hospital signaling and communication systems. This application is a division of my copending application, Serial No. 84,362, filed March 30, 1949; now Patent 2,624,808, which is a continuation of my application, Serial No. 582,466, filed March 13, 1945, and since abandoned.

These systems generally employ a push button switch for each patient, the switches being connected by a flexible cord to the room outlet to permit placing the push button conveniently close to the patient's hand. A system of audible and visual signals is usually provided to direct the attention of the supervising attendant to the existence of a call and to identify the room from which it came.

Such a system requires that the nurse or other attendant go to the room to ascertain the reason for the call. In numerous instances it will be found that the trip could have been avoided had direct communication been possible between the patient and the attendant at the desk.

It is, therefore, one of the objects of the present invention to provide a suitabe signal and voice communication system for hospital use, wherein electro-acoustical transducing means may be directly incorporated in the patient's push button switch unit to permit two-way voice communication with substantially complete privacy and without disturbing other patients.

According to one feature of the invention, there is provided in a compact housing, corresponding in size to conventional push button units, not only button-operated switching means for giving the usual visual and audible signals, but in addition, an electro-acoustical transducer adapted to function both as a telephone transmitter or microphone and as a telephone receiver to permit two-way voice communication with the attendant at the desk, and where desirable, to permit the latter to have auditory supervision of the patients directly from the desk.

In the drawings illustrating the several features of the invention, Fig. 1 is a view in sectional elevation of the switch and transducer assembly on a somewhat enlarged scale; Fig. 2 is an exploded view of the operating parts removed from the housing; Figs. 3, 4, 5, and 6 are detail section views taken along correspondingly numbered section lines in Figs. 1 and 2, Figs. 5 and 6 being taken along the same section line and partly broken away, showing the parts in switch-off and switch-on positions, respectively; and Fig. 7 is a view partly broken away, of a modified form of the invention.

The signaling device comprises a housing or casing formed in two sections **12** and **14** having threaded connections for assembly into a smoothly rounded shape which may be conveniently held in one hand. A flexible multi-conductor connecting cord **16** enters the housing at one end, while at the other end the housing is provided with a push button **18** having a large domed head substantially the diameter of the adjacent end portion of the housing **12**. At the base of the bore within which the push button is slidably mounted, a plurality of switch

contacts **20** having screw terminals **22** is arranged about a central passage **24** in the housing in spaced, mutually insulated relation.

Arranged within the section **14** of the housing is a transducer in the form of a combination microphone-receiver unit **30** of compact but conventional construction. The unit is mounted within a casing **32** having a projecting neck or stem **34** adapted to be received within the passage at the base of housing **12**. The transducer is clamped in position within the housing by means of threaded connections between stem **34** and the inner end of a tube **36**. The tube is held against rotation within the housing through the provision of flats **38** and **40** on tube and housing passage **24**, respectively.

To transmit sound effectively between the transducer diaphragm and the outside of the housing, the stem **34** and tube **36** are provided with an axial passage **42** which gradually expands in cross-section from the inner end of the stem **34** adjacent the transducer unit to the outer end of the tube **36** adjacent the head of the push button **18**. The push button which is bored to provide a free-sliding fit over the tube end, has the portion of its end wall which is in alignment with the tube end perforated at **44** to complete the acoustic passageway to the outside.

The switch mechanism, operating in conjunction with the fixed contacts **20** to transmit visual and audible signals to the attendant, is arranged about the longitudinal tube **36** as an axis, leaving the axial portion of the housing free to provide the acoustic passage. The switch components, in addition to the button **18** and fixed contacts **20** already mentioned, comprise a stator **50** integral with or fixedly secured to the tube **36**, a sleeve **52**, a rotor **54**, and coil springs **56** and **58** associated with the button and rotor, respectively.

The stator **50** is provided with segments **62** having shoulders **64** projecting outwardly beyond the main body of the segments, while the sleeve **52** is formed with an inwardly extending shoulder **66** at one end, with segments **68** extending inwardly therefrom so as to cooperate with the segments **62** of the stator in permitting limited rotation of the sleeve and also inward axial movement thereof. The button and sleeve are adapted to be assembled into a single operating unit locked together by screw **80**, with spring **56** disposed between the button and stator **50** in such manner as to urge the button and sleeve assembly outwardly and in a counterclockwise direction relative to the stator. Grooves **82** and **84** in button and stator, respectively, serve to anchor the spring ends.

The switch rotor **54** comprises a flange portion **86** to which resilient contact fingers **88** are secured. Since the several contact fingers need not be electrically isolated, the contact finger assembly may conveniently be formed from a single piece of sheet Phosphor bronze or other suitable material. Associated with the flange is a hub portion having segments **90** adapted to cooperate with the segments **68** of the sleeve. Spring **58** is arranged between the rotor and the housing **12** to urge the rotor against the sleeve and stator and at the same time to urge the rotor in counterclockwise rotation relative to the stator. Slots or grooves **92** and **94** are provided in rotor **54**, tube **36**, and at the base of the bore in housing **12** for locking the spring ends.

By reason of the interlocking relationship between the segments on rotor and sleeve, and between the sleeve and the stator, the rotor is permitted limited rotary movement. The parts are so arranged that the contact fingers, when the rotor is at the limit of its clockwise movement, are out of contact with the fixed contacts **20**. When the rotor is at the limit of its counterclockwise rotation, on the other hand, the contact fingers are in alignment with the fiexed contacts and, except for the contact fingers

which are in control of the buzzer circuit, in electrical contact to complete the circuits, to the nurse's signal lights. A substantial portion of the switching operation is thus effected by rotation of the rotor to move the contact fingers into and out of registry with the fixed contacts **20**.

Actuation of the switch rotor **54** is controlled by the push button through sleeve **52**. Independent axial and rotary movements of the button are utilized to provide on-actuation and off-actuation respectively, of the rotor. To latch the rotor in pre-set, switch-off position, against the urging of spring **58**, the rotor is provided with short pins **100** which project from the face of segments **90** of the rotor hub. These pins are arranged to register with and to enter holes or sockets **102** in the stator when the rotor is in clockwise, or switch-off position, so as to retain the rotor in that position until such time as a signal is to be given.

To actuate the switch, only slight pressure is required on the push button, since it is only necessary to move the rotor inwardly far enough to release the short pins **100** from their sockets **102**, against the relatively slight axial force of spring **58**. Once the pins are freed of the sockets, the rotor snaps to on-position, causing the nurse's signal lights to be energized. Because of the slight pressure and small movement required to cause the rotor to be lifted out of latching engagement with the stattor, the switch will in most instances be actuated by the blow or impact occasioned by falling from the patient's bed to the floor, so as to summon the atendant.

In order that a brief audible signal may likewise be given, as a supplement to the light signals, the switch is so arranged that the contact finger of the rotor which is in control of the buzzer circuit has a shallower bend than the others, and does not normally make contact with the adjacent fixed contact, even with the rotor at the limit of its counter-clockwise rotation, in switch-on position. To actuate the buzzer, the button is pushed to the limit of its inward position, against the force of spring **58** and also of the spring contact fingers already in engagement with the fixed contacts, thereby bringing the buzzer-circuit finger into contact. Thus, the buzzer or other audible signal is given only so long as the button is pushed, while the light signals remain on after pressure on the button is released.

To reset the switch, once the call has been answered, it is only necessary to turn the push button clockwise until the pins of the rotor register with and enter the sockets in the stator, thus latching the rotor in off position. Since the resetting and actuating operations are entirely different in character, no chance for confusion exists between the rotary resetting operation and the conventional push-button calling operation.

As an alternative to the use of the microphone-receiver unit in association with the switch mechanism, other signaling means may be provided such as a signal

light **110** mounted in socket **112** in the section **14** of the housing, as illustrated in Fig. 7. Such light might be controlled, for example, from the attendant's desk, and lighted in response to a call from the patient to indicate to the patient that the call has been noted, the light being visible from the push button end through the axial passage within the housing. In such embodiment a flanged sleeve **116** takes the place of the transducer casing **30** and stem **34** to retain the tube **36**, upon which the switch mechanism is supported in place in the housing **12**.

I claim:

1. A hospital signaling device for hand-held operation comprising a push button, switching means under the control of the push button and arranged around the axis of the push button, an electro-acoustical transducer within the device, and an acoustic passage coaxial with the axis of the push button and extending from the transducer through the push button to the exterior of the device said pushbutton having an aperture therethrough defining a part of said acoustic passage.

2. A hospital signaling device for hand-held operation, said device comprising an elongated casing, a push button, switching means under the control of the push button, an electro-acoustical transducer within the casing, and an acoustic passage of gradually increasing cross-sectional area from the interior to the exterior of the device extending axially of the casing from the transducer through the switching means to the exterior of the device said pushbutton having an aperture therethrough defining a part of said acoustic passage.

3. A hospital signaling device for hand-held operation comprising a casing, a push button rotatably and axially movable therein, a member fixed within the casing coaxial with the axis of the push button, said member having an axial passage therethrough, audible signaling means within the casing in communication with the inner end of the passage, a passage through the push button in alignment with the passage in the member, and switching means under the control of the push button and mounted on the fixed member intermediate the signaling means and the push button in coaxial relation thereto to provide an unobstructed signaling passage from the signaling means to the exterior of the device.

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