

April 22, 1947.

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2,419,471

AMPLIFIED STETHOSCOPE

Filed Oct. 28, 1944

2 Sheets-Sheet 1

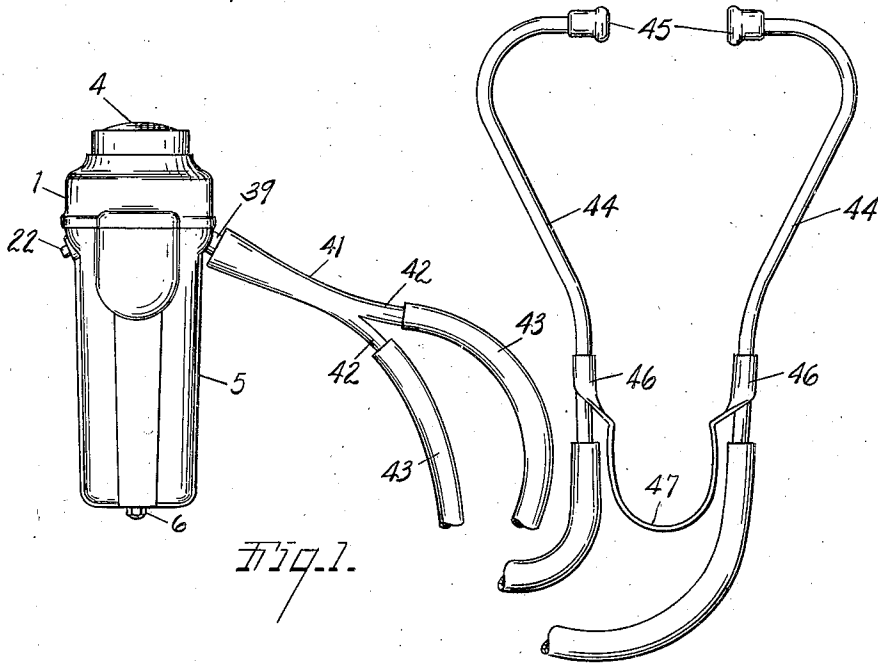


Fig. 1.

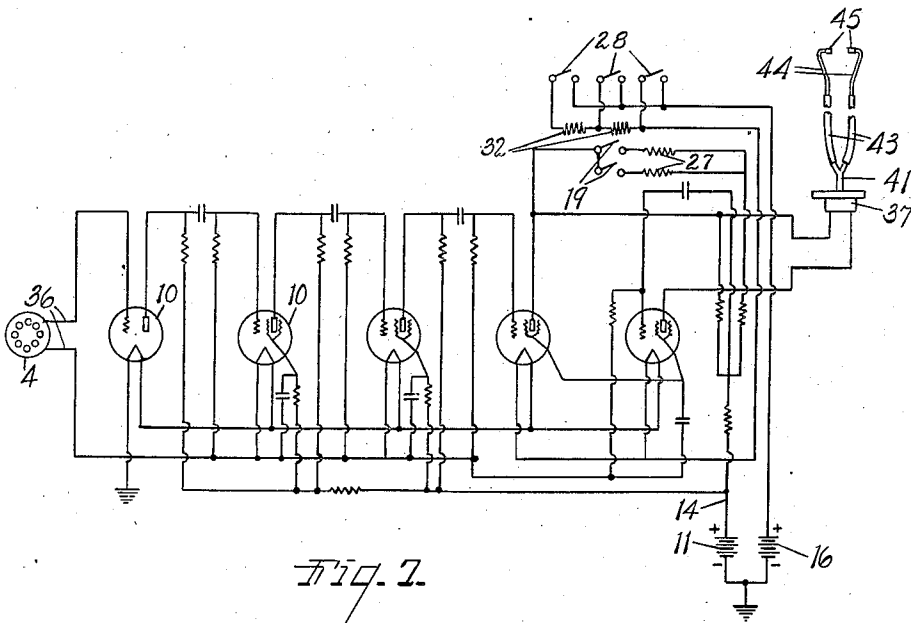


Fig. 2.

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2 Sheets-Sheet 2

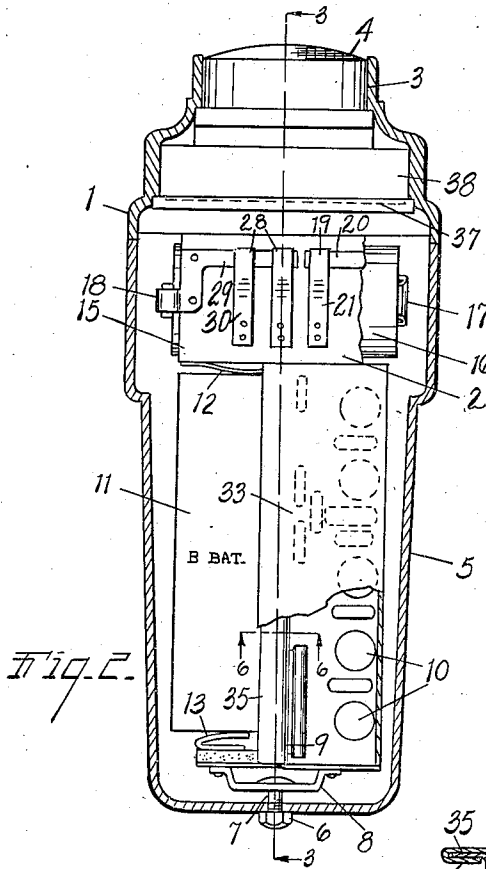


Fig. 2.

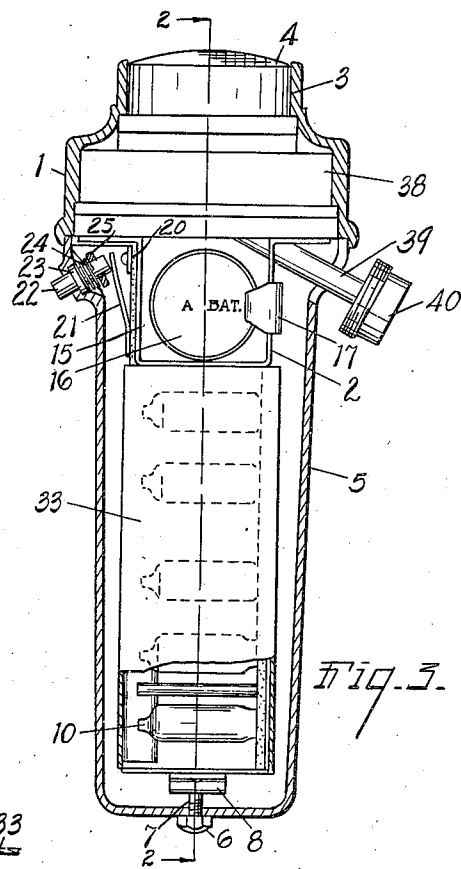


Fig. 3.

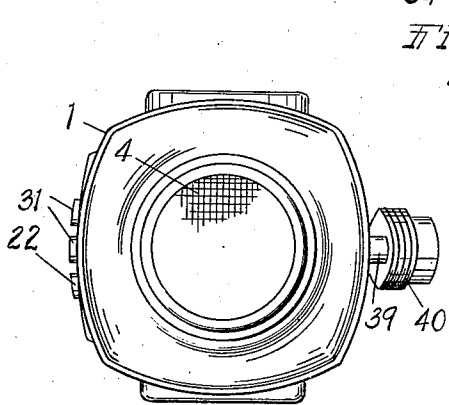


Fig. 4.

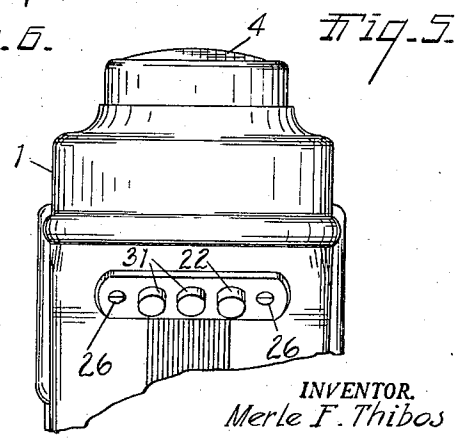


Fig. 5.

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AMPLIFIED STETHOSCOPE

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11 Claims. (Cl. 181—24)

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This invention relates to improvements in amplified stethoscopes.

The main objects of this invention are:

First, to provide a stethoscope which embodies therein sound amplifying means generally of conventional form whereby the sounds created by the heart or other organs of the body are picked up by a microphone, converted into electrical impulses, amplified by the tubes in the amplifier, and converted into sound by a sound reproducer.

Second, to provide an amplified stethoscope that may be used in a manner similar to that of the conventional stethoscope to which every physician is accustomed.

Third, to provide an amplified stethoscope that may be used under any and all conditions where a stethoscope is needed.

Fourth, to provide an amplified stethoscope in which all the parts thereof as a unit may be easily slipped into a coat pocket or may be easily suspended from around the neck when moving from room to room, or may be carried as a single unit in any other convenient position.

Objects relating to details and economies of the invention will appear from the description to follow. The invention is defined and pointed out in the claims. A preferred embodiment of the invention is illustrated in the accompanying drawing, in which:

Fig. 1 is a side elevation of the stethoscope, showing a housing for containing the microphone, amplifier, batteries, and sound reproducer, and connections from the sound reproducer within the housing to the ear pieces.

Fig. 2 is a section of the housing, taken on line 2—2 of Fig. 3, and also illustrates in plan the relative arrangement of the parts within the housing.

Fig. 3 is a section of the housing, taken on line 3—3 of Fig. 2, and also illustrates in plan the relative arrangement of the parts within the housing, viewed at right angle to the position shown in Fig. 2.

Fig. 4 is an end view of the housing illustrating the microphone disposed in said end.

Fig. 5 is a fragmentary side elevation of the housing, showing push button controls for the amplifier, projecting from the housing.

Fig. 6 is an enlarged fragmentary detail sectional view on the line 6—6 of Fig. 2.

Fig. 7 shows a wiring system for the tubes of the amplifier, generally of a conventional form.

Referring to the drawing, the reference numeral 1 designates a housing for a microphone, sound reproducer, amplifier, and batteries, sup-

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ported by a chassis 2 within the housing. The housing 1 is of elongated formation and has an opening 3 at one end thereof through which the microphone 4 projects to permit the same to be placed against the body of the patient. The other end of the housing is of a size and shape to constitute a handle 5 to be grasped by one hand of the physician for positioning the microphone 4 against the body of the patient to pick up the sounds of the heart or other organ of the body.

To provide ready access to the tubes, batteries and other parts, the handle portion 5 of the housing 1 is removably mounted on the chassis 2 and is adapted to be slipped longitudinally from over an end portion of the chassis, by removing the retaining nut 6 from the end of the bolt 7 which projects through an opening in the end of the handle and also through an opening in the bar 8 soldered or otherwise secured to the end of the chassis, the bar 8 retaining the head of the bolt between the same and the end portion of the chassis, as shown in Fig. 2.

One portion of the chassis 2, constituting a partition member 9, extends longitudinally of the handle 5 substantially midway between the opposite sides thereof. On one side of this partition member 9 are supported the tubes 10, condensers, coils and other parts of conventional design, while on the other side is supported the B battery 11 between the springs 12, 13, with the spring 12 grounding one terminal of the battery to the metal chassis 2 and with the other spring 13 insulated from the chassis and connecting the other terminal of the battery 11 to the wiring 14 leading to the plates of the tubes, as shown in Figs. 2 and 7. The chassis 2 is also provided with a compartment 15 for receiving the A battery 16. Projecting transversely of the openings at the opposite ends of this compartment are springs 17 and 18, with the spring 17 engaging the bottom of the battery and grounding it to the chassis, and with the spring 18 insulated from the chassis and engaging the terminal at the top or opposite end of the battery and connecting the battery 16 to the filament circuit of the tubes through the connections hereafter described.

A switch 19 is used to reduce the volume by the introduction of negative feed-back in the amplifier. Switch 19, as shown in Figs. 2 and 7, comprises two metal plates 20 and 21 disposed transversely of each other and both having insulated support on a wall of the compartment 15 of the chassis 2, with the plate 20 wired to the plate of one of the tubes and the other plate 21 wired in series with resistor 27 to a grid of a tube 10, and composed

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of resilient metal and having one end fixedly secured to its support and the other end normally slightly spaced from the plate 20.

To close the volume reducing circuit, the free end of the spring 21 is forced into electrical contact with the plate 20 by means of a push button 22 of insulated material and projecting from the interior of the handle 5 to the exterior thereof to be engaged by a finger of the operator. The push button 22 is provided with an annular rib 23 abutting on one side thereof the interior surface of the handle 5 and on the opposite side thereof one end of a coil spring 24 encircling the push button. The spring 24 is under compression between the rib 23 and a metal plate 25 through an opening in which the button 22 passes. The intermediate portion of this plate is spaced from the interior of the handle and its opposite ends are secured thereto by screws 26 with their inner ends threaded into said plate and with their heads engaging the exterior of the handle. Only one switch 19 is shown in Fig. 2 but obviously there may be two switches 19, as shown in Fig. 7, with the switches arranged in parallel in the plate circuit, as shown in Fig. 7, and with the parallel circuit of each switch including a separate resistance 27 different from the resistance 27 in the other parallel circuit to permit of control of volume.

In the filament circuit of the tubes between the A battery 16 and the filaments of the tubes is a switch 28 comprising two metal plates 29 and 30 disposed transversely of each other, as shown in Fig. 2, both having insulated support on a wall of the compartment 15 of the chassis 2. The plate 29 is connected to the spring 18 contacting a terminal of the A battery 16 and the plate 30 is wired to the filaments of the tubes. The plate 30 is of resilient material constituting a spring with one end fixed and the other end free and slightly spaced from the plate 29, similarly to the spacing of the free end of spring 21 from the plate 20, as shown in Fig. 3 and above described. A push button 31 constructed and mounted as the push button 22 shown in Fig. 3 and above described, may be pressed by a finger of the operator to press the spring 30 into engagement with plate 29 to close the filament circuit of the tubes. Instead of a single switch 28 in the filament circuit of the tubes, there may be two switches 28, as shown in Fig. 2, or three, as shown in Fig. 7, the switches all being of duplicate construction and disposed in parallel in the filament circuit, as shown in Fig. 7, and so arranged under the buttons that the closing of a volume reduction switch will also close the filament circuit.

A metallic shield 33 in connection with the metallic chassis 2 completely houses the tubes 10 and the connections therebetween to shield the same from stray pick up. This shield 33 extends longitudinally of the handle 5, is U-shaped in cross section, and is slidable and removably mounted on the partition member 9 of the chassis 2 by means of intumed flanges 34 on the opposite edges thereof, slidably embracing the out-turned flanged edges 35 of the partition member 9, the slidable engagement for one side being shown in enlarged detail in Fig. 6.

The terminals 36 shown in Fig. 7 are connected in conventional manner to the microphone 4 projecting from the end of the housing 1, and the sound reproducer 37 conventionally shown in Fig. 7 is disposed within the compartment 28 to the rear of the microphone 4. Leading from the sound reproducer 37 within the compartment 28

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is a sound conveying tube 39 provided with a head 40 having a screw threaded engagement with the metal tube 41 provided at its outer end with branches 42 over which are slipped the inner ends of the rubber tubes 43, engaging at their outer ends over the longitudinally curved metallic tubes 44 provided with ear pieces 45. The tubes 44 adjacent their inner ends are embraced by sleeve-like members 46 at the ends of a U-shaped spring 47, for resiliently retaining the ear pieces 45 at the outer ends of the tubes 44 in position during use. The sound waves produced by electrical impulses through the sound reproducer 37 within the housing 1 are conveyed as ordinary sound waves through the tubing above described, to the ears of the physician. If desired, a physician can readily convert his present conventional stethoscope into an amplified stethoscope by simply detaching that part of his present stethoscope that engages the chest of the patient from the sound tubes that lead to the ear pieces and then slip these sound tubes over the branches 42 of the tube 41, as are the rubber tubes 43 above described.

As the microphone, sound reproducer and amplifier are generally of conventional design, further description of the details thereof is deemed unnecessary, the present invention relating more particularly to a simple and compact arrangement of said parts in an instrument adapted to be used as a stethoscope, together with manually operable means adapted to be readily engaged for control of the amplifier.

The terms and expressions which have been herein employed are used as terms of description and not of limitation, and there is no intent in the use of such terms and expressions of excluding any equivalents of the features shown and described. It is recognized various modifications are within the scope of the invention claimed.

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

1. In an amplified stethoscope, a housing having a microphone, an amplifier adapted for volume control, a sound reproducer, and batteries disposed therein, said housing being of elongated formation, said microphone being fixedly mounted in one end of the housing to permit placing the same against the patient's body, the opposite end of said housing constituting a handle to be grasped by a hand of the operator, manually operable means engageable exteriorly of said housing for controlling said amplifier, ear pieces, and sound conveying tubes for connecting said sound reproducer to said ear pieces, said microphone and said means for controlling the amplifier both being positioned relative to said housing to permit the operator's hand which grasps the housing to simultaneously hold the microphone against the patient's body and operate the means for controlling the amplifier.

2. In an amplified stethoscope, a housing having a microphone, an amplifier adapted for volume control, a sound reproducer, and batteries disposed therein, said housing being of elongated formation, said microphone being fixedly mounted in one end of said housing, the opposite end of said housing constituting a handle, manually operable means for controlling said amplifier, said means being engageable exteriorly of said housing, a sound tube connected to the sound reproducer within the housing and having branch sound tubes exteriorly of the housing, flexible

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tubes having their inner ends connected to said branch tubes, ear pieces, and means connecting the outer ends of said flexible tubes to said ear pieces, said microphone and said means for controlling the amplifier both being positioned relative to said housing to permit the operator's hand which grasps the housing to simultaneously hold the microphone against the patient's body and operate the means for controlling the amplifier.

3. In an amplified stethoscope, a housing having a microphone, an amplifier adapted for volume control, a sound reproducer, and batteries disposed therein, said housing being of elongated formation, said microphone being fixedly mounted in one end of the housing to be placed against a patient's body, the opposite end of the housing constituting a handle to be grasped by a hand of the operator, circuits including said batteries and said amplifier, switches in said circuits, means for controlling said switches, said means being disposed adjacent the inner end of said handle and including push buttons, sound tubes having ear pieces at the outer ends thereof, and means for connecting the inner ends of said tubes to said sound reproducer, said microphone and said push buttons both being positioned relative to said housing to permit the operator's hand which grasps the housing to simultaneously hold the microphone against the patient's body and operate said push buttons.

4. An amplified stethoscope comprising a housing of elongated formation having a microphone, an amplifier adapted for volume control, a sound reproducer, and batteries disposed therein, a chassis for supporting said batteries and amplifier within one end portion of said housing, said end portion constituting a handle removable from said chassis to permit access to said amplifier and batteries, circuits including said batteries and amplifier, switches in said circuits, said switches being mounted on said chassis, push buttons for operating said switches and disposed adjacent the inner end of said handle, said push buttons being manually operable to operative position, and springs for operating the same to an inoperative position, said microphone and sound reproducer being disposed in the opposite end portion of said housing, a sound tube having its inner end connected to said sound reproducer and having its outer end provided with branch tubes, flexible sound tubes having their inner ends connected to said branch tubes, ear pieces, and means for connecting said ear pieces to the outer ends of said flexible tubes, said microphone and said push buttons both being positioned relative to said housing to permit the operator's hand which grasps the housing to simultaneously hold the microphone against the patient's body and operate said push buttons.

5. An amplified stethoscope comprising a housing of elongated formation having a microphone, an amplifier, a sound reproducer, and batteries disposed therein, a chassis for supporting said batteries and amplifier within one end portion of said housing, said end portion constituting a handle removable from said chassis to permit access to said amplifier and said batteries, circuits from said batteries to said amplifier, switches in said circuits for controlling said amplifier, said switches being mounted on said chassis, each switch including a spring for normally holding the switch open, a plurality of push buttons for operating said switches, said buttons being on the inner end of said handle and projecting through a wall thereof to be engaged ex-

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teriorly of the handle, said push buttons being manually operable inwardly, springs carried by the handle for operating the buttons outwardly, ear pieces, and sound tubes for connecting said ear pieces to said sound reproducer, said microphone and said push buttons both being positioned relative to said housing to permit the operator's hand which grasps the housing to simultaneously hold the microphone against the patient's body and operate said push buttons.

6. An amplified stethoscope comprising a housing of elongated formation having a microphone, an amplifier, a sound reproducer, and batteries disposed therein, a chassis for supporting said batteries and amplifier within one end portion of said housing, said end portion constituting a handle removably mounted on said chassis for access to the batteries and amplifier on the chassis, and manually operable control means for said amplifier, said control means being disposed adjacent the inner end of said handle, said microphone and said means for controlling the amplifier both being positioned relative to said housing to permit the operator's hand which grasps the housing to simultaneously hold the microphone against the patient's body and operate the means for controlling the amplifier.

7. An amplified stethoscope comprising a housing of elongated formation having a microphone, an amplifier, a sound reproducer, and batteries disposed therein, a chassis for supporting said batteries and amplifier within one end portion of said housing, said end portion constituting a handle removably mounted on said chassis to permit access to said amplifier and batteries, and a plurality of push buttons for controlling said amplifier and disposed adjacent the inner end of said handle, said microphone and said push buttons both being positioned relative to said housing to permit the operator's hand which grasps the housing to simultaneously hold the microphone against the patient's body and operate said push buttons.

8. An amplified stethoscope comprising a microphone adapted to be placed against a patient's body, an amplifier, a sound reproducer, supporting means for said microphone adapted to be grasped by a hand of an operator, and control means for said amplifier mounted on said supporting means, said control means being manually moved into an operative control position, and a spring for moving the same to an inoperative position, said microphone and said amplifier control means both being positioned on said supporting means to permit the operator's hand which grasps said supporting means to simultaneously hold the microphone against the patient's body and operate the amplifier control means.

9. An amplified stethoscope comprising a microphone adapted to be placed against a patient's body, an amplifier, a sound reproducer, supporting means for said microphone adapted to be grasped by a hand of an operator, and control means for said amplifier carried by said supporting means, said control means including a plurality of push buttons each manually operable to an operative position and a spring for moving each push button to an inoperative position, said microphone and said push buttons being positioned on said supporting means to permit the operator's hand which grasps the supporting means to simultaneously hold the microphone against the patient's body and operate said push buttons.

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10. In an amplified stethoscope, a housing having a microphone, an amplifier, and a sound reproducer disposed therein, said housing being of elongated formation, said microphone being disposed in one end of said housing to be placed against the patient's body, the opposite end of said housing constituting a handle to be grasped by the hand of an operator, and manually operable means to be engaged exteriorly of said housing for controlling said amplifier, said microphone and said means for controlling the amplifier both being positioned relative to said housing to permit the operator's hand which grasps the housing to simultaneously hold the microphone against the patient's body and operate the means for controlling the amplifier.

11. In an amplified stethoscope, a microphone, an amplifier, a sound reproducer, and supporting means for said microphone adapted to be grasped by a hand of an operator for placing said microphone against the body of a patient, and man-

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ually operable means carried by said supporting means for controlling said amplifier, said microphone and said amplifier control means both being positioned on said supporting means to permit the operator's hand which grasps said supporting means to simultaneously hold the microphone against the patient's body and operate the amplifier control means.

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