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L. B. LOGSDON

2,172,066

ANNOUNCING SYSTEM FOR SHIPS

Filed July 21, 1937

FIG. 1.

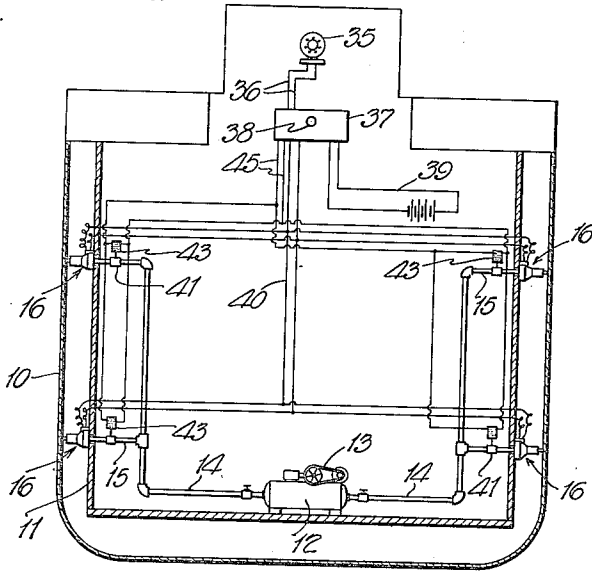


FIG. 2.

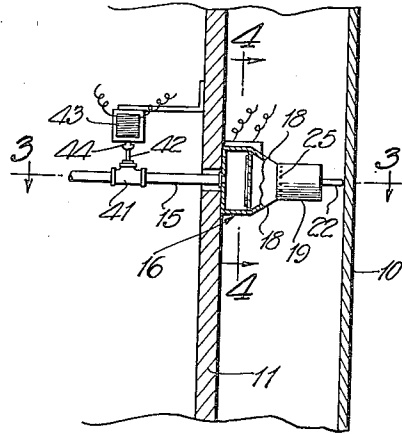


FIG. 3.

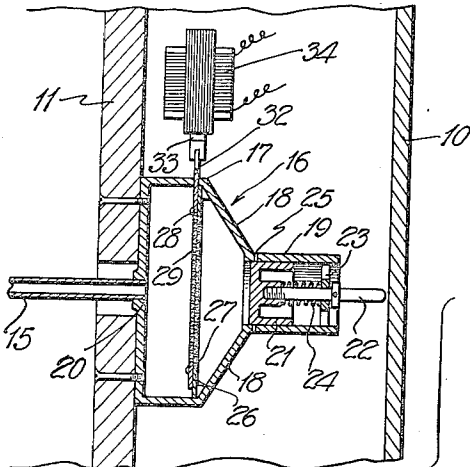


FIG. 4.

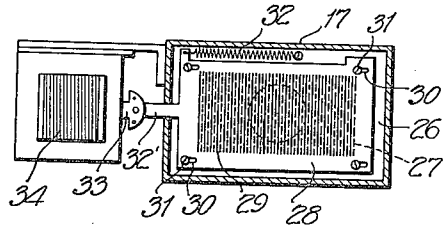


FIG. 5.

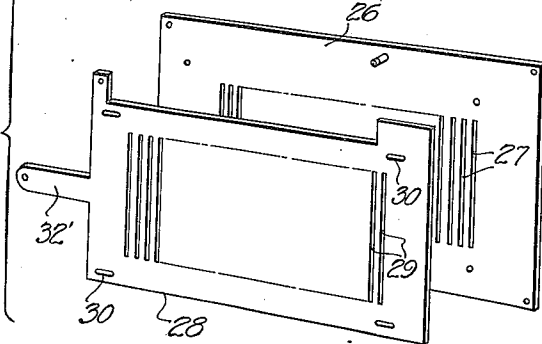
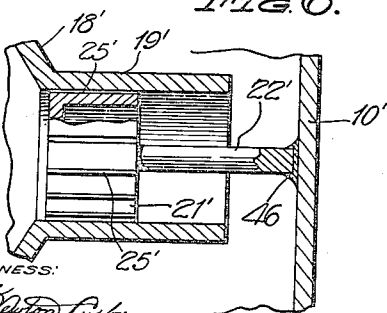


FIG. 6.



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UNITED STATES PATENT OFFICE

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ANNOUNCING SYSTEM FOR SHIPS

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9 Claims. (Cl. 179—1)

This invention relates to sound reproduction and more specifically to audio amplifier announcing systems for use on ships.

One of the main features of the invention resides in utilizing the metal hull of a ship to convey audible sounds throughout the ship by mechanical vibration at all voice frequencies. Whereas the advantages of a system of sound reproduction of the above kind may have many advantages, the system will be found most useful for emergency purposes to publicly notify the crew and passengers of a ship regardless of their whereabouts of fire drills, actual impending dangers affecting the safety of the ship at sea, and the paging of individual passengers and crew aboard the ship.

Another feature of the invention is to provide a sound reproduction system in which a number of impact striker units are arranged adjacent the metal hull of a ship in suitable spaced relation throughout its entire area, the same being in circuit with an audio amplifier, the impact striker units being simultaneously controlled by the voice frequencies in the circuit for imparting corresponding vibratory frequencies to the ship's hull, thus utilizing the ship's hull as a vibratory loud speaker.

With these and other objects in view, the invention resides in the certain novel construction, combination and arrangement of parts, the essential features of which are hereinafter fully described in the following specification, are particularly pointed out in the appended claims, and are illustrated in the accompanying drawing in which:

Figure 1 is a transverse sectional view through a ship's hull with my invention associated therewith.

Figure 2 is an enlarged fragmentary sectional view of one of the impact striker units.

Figure 3 is an enlarged horizontal sectional view on the line 3—3 of Figure 2.

Figure 4 is a vertical sectional view on the line 4—4 of Figure 2.

Figure 5 is a detail perspective view of the shutter valve plates in separated relation.

Figure 6 is a detail vertical sectional view of a modified form of the invention.

Referring to the drawing by reference characters, the numeral 10 designates a metal ship's hull and 11 an inner wall structure such as watertight bulkheads, arranged in spaced relation to the hull. Mounted within the ship is a compressed fluid storage tank 12 which may contain air or other fluid pressure. A predetermined

fluid pressure is maintained in the storage tank 12 by a motor driven compressor 13. Connected to the storage pressure tank 12 are fluid pressure distributing pipes 14 which extend throughout the length of the ship's hull and to which branch pipes 15 are suitably connected. In Figure 1 of the drawing, I have shown four of such branch pipes 15, the same extending horizontally through the inner wall structure 11 and being arranged in pairs on opposite sides of the hull. It will be understood that any number of branch pipes may be provided throughout the area of the hull for individual connection with impact striker units 16 now to be described.

Each impact striker unit includes a rectangular casing 17 bolted or otherwise secured to the outer side of the inner wall structure 11 so as to be disposed within the space between the hull 10 and the inner wall structure. The outer side of the casing is provided with converging walls 18 which meet the inner ends of an open ended cylinder 19. The casing 17 is provided with an air inlet opening 20 joined by a branch pipe 15, and which inlet opening is disposed in axial alignment with the axis of the cylinder 19. Slidably mounted in the cylinder 19 is a piston head 21 from which a piston rod 22 extends in the direction of the adjacent surface of the hull 10. The rod 22 is slidably mounted in a spider bearing 23 disposed within the cylinder, while a spring 24 surrounds the rod and is interposed between the bearing 23 and piston head 21 to normally urge the piston inwardly and hold the free end of the rod in close spaced relation to the hull 10. A stop collar on the rod 22 limits the inward movement of the piston by its engagement with the bearing 23. The piston head 21 normally overlies bleed openings 25 provided adjacent the inner end of the cylinder 19. From the description thus far, it will be understood, that any fluid pressure force greater than the tension force of the spring 24 upon the piston head 21 from within the casing 17 will cause the piston to move outwardly at which time the free end of the piston rod will impart a striking blow to the hull 10. From the description to follow, I control the intermittent striking impacts of the piston by the human voice frequencies to reproduce like voice frequencies using the hull as a vibratory diaphragm so that the amplified voice may be clearly heard throughout a ship.

Fixedly mounted within the casing 17 and extending the length and height thereof is a valve shutter plate 26 having spaced vertical air slots 27 therein. Slidably mounted along one side of

the plate 26 is a shutter valve plate 28 which is provided with vertical slots 29 corresponding in number and spaced relation to the slots 27 in the plate 26. The plate 28 is provided with horizontal slots 30 through which pins 31 extending from the plate 26 pass. The length of the slots 30 predeterminedly limit the range of sliding movement of the plate 28 in opposite directions. A contractile spring 32 has one of its ends fastened to the casing 17 and its other end connected to one end of the plate 28 to normally hold the slide plate at the limit of its sliding movement in one direction at which time the slots 29 are out of register with the slots 27.

One end of the plate is provided with an extending arm 32 which slides through one end wall of the casing 17 and to which the sliding core 33 of a fixedly supported horizontally disposed solenoid 34 is connected. Energization of the solenoid 34 imparts a sliding movement to the slide shutter plate 28 against the action of the spring 32 to position the slots 29 in register with the slots 27 and by intermittently energizing the same by voice frequencies, the slide shutter plate will reciprocate and control the passage of fluid pressure from the branch fluid pressure pipe 15 to the cylinder 19.

Located at any suitable place upon a ship is a microphone 35 operatively connected by wires 36 to a conventional electronic audio amplifier unit shown diagrammatically at 37 and which includes a hand operated switch 38 for turning the same on and off. The amplifier unit receives its current from an electric supply circuit 38. Operatively connected to the output of the amplifier unit is an amplifier circuit 40 in which all of the solenoids 34 are arranged in parallel, thus the solenoids are responsive to the voice frequencies set up in the amplifier circuit in the same manner as electrically controlled element of a dynamic loud speaker. Thus the voice frequencies in the amplifier circuit control the actuation of the slide shutter plate 28 to admit the head of fluid pressure to intermittently act on the piston head 21 to cause the piston rod to forcibly strike the ship's hull 10 to set up thereover a mechanical vibration at the voice frequencies corresponding to those entering the microphone 35. As the piston head 21 of each impact striker unit moves outwardly clear of the bleed openings 25 the air pressure acting upon the piston head is reduced causing the spring 24 to return the piston to its normal position, thus during operation of the apparatus the piston will impart rapid intermittent taps to the ship's hull to audibly reproduce throughout the ship, the voice sounds spoken into the microphone 35.

It is a known fact that the character of complex speech sound depends upon all overtones or harmonics and in this system of sound reproduction, there may be a distortion of the "wave form" between that entering the system and that set up by the hull of the ship, but not to the extent of complete loss of "intelligibility". The pressure of air acting upon the striker piston varies as does the release of the pressure on the piston due to the actuation of the gate valve, thus the piston strikes the resilient hull and remains in contact therewith during its yielding vibratory movement at various degrees of pressure, thus making it possible to obtain overtones or harmonics necessary to intelligibly reproduce speech sound at like frequency, although the harmonics of the sound reproduced may vary from the harmonics of the speech sound entering the system.

To relieve the fluid pressure upon each impact striker unit 16 when the system is turned off at the switch 38, I provide electrically controlled shut off valves 41 in each branch pipe 15. Each valve 41 includes a normally closed valve element 42 movable to an open position by the energization of a solenoid 43, the sliding core 44 of which is connected to the valve element 42. The solenoids 43 of the shut off valves 41 are arranged in parallel within a circuit 45, the said circuit 45 being operatively connected to the current supply circuit 39 through the switch 38, so that when the switch 38 is "off" the circuit 45 is open and when the switch 38 is "on" the circuit 45 is closed and the solenoids 43 energized to open the valves 41 to enable the stored head of fluid pressure to enter the inlet side of the casings 17.

In Figure 6 of the drawing, I have illustrated a slightly modified form of impact striker unit wherein 19' designates the cylinder communicating with the pressure outlet side of a casing 18'. Slidable in the cylinder 19' is a piston head 21' having spaced longitudinal grooves 25' in the outside thereof. A piston rod 22' extends outwardly from the head 21' and is welded or otherwise secured to the ship's hull 10' as at 46. The operation of the modified form of impact unit is the same as that previously described but the sound vibrations are directly imparted to the hull. The grooves 25' permit of the escape of fluid pressure but not such an amount as would effect actuation of the piston when the shutter valve is in open position.

While I have shown and described what I consider to be the most practical embodiment of my invention, I wish it to be understood that such changes and alterations as come within the scope of the appended claims may be resorted to if desired.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. In combination with the metal hull of a ship, sound transmission means within the ship, and fluid pressure actuated striker means responsive to the sound frequencies entering said sound transmission means for imparting vibrations to said hull for reproduction of sound through the area thereof at like frequencies as that entering said sound transmission means.

2. In combination with the metal hull of a ship, voice transmission means within the ship, and fluid pressure actuated striker means responsive to the voice frequencies entering said sound transmitting means for setting up vibrations of said hull at like voice frequencies to audibly reproduce sound to be heard throughout the ship.

3. In combination with the hull of a ship, an electric sound transmission circuit including an electronic amplifier, and a voice transmitter adapted to be suitably located within said ship, fluid pressure actuated striker devices for imparting vibrations to said ship's hull, and means in said circuit responsive to the voice frequencies entering the same for controlling the actuation of said fluid pressure actuating devices to cause the same to act upon said hull to vibrate the same and reproduce sound throughout said hull at frequencies similar to the voice frequencies entering said voice transmitter.

4. In combination with the hull of a ship, a voice transmission circuit having a microphone and an electronic amplifier arranged therein, and fluid pressure actuated striker means responsive to the voice frequencies passing through said cir-

cuit for imparting vibrations to said hull to reproduce sound of a frequency corresponding to the voice frequency entering said circuit.

5 5. In combination with the hull of a ship, a voice transmission circuit having a microphone and an electronic amplifier arranged therein, a plurality of impact striker units mounted relative to the hull for intermittent striking contact there-
10 with, fluid pressure means for actuating said impact striker units, and means responsive to the voice frequencies passing through said circuit for controlling the fluid pressure means to cause said impact striker devices to impart vibration to said hull to reproduce sound of a frequency corre-
15 sponding to the voice frequency entering said circuit.

6. In combination with the metal hull of a ship, a voice transmission circuit having a microphone and an electronic amplifier arranged therein, an impact striker unit mounted relative to said hull comprising a cylinder, a striker piston slidably
20 mounted in said cylinder, spring actuated means tending to hold said striker piston out of contact with the hull, pneumatic means connected with said cylinder for actuating the same to cause
25 said piston to strike said hull, valve means for regulating the operation of said pneumatic means, and means in said transmission circuit responsive to the voice frequencies entering the same
30 for imparting intermittent actuation to said valve means to intermittently actuate said striker piston to vibrate said hull at corresponding voice frequencies.

7. In combination with the metal hull of a ship,
35 a voice transmission circuit having a microphone and an electronic amplifier arranged therein, an impact striker unit mounted relative to said hull comprising a cylinder, a striker piston slidably
40 mounted in said cylinder, spring actuated means tending to hold said piston in a normally retracted position away from said hull, a pipe line,

a chamber connected to one end of said pipe line and communicating with said cylinder, means for maintaining a head of fluid pressure within said pipe line, a slide valve arranged within said chamber for regulating the flow of fluid pressure to
5 said cylinder, and electro-magnetic means in said circuit responsive to the voice frequencies passing through said circuit for imparting intermittent sliding movement to said slide valve, substantially
10 as and for the purpose specified.

8. In combination with the metal hull of a ship, a voice transmission circuit having a microphone and an electronic amplifier arranged therein, an impact striker unit mounted relative to said hull comprising a cylinder, a striker piston slidably
15 mounted in said cylinder, spring actuated means tending to hold said piston in a normally retracted position away from said hull, a pipe line, a chamber connected to one end of said pipe line and communicating with said cylinder, means for
20 maintaining a head of fluid pressure within said pipe line, a slide valve arranged within said chamber for regulating the flow of fluid pressure to said cylinder, and electro magnetic means in said
25 circuit responsive to the voice frequencies passing through said circuit for imparting intermittent sliding movement to said slide valve, an electro magnetic valve arranged in said pipe line, an actuating circuit therefor, and switch means com-
30 mon to said amplifier circuit and to said actuating circuit for simultaneously opening and closing the same by manual actuation thereof.

9. In combination, a diaphragm, sound transmission means, and fluid pressure actuated striker means responsive to the sound frequencies en-
35 tering said sound transmission means for imparting vibrations to said diaphragm for the reproduction of sound at like frequencies as that entering said sound transmission means.

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