July 21, 1931. W. L. ECKHARDT 1,815,552

SOUND GENERATOR FOR AUTOMOBILES

Filed Sept. 25, 1930

Fig. 1.

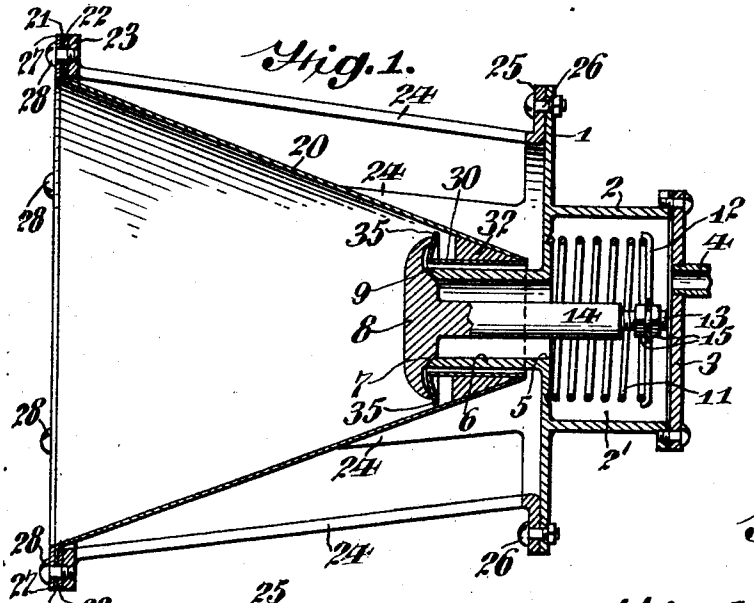


Fig. 2.

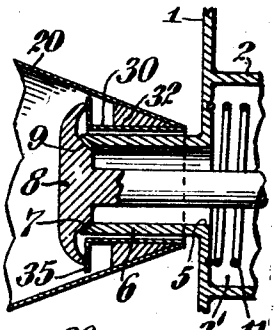


Fig. 3.

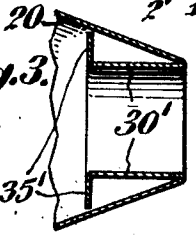


Fig. 4.

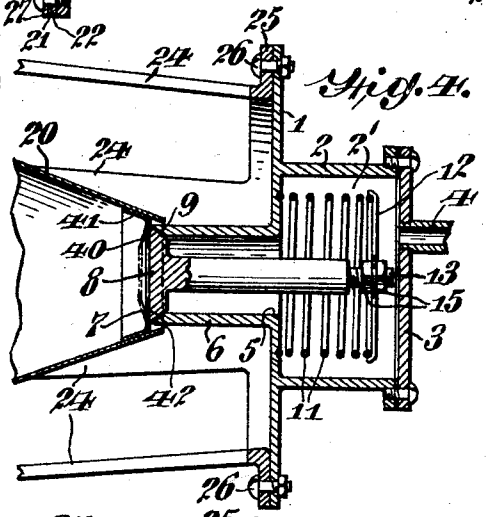


Fig. 5.

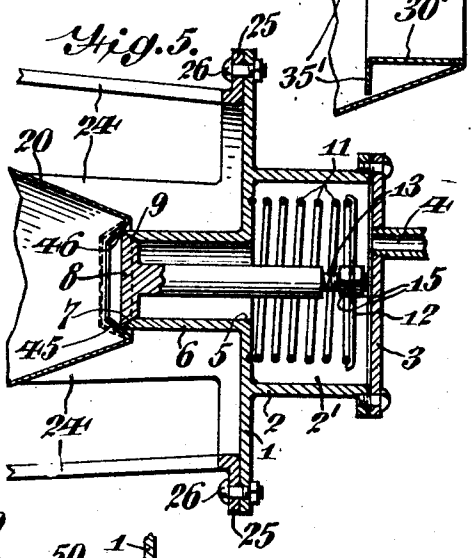


Fig. 6.

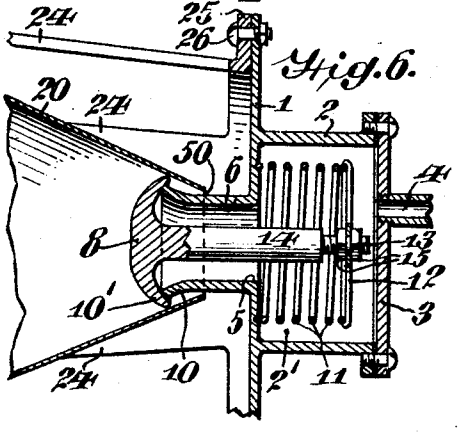
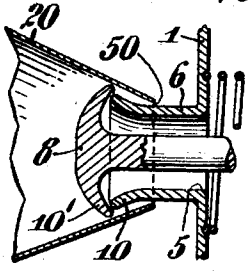


Fig. 7.



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UNITED STATES PATENT OFFICE

WALTER L. ECKHARDT, OF PHILADELPHIA, PENNSYLVANIA

SOUND GENERATOR FOR AUTOMOBILES

Application filed September 25, 1930. Serial No. 484,306.

My invention relates to sound producing instrumentalities which are adapted for use upon automobiles and the like for producing warning sound signals. Although adapted more particularly for use upon automobiles it is to be understood that instrumentalities embodying my invention are not limited to that particular use or purpose but may be employed for the purpose of producing sound signals for the protection of ocean traffic and for other purposes.

The instrumentalities or devices embodying my invention are adapted to be actuated for the production of sound by the action thereon, or upon portions thereof, of air or gas under pressure, such air or gas under pressure being obtained from any source. For example, air or gas may be placed in a tank or receiver under compression and released as desired, or the air or gas may be supplied from a compressible and collapsible bulb which may be operated manually for the purpose of forcing the same into the instrumentality to effect vibration thereof or of portions thereof for producing a warning or signal sound.

The general object of the invention is to provide a device or instrumentality of the character and for the purpose stated which is novel but simple in construction and which may be manufactured at a minimum of cost.

It is also an object of the invention to provide a device or instrumentality of the character indicated of novel construction and of a character such that the volume of sound may be regulated by the pressure of the air or gas admitted thereto.

A further object of the invention is to provide a device or instrumentality of novel construction including means the presence of which causes the production of a warning or signal sound more agreeable to the ear and more sonorous than has been the case with devices or instrumentalities heretofore in use, as far as I am aware.

A still further object of the invention is to provide a sound signaling device including a horn having as usual one end smaller than the other, the smaller end being unsupported and free to vibrate.

Without attempting at this time to enumerate the further objects and advantages of my invention I shall proceed to a detailed description thereof wherein other objects and advantages thereof will be set forth or else will become apparent.

In order that the invention may be readily understood and its practical advantages fully appreciated reference should be had to the accompanying drawing wherein I have illustrated certain forms of construction showing different embodiments of the invention. These several embodiments are intended merely to bring out more fully and clearly the principle underlying the operation of devices embodying the invention and are not intended to indicate a limitation of the invention which may be embodied in a variety of forms of construction without departure from the principle thereof.

In the drawings:

Fig. 1 is a view in longitudinal central section of a device or instrumentality embodying the invention;

Fig. 2 is a view of a fragmentary portion of the device shown in Fig. 1 showing certain of the parts in different positions from those in which they are shown in Fig. 1;

Fig. 3 is a view of a fragmentary portion of a device embodying the invention showing a modified construction of the invention;

Fig. 4 is a view in central longitudinal section of a portion of a device or instrumentality showing a modified construction of the invention;

Fig. 5 is a view similar to Fig. 4 showing another modified construction of the invention;

Fig. 6 is a view similar to those shown in Figs. 4 and 5 but showing another modified construction of device embodying the invention; and

Fig. 7 is a view of a fragmentary portion of the device shown in Fig. 6 but showing certain of the parts in different positions from those in which they are shown in Fig. 6.

In the drawings I have shown at 1 a plate from one side of which projects an annular or circular flange 2 forming a chamber 2′ the outer end of which is closed by means

of a plate 3 secured to the outer edge of the said flange. The said plate is provided with a tapped opening for the reception of the end of a pipe 4 having connection with a source of air or other gas under pressure, not shown. The said air or gas may be supplied from a tank or receiver in which the same may be contained under pressure, or it may be supplied from the exhaust of an internal combustion engine, or from the cylinder of such an engine, or it may be supplied by means of a bulb or the like which may be operated by pressure in known manner. Practically it is immaterial by what means air or gas under pressure is delivered as desired to the chamber 2'. In order that the volume of the sound produced may be controlled it is desirable that the pressure of the air or gas within the chamber shall be controllable and this may be effected by any suitable known means.

The plate 1 is provided with an opening 5 from the edge of which a tubular projection 6 extends in a direction opposite that in which the tubular or circular flange 2 projects.

In Figs. 1, 2, 4 and 5 the inner edge of the outer end of the said tubular projection 6 is provided with a beveled or inclined portion 7 forming a valve seat. The opening of the outer end of the said tubular projection is adapted to be opened and closed by means of a valve 8 which is provided with a surface at 9 corresponding to the surface 7 and cooperating therewith.

In the construction as illustrated in Figs. 6 and 7 the outer end of the tubular projection 6 is flared as indicated at 10 and the valve 8 is provided with an outwardly and inwardly or downwardly extending skirt or flange portion 10' the inner or under side of which is adapted to contact and cooperate with the outer edge of the flared portion 10.

For the purpose of holding the valves in the several forms of construction against their seats I have provided a coiled spring 11 the outer end of which is seated against a support 12 adjustably secured upon the lower screw-threaded reduced end portion 13 of the valve stem 14 by means of nuts 15. By adjusting the support 12 (which comprises a plurality of radially extending arms) lengthwise of the stem 14 the compression of the spring 11 and in consequence the force exerted by the latter to resist opening movements of the valve 8 is varied.

In the several forms of construction as illustrated I show a horn 20 of truncated cone-shape having at its outer end a laterally extending flange 21 resting upon a ring 22 supported upon the ring-shaped part 23 provided at the upper end of a support or standard 24. The latter may consist of a plurality of spaced portions, as indicated, or may be continuous. The support 24 terminates at its lower end in a laterally and outwardly extending flange 25 which rests upon and is secured to the outer edge portion of the plate 1 by means of fastening bolts 26. A ring 27 overlies the flange 21 at the outer flared end of the horn 20 and the two rings 22 and 27 and the intermediate flange 21 are secured to the flange 23 by means of fastening screws 28.

Although the horn 20 as illustrated is of truncated cone-shape I desire it to be understood that the horn may be of other shapes; for example, it may consist of an approximately cylindrical tubular member.

Referring now to Figs. 1 and 2 it will be noted that the inner smaller end of the horn 20 extends to a plane near the bottom of the tubular projection 6 and that it terminates in proximity to the outer circumference of said projection. A tubular cylindrical member 30 is located within and secured to the lower end portion of the horn 20 and is coaxial therewith. The inner end of the tubular cylindrical portion 30 is located practically in the same plane as that of the inner edge or end of the horn 20.

An annular member 32 is located in the annular space between the cylindrical tubular member 30 and the adjoining opposing inner end portion of the horn 20. The member 32 is of triangular shape in cross section so that it fits accurately the space between the members 20 and 30. The three members 20, 30 and 32 may be secured together in any suitable manner as by brazing, spot welding or by riveting. The outer end of the cylindrical tubular member 30 projects beyond what may be regarded as the base of the member 32 and is provided with an outwardly extending flange 35. The flange 35 is flexible and resilient so that when the valve 8 is drawn by the spring 11 against its seat as shown in Fig. 1 the flange 35 is deflected or bent inwardly as shown in Fig. 1. However, when the valve is raised from its seat by means of air or gas admitted to the chamber 2' the flange 35 assumes a position in a plane practically at right angles to the axis of the horn 20.

The construction as shown in Fig. 3 is similar to that shown in Fig. 1 the difference being that the cylindrical tubular member 30' is integral with the inner end of the horn 20. The flange 35' corresponds to the flange 35 and like the latter is flexible or bendable and resilient. It will be understood that when the construction as illustrated in Fig. 3 is embodied in a completed sound-producing device it will be provided with a valve 8 like that shown in Figs. 1 and 2 of the drawings and that the relation of the said valve to the flange 35' will be identical with the relationship which is shown between the valve 8 and the flange 35 in Figs. 1 and 2.

In the operation of the device as shown in

Figs. 1, 2 and 3 it will be understood that when air or gas under pressure (which pressure may be regulated in any practicable and desirable manner) is admitted to the chamber 2′ it acts upon the inner or under side of the valve 8 to cause slight opening thereof in opposition to the force exerted by the spring 11. The opening and closing under the influence of the air or gas pressure and the spring 11 takes place very rapidly causing a corresponding rapid vibrating movement of the flange 35 or 35′, and the escape of the air or gas through the narrow spaces between the outer edge of the valve 8 and the flange 35 or 35′ and through the space between the tubular projection 6 and the inner surface of the tubular member 30 or 30′ causes a rapid vibration of the horn 20 suspended, as described, by means of the flange 21.

In Fig. 4 of the drawings the outer edge portion of the top side of the valve 8 is in contact with a flange 40 which extends inwardly from a truncated cone-shaped annular or ring-shaped member 41 which is secured to the inner side of the horn 20 near the lower end thereof as shown by brazing, spot-welding, riveting or otherwise. The flange 40 normally, that is, when the device may be said to be inactive, occupies a plane extending practically at right angles to the axis of the horn 20. When air or gas under compression is admitted to the chamber 2′ it acts upon the inner or under side of the valve 8 to cause opening movement of the latter in opposition to the force exerted by the spring 11 and also in opposition to the resistance offered by the flange 40. The latter, as is the case with the flange 35 or 35′, is flexible or bendable and is resilient so that it will yield sufficiently to permit slight opening movement of the valve 8 to permit the passage from the chamber 2′ of air or gas which may be under compression therein. It will be noted that the inner or lower edge of the horn 20 slightly overlaps the outer or upper end of the tubular projection 6 and as indicated at 42 is located in close proximity thereto so as to provide a narrow annular outlet for gas which may be released from the chamber 2′. Upon the passage of the gas from the chamber 2′ a portion thereof passes out through the space at 42 and other portions thereof pass at rapid intervals between the valve and the flange 40. The result is to cause not only rapid vibrations of the flange 40 but also rapid vibrations of the horn 20.

In Fig. 5 of the drawings I have shown a construction wherein the horn 20 terminates at its inner smaller end in an inwardly and upwardly inclined flange 45 which contacts with the outer sharp edge or corner 46 of the valve 8. When air or gas under sufficient pressure or compression is admitted to the chamber 2′ it acts upon the valve 8 to open the same in opposition to the resistance offered by the spring 11 and the flange 45. As a result of the combined forces upon the valve 8 it opens and closes rapidly thereby causing rapid vibrations of the flange 45 and of the horn 20.

In Figs. 6 and 7 of the drawings the inner smaller end of the horn 20 extends a considerable distance inwardly of or below the outer flared end 10 of the tubular projection 6 and terminates in proximity to the outer circumference of the latter so as to provide a narrow annular space as indicated at 50. Upon the admission of air or gas under pressure the pressure thereof against the inner or under side of the valve 8 causes an opening movement thereof in opposition to the resistance offered by the spring 11. The combined forces acting upon the valve 8 cause the latter to open and close rapidly or to vibrate permitting the air or gas to escape at intervals in rapid succession. The passage of the air or gas thus escaping between the outer edge of the skirt 10′ of the valve 8 and the adjoining portion of the horn 20 and also through the annular narrow passage 50 imparts to the horn 20 rapid vibrations the result of which is the production of sound.

It will be observed that the inner or smaller end portion of the horn is unsupported except by the flange 21 previously referred to. Because the inner smaller end portion of the horn is thus unsupported and is thus free to vibrate it is appropriate to describe it as a floating horn.

It will be understood that the horn and other parts of the structure may consist of any suitable material. For example, the horn may consist of brass.

The vibrations imparted to the inner smaller end of the horn 20 are amplified by the horn, as is well known particularly to those familiar with the phonograph art. The tonality of the sound produced may be varied and controlled by a proper selection of materials, by variations in the length and flare of the horn, and by a variation in the pressure of the air or gas admitted to the chamber 2′ by which the device or instrumentality is actuated.

It will be understood, as already has been indicated, that any suitable gaseous fluid may be employed in the operation of the device and I desire it to be understood that both in the specification and in the claims the word "gas" when employed is intended to signify not only air but steam and gases of any other character.

The device as a whole may be mounted and supported in any suitable manner upon and in desired position upon an automobile, or other motor vehicle, or a structure of any other kind or character.

Although in the construction as illustrated the inner end portion of the horn in

adjoining relation to the projection 6 is free and floating as described yet I desire it to be understood that a construction wherein a reverse arrangement is employed comes within the general scope of my invention. That is to say, the inner end of the horn may be rigidly supported, in which event the outer end should be left free and unsupported or floating.

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

1. A sound generating instrumentality comprising, in combination, a horn having inner and outer ends, the former being suspended and free to vibrate, a receptacle for the reception of a gas under pressure, said receptacle having a passageway leading through the adjoining inner end of the said horn, means for regulating the passage of gas from said receptacle through the said passageway, and means whereby the escape of gas from said passageway imparts vibrations to the horn to cause the same to emit sounds.

2. A sound generating instrumentality comprising, in combination, a horn wider at one end than the other and being open at both ends, a receptacle for the reception of gas under pressure, said receptacle having an opening in one side thereof, a tubular projection extending from the edge of said opening into the adjoining smaller end of the said horn, the said smaller end being suspended and free to vibrate and means operating to cause vibrations of the said horn upon the escape of gas through said tubular projection from the said receptacle.

3. A sound generating instrumentality comprising, in combination, a horn of truncated cone-shape open at both ends, a receptacle for gas under pressure, the smaller end of said horn being located in adjoining relation to the said receptacle, one side of said receptacle having an opening therethrough, a tubular projection extending from the edge of said opening into the opening in the adjoining smaller end of the said horn, a valve for closing the outer end of the said tubular projection, means for yieldingly holding the said valve in closed position, said valve adapted to be opened by the force exerted by gas under pressure within said receptacle, and means operating upon the escape of gas from the said chamber to impart vibratory movement to the said horn to thereby produce sounds.

4. A sound generating instrumentality comprising, in combination, a receptacle for receiving a gas under pressure, said receptacle having an opening in one side thereof, a tubular projection extending outwardly from the edge of said opening, a valve for closing the outer end of said tubular projection, means for yieldingly holding the said valve in closed position, a horn open at both ends, one end of which overlaps the said projection and forms with the outer circumference thereof a narrow outlet, and a yielding resilient member mounted upon the end portion of the said horn which overlaps the said tubular projection, the outer edge of the said valve being in contact with the said yielding resilient member.

5. A sound generating instrumentality comprising, in combination, a receptacle for gas under pressure, said receptacle having an opening in one side thereof, a tubular projection extending outwardly from the edge of said opening, a horn one end of which is smaller than the other, the smaller end overlapping the said tubular projection and forming therewith a narrow outlet for the passage of gas released from the said chamber, and means whereby when gas is admitted to the said receptacle under pressure it is released therefrom at rapid intervals in succession.

6. A sound generating instrumentality comprising, in combination, a tubular member to which gas is adapted to be supplied under pressure, a floating horn having one end in overlapping relation to the said tubular member, and means for releasing the gas from the said tubular member in rapid successive impulses.

7. A sound generating instrumentality comprising, in combination, a tubular member to which gas is adapted to be supplied under pressure, a floating horn having one end in overlapping relation to the said tubular member, means for releasing the gas from the said member in rapid successive impulses, and means acted upon by the gas escaping from the said tubular member to cause rapid vibratory movement of the said horn.

8. A sound generating instrumentality comprising, in combination, a tubular member to which gas under pressure is adapted to be supplied, a valve yieldingly held against an end of the said tubular member for closing the same, a flared horn supported at its outer flared end, the inner floating end of which is in telescoping relation to the said tubular member, the telescoping portion of the said horn forming with the outer circumference of the said tubular member a narrow passageway through which gas escaping from the said tubular member may pass.

9. A sound generating instrumentality comprising, in combination, a tubular member to which gas under pressure is adapted to be supplied and through which said gas is adapted to flow, a valve for closing the outer end of said tubular member, means for holding the said valve yieldingly in closed position, a tapered horn, means for supporting the said horn at its outer flared end, the inner small end of said horn inclosing a portion of the said tubular member and form-

ing therewith a narrow passageway, and a flexible resilient member in contact with the said valve and adapted to move by the action of forces thereon exerted by the said valve.

10. A sound generating instrumentality comprising, in combination, a tubular member to which gas under pressure is adapted to be admitted, a valve for closing the outer end of said tubular member, resilient spring acting means for holding the said valve in closed position, said last named means yielding to permit opening of said valve upon the admission of gas under pressure to the said member, the effect of the gas pressure and of the force exerted by the said resilient yielding spring member being to cause rapid opening and closing movements of the said valve, a tapered horn, and means for supporting the outer flared open end of said horn, the inner small end of said horn encircling the said tubular member and the inner edge of its open end being located in proximity to the outer circumference of the adjoining portion of the said tubular member.

11. A sound generating instrumentality comprising, in combination, a receptacle for the reception of a gas under pressure, said receptacle having an opening for the outlet of gas therefrom, a valve for closing said opening, yielding resilient means for holding the said valve in closed position, said means being adapted to be overcome by the force exerted by the expansion of the gas to permit opening of the said valve, a tapered horn, means for supporting the outer open flared end of the said horn the inner small end of which is unsupported, and a flange of yielding resilient material mounted upon the interior of the small open end of the said horn and being in engagement with the said valve and being actuated thereby upon movement thereof under the influence of gas pressure admitted to the said receptacle.

12. A sound generating instrumentality comprising, in combination, a receiver for gas having a port for the outlet of gas therefrom, means for opening and closing said port, yielding means tending to hold the said port closing means in closed position, a horn having a floating end portion which surrounds said port, and a yielding resilient member having connection with and supported by the said horn and upon which the gas impinges as it escapes from said receiver.

13. A sound generating instrumentality comprising, in combination, a valve for closing a passageway leading from a supply of gas under pressure, means for yieldingly holding said valve in closed position, a flexible resilient ring supported in contiguous relation to the said valve, a portion of said valve being in contact with said ring, and a horn inclosing said ring.

14. A sound generating instrumentality comprising, in combination, a valve for closing a passageway leading from a supply of gas under pressure, yielding resilient means for holding said valve in closed position, a horn, and a flexible resilient ring mounted upon said horn, a portion of said valve contacting with said ring.

15. A sound generating instrumentality comprising a valve for closing the passageway leading from a supply of gas under pressure, a flexible resilient annular flat ring member with which the said valve is in contact, and a horn having connection at one end to the said annular ring member.

16. A sound generating instrumentality comprising, in combination, a valve for closing a passageway leading from a supply of gas under pressure, yielding resilient means for holding said valve in closed position, a flexible resilient flat metal ring one edge of which is free, a portion of said valve contacting with said ring, and means for supporting the said ring.

17. A sound generating instrumentality comprising, in combination, a valve for closing a passageway leading from a supply of gas under pressure, means for holding said valve in closed position, a flexible resilient flat metal ring one edge of which is free, a portion of said valve contacting with said ring, and means for supporting said ring.

In testimony that I claim the foregoing as my invention I have hereunto signed my name this 24th day of September, A. D. 1930.

WALTER L. ECKHARDT.