United States Patent [19]

Pappas et al.

[11] **3,757,731**

[45] **Sept. 11, 1973**

[54] **GAS POWER OPERATED HAND HELD ACOUSTIC DEVICES**

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[73] Assignee: **Falcon Safety Products, Inc.,** Mountainside, N.J.

[22] Filed: **July 5, 1972**

[21] Appl. No.: **269,056**

[52] **U.S. Cl.** ..... **116/112,** 74/551.9, 116/142 FP, 239/579

[51] **Int. Cl.** **G08b 21/00**

[58] **Field of Search** ..... 116/112, 142, 142 FP, 116/65, 117, 106; 239/579; 222/402.24; 74/551.9; 340/388; 248/139, 140, 141, 142

[56] **References Cited**

UNITED STATES PATENTS

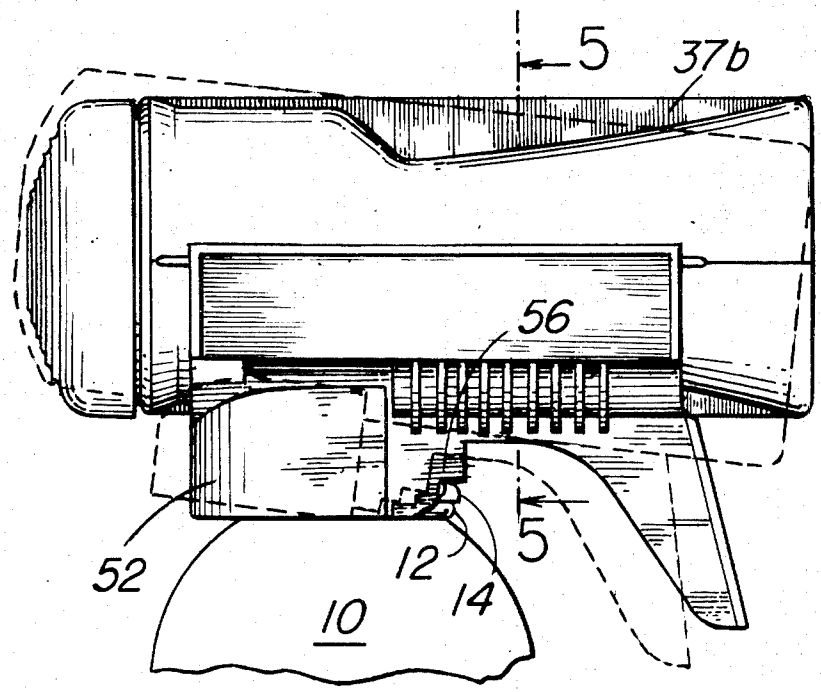
2,658,470	11/1953	Swanson	116/142 R
3,420,207	1/1969	Holm	116/142 R
3,429,294	2/1969	Holm	116/142 R
3,670,689	6/1972	Pappas	116/142 FP

Primary Examiner—Louis J. Capozi
Attorney—William F. Sonnekalb, Jr.

[57] **ABSTRACT**

A gas powered hand held acoustic device has a horn removably mounted in a cradle and on the tiltable stem of a valve in the neck of a can containing fluid under pressure. The cradle has a trigger which when pressed tilts the horn and valve stem and blows the horn. Sliding movement of the cradle relative to the horn and can locks the horn and prevent blowing until pressure on the trigger slides the cradle and unlcoks it, permitting operation. The horn has a body and a snap-on plastic cap with a vibratable unperforate diaphragm held between them in a none rigid non-hermetic sealing relationship.

18 Claims, 10 Drawing Figures



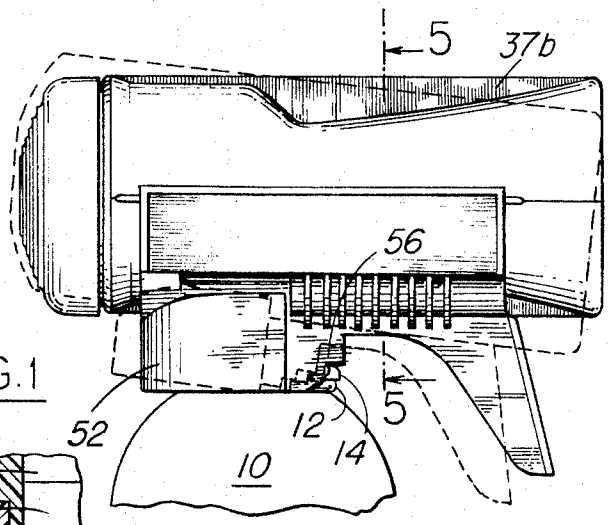


FIG. 1

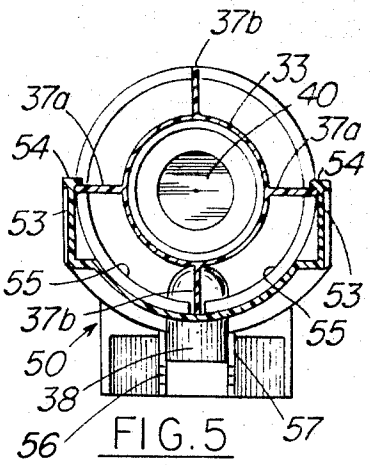


FIG. 5

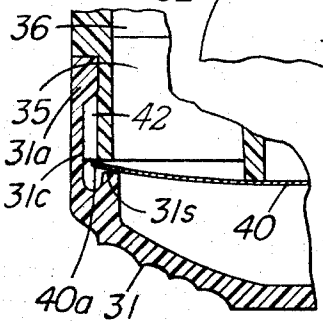


FIG. 10

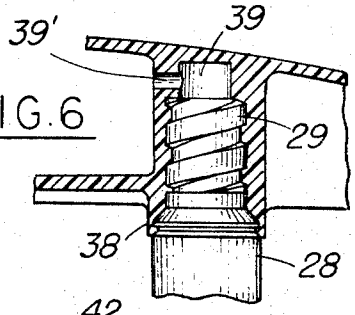


FIG. 6

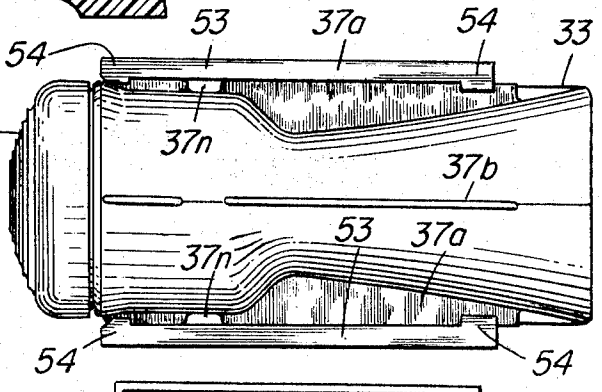


FIG. 2

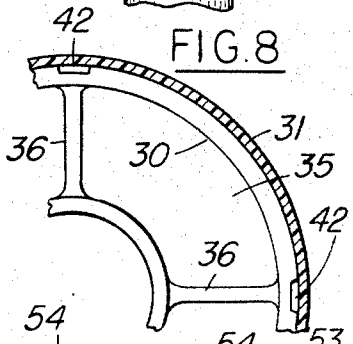


FIG. 8

FIG. 4

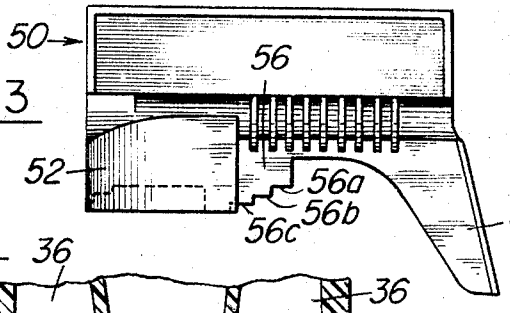


FIG. 3

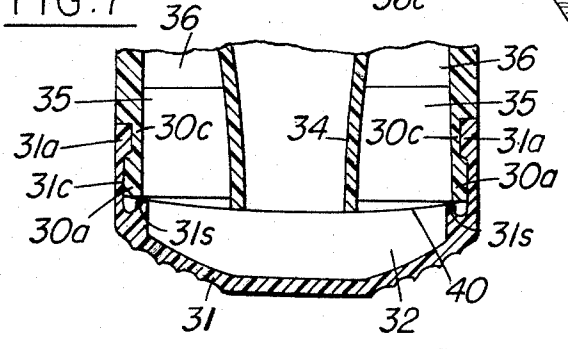


FIG. 7

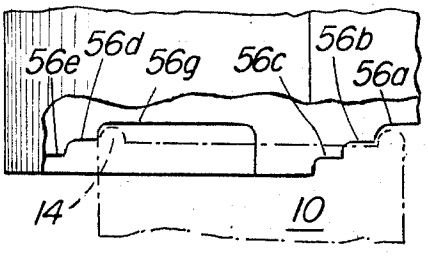


FIG. 9

GAS POWER OPERATED HAND HELD ACOUSTIC DEVICES

This invention relates to hand held gas-power-operated acoustic devices, such as horns mounted on a container of compressed or liquefied gas. More particularly, the invention relates to the type of horn that is mounted on a tiltable valve of a container containing the compressed or liquefied gas.

In prior U.S. Pat. No. 3,670,698 of Michael Pappas, issued June 20, 1972, there is disclosed a power operated horn of the kind with which the present invention is concerned, which can be operated by tilting the horn relative to the container by application of finger or thumb pressure.

It is an object of this invention to provide a horn of the above-mentioned type with a trigger-like formation to enable tilting by finger pressure by a person who is holding the container in his hand.

Another object of the invention is to provide means to prevent accidental tilting of such a horn during shipment or when not in use.

A related object is to provide means which will prevent tilting of the horn in any direction, forward, backward or sideways.

Another object is to provide a horn of the aforementioned type which has bolt tilt-prevention means and trigger-like means wherein application of finger pressure on the trigger means automatically releases the tilt-prevention means to permit blowing of the horn.

Another object is to provide in a diaphragm type horn having an unperforate diaphragm, means to vent pressure to the atmosphere in case of leakage around the periphery of the diaphragm to prevent pressure build-up behind the diaphragm.

Other objects and advantages of the invention will become apparent as the invention is described in connection with the accompanying drawings.

In the drawings:

FIG. 1 is a side elevation view partly broken away of the invention.

FIG. 2 is a plan view of the invention illustrated in FIG. 1.

FIG. 3 is a side elevation view of the trigger or cradle portion of the horn.

FIG. 4 is an end elevation view of the cradle or trigger portion.

FIG. 5 is a transverse section view taken along line 5—5 of FIG. 1 of the cradle member and horn body.

FIG. 6 is an enlarged fragmentary longitudinal section view of the connection between the tiltable valve and the horn body, with the parts facing oppositely from FIGS. 1 and 2.

FIG. 7 is an enlarged fragmentary longitudinal section view through the cover and the adjacent portion of the horn body.

FIG. 8 is an enlarged fragmentary transverse section view through the cap portion and the horn body portion of the horn structure, taken just above the diaphragm in FIG. 7.

FIG. 9 is an enlarged fragmentary view partly broken away of the container-engaging portion of the cradle.

FIG. 10 is an enlarged fragmentary view in section of the joint between the horn body, cover and diaphragm.

According to the invention, a horn of the type in which the horn body is mounted upon a tiltable valve is provided with means for holding the horn against tilting relative to the container during shipment or when the horn is not in use. A trigger-like extension is provided in the position to be engaged by the index finger or thumb of a person holding the container in the grasp of his hand, so that pressure on the trigger member will cause tilting of the horn relative to the container, thus to operate the valve and blow the horn. Pressure on the trigger also causes automatic release of the tilt-prevention means so that no time is lost by a person who picks up the horn wishing to operate it as quickly as possible.

Referring to the drawings, the container **10** is of conventional shape and has a tiltable valve tube at its upper end (viewing the container in normal upright position) mounted on a conventional cup-shaped circular cap member **14.** The peripheral edge of the cap **14** is spun over an open circular neck or opening **12** in the upper end of the container **10** to permanently secure the cap **14** to the container.

The valve parts are mounted in an aperture in the center of the cap as described in said U.S. Pat. No. 3,670,689. Described generally, a tubular stem **29** of molded synthetic plastic material, relatively rigid, extends upward through an axial passage in a reslient member **28** of rubber or other equivalent material which is mounted in the aperture in the cap. When the stem **29** is upright, the compressed gas is prevented from issuing through the stem, but when the stem is tilted in any direction, a metered or limited amount of gas flows through it, depending on the degree of tilt. The stem **29** is exteriorly screw-threaded so that a horn body can be mounted thereon by a screw-on connection, all as described in said U.S. Pat. No. 3,670,689.

The horn body is designated generally by the numeral **30** and may be like the horn body in U.S. Pat. No. 3,670,689, except as noted below. Described generally, the horn body **30** is molded of synthetic plastic material having a circular form at each end with a cover **31** closing one end. The horn body is formed with a flared trumpet **33** narrowing from its outer end or mouth down to a throat **34** at its inner end. Surrounding the throat **34** are four equal chambers **35** separated by four equally spaced internal stiffening webs **36** extending radially from the throat to the periphery of the horn body and axially most of the depth of the chambers from the mid-position of the body toward the periphery or rim. Four equally spaced exterior stiffening webs **37*a*** and **37*b*** are provided running from the outer end or mouth of the trumpet end of the horn body to the opposite end, webs **37*a*** being on opposite sides of the body and webs **37*b*** likewise being on opposite sides of the body.

The outside surface of the throat end of the body is provided with an annular external ridge or bead **30*a*** and next to it an external annular channel **30*c***. The cover **31** is of cup-shape with a concave or dome-shaped end. The cover is of approximately the same diameter as the body **30,** and formed so as to fit over the end of the body in the manner now to be described. On the inner cylindrical wall of the cover adjacent its rim an annular bead or ridge **31*a*** is formed next to which an annular internal recess **31*c*** is formed. The cross-sectional shape of the cover bead **31*a*** and the cover recess **31*c*** are complementary to the horn body channel **30*c*** and the horn body bead **30*a***, respectively. It will be recalled that the horn body **30** and its cap **31** are made of relatively rigid but resilient synthetic plastic material

which after momentary deformation resumes its previous form, so that as the cover is forcibly pushed over the head **30***a* of the horn body, the cover bead **31***a* will fit into the body channel **30***c* and the body bead **30***a* will fit into the cover recess **31***c*.

A circular disc-shaped thin metal or plastic diaphragm **40** is held entirely around its periphery between the body bead **30***a* and the cooperating internal annular shoulder **31***s* of the cover. The periphery of the throat **34** is made to lie in a plane spaced outwardly slightly from (lower than referring to FIG. **7**) the plane of the rim or periphery of the body **30** so that the diaphragm is normally pressed against the periphery of the throat and is slightly concavely held.

Usually a tiny bleed hole is formed in the center of the diaphragm to prevent the build-up of pressure in the chamber **32** between the diaphragm and cap **31.** Not only is this hole difficult to produce but it gets plugged up sometimes; and it often adversely affects operation of the horn. To avoid this, the diaphragm **40** is imperforate, and there are provided a plurality of small notches **42** (see FIG. **8**), preferably four, equally spaced around the periphery of the body portion **30** and between the periphery of the body **30** and the cap **31.** These notches **42** provide a vent to the atmosphere if leakage occurs by the diaphragm. It should be noted that the curvature of the diaphragm is increased as the horn is blown due to the build-up of pressure in the chambers **35.** This permits passage of the gas into the throat of the horn as the diaphragm lifts from its engagement with the throat, and then return of the diaphragm against the throat in known fashion to cause vibration of the diaphragm and blowing of the horn.

The periphery of the diaphragm is firmly but not rigidly held between the periphery of the horn body and the shoulder **31***s* on the cap. There is a controlled gap between the shoulder and the periphery of a few thousandths of an inch which permits movement to that extent, of the periphery of the diaphragm **40** between the cap and the periphery of the horn body. The outer edge of the diaphragm **40***a* is pressed against the body bead **30***a* (FIG. **7**) thereby providing a partial seal for the gas in the chambers **35** during operation. Any gas leakage past the seal between the bead **30***a* and the diaphragm **40***a* is vented to the atmosphere thereby preventing a pressure build-up in the cap chamber **32.** Such a pressure build-up can cause the horn to cease functioning.

A passage or hole **39** is formed in the body of the horn directly over the threaded end of the valve stem **29** to permit the flow of gas from the valve stem. A smaller hole or passage **39'** leading transversely from the passage **39** into the chambers **35** provides a regulated flow of gas and thus causes the vibration of the diaphragm as the horn is operated in the usual fashion.

The horn has an internally threaded extension **38** which mates with the valve stem **29** in such a way as to create a seal so as to prevent significant leakage of the gas passing from the valve into the horn chamber. This seal keeps any possible leakage to such a low level as to be considered nil from a practical viewpoint.

For the dual purpose (*a*) of preventing tilting of the horn body relative to the container **10** and inadvertent operation of the valve during shipping or when not in use, and (*b*) to provide means to facilitate the tilting of the horn body and valve and operation of the horn by trigger action, a combination cradle and trigger member is provided designated generally by the numeral **50.**

Preferably, the member **50** is molded from synthetic plastic material into a generally semi-cylindrical shape as shown in FIG. **4** with a trigger-like exterior radial extension **51** adjacent one end and a thin walled hollow semi-cylindrical collar-like downward (in FIGS. **1** and **4**) extension **52** adjacent the other end. The inner radius of the collar-like extension or skirt **52** is equal to the exterior radius of the spun-over lip of the cap **14** on the container, so as to embrace one-half of the cap.

In order to slidably receive the horn body **30** in the cradle **50,** opposite stiffening webs **37***a* on the sides of the body are dimensioned to extend to the interior surfaces of the sides **53** of the cradle adjacent their upper edges (see FIGS. **5** and **4**). At each end of each of the sides **53,** a lug **54** extends radially inward, there being four lugs in all (see FIG. **2**). To receive two opposite lugs **54** which are nearest the cover **31,** notches **37***n* are formed in the webs **37***a*. The distance between the notch and the end of its web **37***a* is equivalent to the distance between the lugs **54.** Thus, the horn body may be placed in the cradle by registering the left lugs **54** with the notches **37***n* and registering the right lugs with the open spaces at the right ends of webs **37***a*, all referring to FIG. **2.** Thereafter, the horn body may be slid lengthwise with the lugs **54** overlying the webs **37***a* to maintain the horn body in the cradle.

The interior surface of the cradle is provided with a plurality of equally spaced ribs **55,** preferably one at each end and a central rib; but the invention is not limited to a particular number. The ribs terminate just short of the upper edges of the cradle leaving a space between the lugs **54** and the termini of the ribs, approximately equal to the thickness of the webs **37***a*, so that as the horn body is placed in the cradle, the lower surface of the webs **37***a* will rest upon the upper ends of the ribs and the lower surface of the lugs **54** will slidably engage the upper surface of the webs, enabling the horn body to be slid lengthwise relative to the cradle. When the horn body is placed in the cradle and slid lengthwise, the lugs **54** will then overlie and engage the webs **34***a* as shown in FIG. **2,** holding the horn and cradle together. At the same time the edges of the webs frictionally engage the inner surface of the sides **53** of the cradle providing a force resisting longitudinal sliding until pressure is applied, longitudinally. The ribs **55** each have a break **55***b*, at their mid-portion (the bottom portion as shown in FIG. **5**) the breaks being in longitudinal alignment providing passage for the bottom or inner web **37***b* on the horn body.

The bottom of the cradle is provided with an elongated opening (not shown) for passage of the interiorly screw-threaded extension **38** of the horn body thus enabling longitudinal movement of the cradle relative to the container and horn body after the container and horn body are connected.

In order to prevent tilting of the horn body in the plane defined by its longitudinal axis and the axis of the valve stem (i.e., longitudinally) a pair of parallel spaced plates **56, 57** are molded integrally with the cradle in position to be on opposite sides of the horn body extension **38** when body and cradle are assembled (see FIG. **5**). At the opposite ends of each plate a series of steps such as **56***a*, **56***b*, **56***c* and **56***d*, **56***e* are formed. As may be seen in FIG. **9,** there is a gap **56***g* between said series of steps. When the horn is placed in the cradle as above described, the horn may be slid backward until stopped by the extension **38** on the horn. Then the horn and

cradle assembly may be screwed on the valve stem **29** until fully engaged. In this position, the horn may be tilted by applying finger pressure on the trigger **51** to cause tilting from the full line position of FIG. **1** to the dotted position.

This tilting will open the valve and cause the horn to blow, as explained in said U.S. Pat. No. 3,670,689.

If it is desired to prevent tilting during shipment or accidentally or when not in use, the cradle may be slid longitudinally forward by applying longitudinal force. This will cause the steps **56***a* and the equivalent steps **57***a* (not visible) to slide over the lip (shown in dotted lines in FIG. **9**) of the container at one end of the plates **56,57**; meanwhile the gap surface **56***g* slides over the lip of the container on the opposite side of the valve stem. The length of the gap **56***g* in the plate **56** (and equivalent spacing in the plate **57**) allow for such sliding of the cradle. With the steps engaged with the lip of the container, it is not possible to tilt the horn longitudinally until a backward force perpendicular to the axis of the container is applied to disengage the steps from the lip.

Forward sliding of the cradle into tilt-preventing position is limited by engagement of the vertical portion between the steps **56***a* and **56***b* with the inside lip of the container and likewise by engagement of the vertical portion between the steps **56***d* and the gap surface **56***g*. This limitation prevents the cradle from moving relatively to the horn to a point where the lugs **54** are in register with the notches **37***n*.

To activate the horn from the tilt-prevention position one merely pulls on the trigger **51**. This results in an unlocking backward motion of the cradle and subsequent tilting and therefore operation of the horn.

The pressure of the gas within the container varies in accordance with temperature conditions. When the pressure increases substantially, the valve stem can rise as much as ⅝ of an inch. It is for this reason that more than one step of a series of steps above-mentioned is provided. Obviously, when the stem rises somewhat, the step **56***b* and **56***d* will perform the tilt-preventing function by overlying and engaging the lip of the can. Likewise, when the pressure increases still further, the steps **56***c* and **56***e* will perform the tilt-preventing function.

Sidewise tilting to the right or left is prevented in all positions of the cradle. This is done by engagement of the edges of the collar-like portion **52** with the container body. Thus, when an attempt is made to tilt the cradle and horn assembly laterally to the right or to the left, the curved peripheral edge of the collar-like portion engages the container body just outside the lip of the cap.

From the foregoing, it will be seen that the invention provides a novel means to tilt the horn by an easy and convenient trigger action to operate the valve and cause the horn to blow. Concomitantly the invention provides means to prevent accidental tilting of the horn, during shipment or when not in use. At the same time, the container may be easily and conveniently removable from and connectible to the horn and trigger assembly during the manufacturing of the device and also when it may become necessary to replace an exhausted container with a full container. The assembly of these separate parts, the horn, the body, the cradle, and the container, is accomplished with utmost ease and convenience; and any one of these three parts can likewise be replaced at will.

Many modifications within the scope of the invention will occur to those skilled in the art. Therefore, the invention is not limited to the precise form and dimensions as illustrated and described.

We claim:

1. In combination, a pressurized fluid container, having an outlet, valve means in said outlet tiltable both longitudinally and laterally and having a stem with a passage for compressed gas from said container as said stem is tilted, a compressed-gas-operated horn mountable on said stem and tiltable therewith, said horn having passageways connecting with said stem passage for flow of the compressed gas, a cradle member mounted on said horn and having a finger engageable extension for tilting said cradle and horn to blow said horn on application of finger pressure to said extension.

2. In combination, a pressurized fluid container, having an outlet, valve means in said outlet tiltable both longitudinally and laterally and having a stem with a passage for compressed gas from said container as said stem is tilted, a compressed-gas-operated horn mountable on said stem and tiltable therewith, said horn having passageways connecting with said stem passage for flow of the compressed gas, a cradle member mounted slidably on said horn and movable between two positions, said horn having lateral extensions interengaging slidably with said cradle to guide the movement of said cradle, and means on said cradle engaging said container to prevent tilting of said horn in certain positions of said cradle.

3. The combination as claimed in claim **2** wherein said tilt-prevention means prevents in one of said positions of said cradle longitudinal tilting sufficient to blow the horn.

4. The combination as claimed in claim **2** wherein said tilt-prevention means prevents in all positions of said cradle lateral tilting sufficient to blow the horn.

5. The combination as claimed in claim **2** wherein said tilt-prevention means prevents in all positions of said cradle lateral and backward tilting sufficient to blow the horn but permits forward tilting in one position of the cradle.

6. The combination as claimed in claim **2** wherein said tilt-prevention means prevents in one position of the cradle all tilting sufficient to blow the horn.

7. The combination as claimed in claim **6** having a finger-engageable trigger-like extension on said cradle engageable to slide said cradle into another position and therein to tilt said horn longitudinally to blow the horn.

8. In combination, a pressurized fluid container, having an outlet, valve means in said outlet tiltable both longitudinally and laterally and having a stem with a passage for compressed gas from said container as said stem is tilted, a compressed-gas-operated horn mountable on said stem and tiltable therewith, said horn having passageways connecting with said stem passage for flow of the compressed gas, a cradle member mounted slidably on said horn and movable between two positions, said horn having lateral extensions interengaging slidably with said cradle to guide the movement of said cradle, and means for detachably mounting said horn on said cradle comprising lugs on said cradle registrable with recesses in said lateral extensions enabling connection of said cradle and horn and subsequent slid-

ing movement of said cradle into another position relative to said horn, said lugs overlying said extensions in said subsequent position and maintaining them interconnected.

9. The combination as claimed in claim **8** having means on said cradle engaging said lateral horn-extensions on one side while said lugs engage said horn extensions on their other sides to guide said sliding movement of the cradle relative to the horn.

10. The combination as claimed in claim **8** having means to limit the sliding movement of the cradle relative to the horn when the horn is mounted on said valve stem preventing registration of said lugs and said recesses and thereby preventing separation of said horn and cradle.

11. The combination as claimed in claim **8** wherein said valve stem abuts the end of an opening in said cradle to limit the sliding movement of the cradle relative to the horn when the horn is mounted on said valve stem preventing registration of said lugs and said recesses and thereby preventing separation of said horn and cradle.

12. The combination as claimed in claim **2** having means for detachably mounting said horn on said cradle comprising lugs on said cradle registrable with recesses in said lateral extensions enabling connection of said cradle and horn and subsequent sliding movement of said cradle into another position relative to said horn, said lugs overlying said extensions in said subsequent position and maintaining them interconnected.

13. The combination as claimed in claim **12** having means on said cradle engaging said lateral horn-extensions on one side while said lugs engage said horn extensions on their other sides to guide said sliding movement of the cradle relative to the horn.

14. The combination as claimed in claim **12** having means to limit the sliding movement of the cradle relative to the horn when the horn is mounted on said valve stem preventing registration of said lugs and said recesses and thereby preventing separation of said horn and cradle.

15. The combination as claimed in claim **12** wherein said valve stem abuts the end of an opening in said cradle to limit the sliding movement of the cradle relative to the horn when the horn is mounted on said valve stem preventing registration of said lugs and said recesses and thereby preventing separation of said horn and cradle.

16. A gas-power-operated horn having a body part and a cap part and a vibratable imperforate diaphragm and means providing communication to said diaphragm of gas flowing from a compressed gas source to cause vibration of said diaphragm, cooperating opposed interior annular means on said cap part and said body part with a controlled gap therebetween providing a seal for the peripheral edge of said diaphragm, said cap part and said body part holding said diaphragm between them but permitting limited movement of the periphery of said diaphragm while maintaining a substantial but non-rigid, non-hermetic seal at the periphery of said diaphragm, said diaphragm providing a closed chamber between itself and said cap part, and a snap-on connection between said body and cap parts comprising annular projecting means and annular recess means on said body part and cap part which have mating engagement when assembled, at least one of said parts being made of resilient material whereby said parts may be forced together and securely held in engagement concomitantly providing a seal therebetween, and means providing a vent to the atmosphere between said cap part and body part for any gas leakage past the seal between them.

17. A horn as claimed in claim **16** wherein said vent means comprises at least one notch in said annular means between said diaphragm and the atmosphere.

18. A gas-power-operated horn having a body part and a cap part and a vibratable imperforate diaphragm and means providing communication to said diaphragm of gas flowing from a compressed gas source to cause vibration of said diaphragm, cooperating opposed interior annular means on said cap part and said body part with a controlled gap therebetween providing a seal for the peripheral edge of said diaphragm, said cap part and said body part holding said diaphragm between them but permitting limited movement of the periphery of said diaphragm while maintaining a substantial but non-rigid, non-hermetic seal at the periphery of said diaphragm, said diaphragm providing a closed chamber between itself and said cap part, and a connection including a seal between said body and cap parts, and means holding said cap and body parts securely in engagement, and means providing a vent to the atmosphere between said cap part and body part for any gas leakage past the seal between them.

* * * * *