

[54] **SOUNDING DEVICE**

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[22] Filed: **Sept. 12, 1972**

[21] Appl. No.: **288,405**

[30] **Foreign Application Priority Data**

April 3, 1972 Japan.....47/38361  
July 29, 1972 Japan.....47/89642

[52] U.S. Cl..... 46/232, 46/179

[51] Int. Cl..... A63h 33/26

[58] Field of Search..... 46/179, 232, 44;  
116/147

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[57]

**ABSTRACT**

A sounding device comprising at least two resonance chambers communicating with each other through apertures formed between the adjacent two chambers and a valve rod extending through said apertures and carrying valves adapted to open or close said apertures in association with vertical movements of the rod. Therefore, the total space of the resonance chambers can be controlled by the movements of the rod and the sounds issued from a whistling mouth varies in pitch and tone. The valve rod may be operated by a cam means in association with a rotary means for rotating an air forwarding fan by means of a gear system. The sounding device may be provided with an electric lamp having a surrounding barrier which is open in one direction and adapted to rotate in association with said gear system.

Such a sounding device as described can blow a melodious tune clearly and continuously with a simple structure and be effectively employed in vehicular toys or as an instrument for auditory education.

**8 Claims, 5 Drawing Figures**

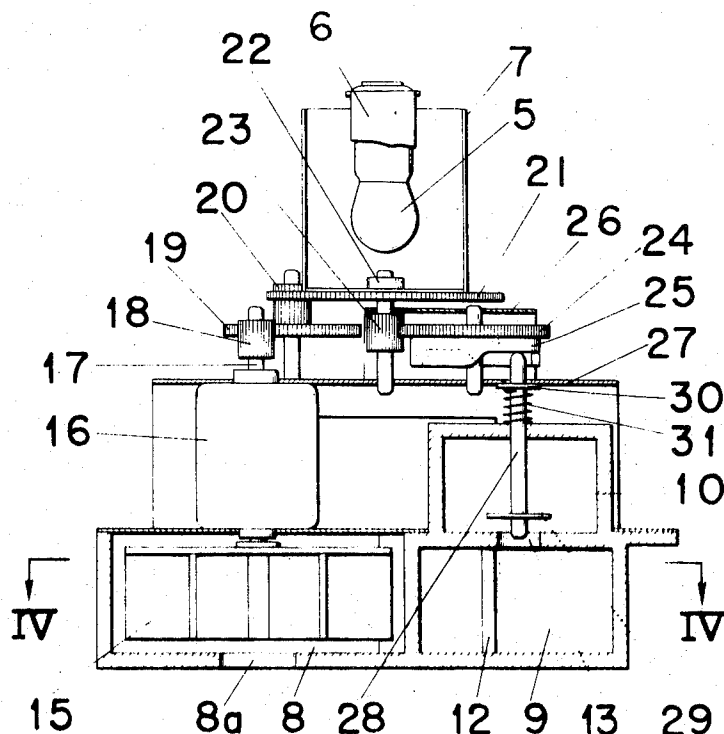


FIG. 1

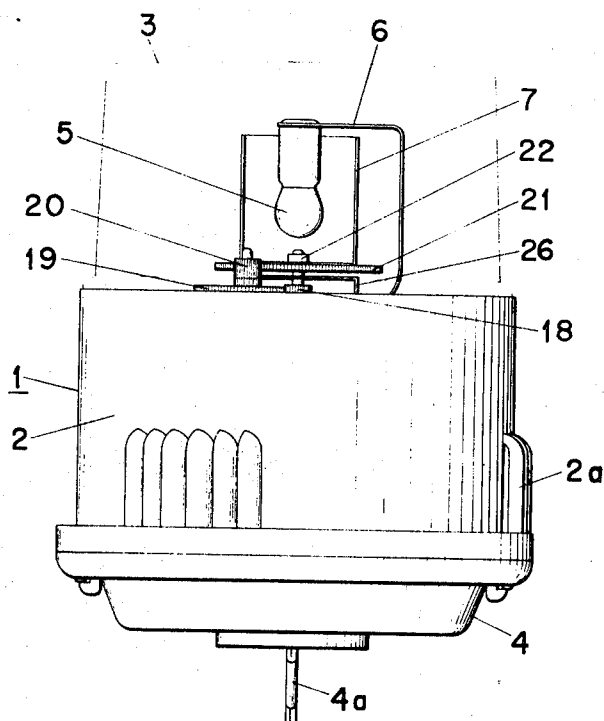


FIG. 2

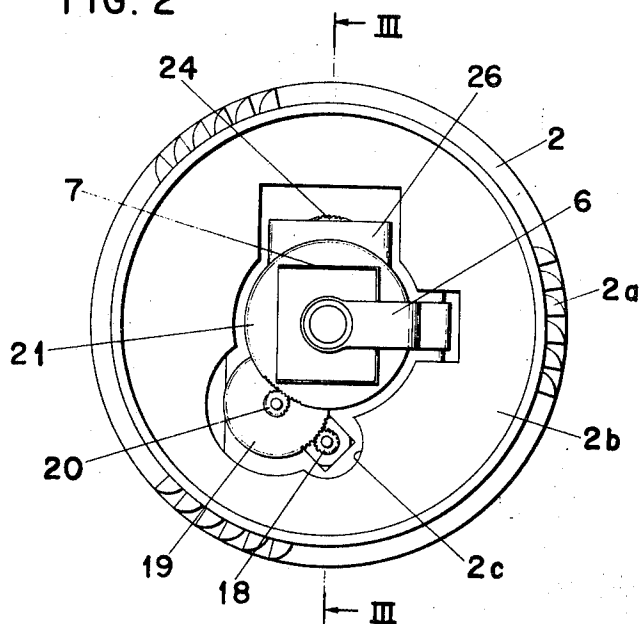


FIG. 3

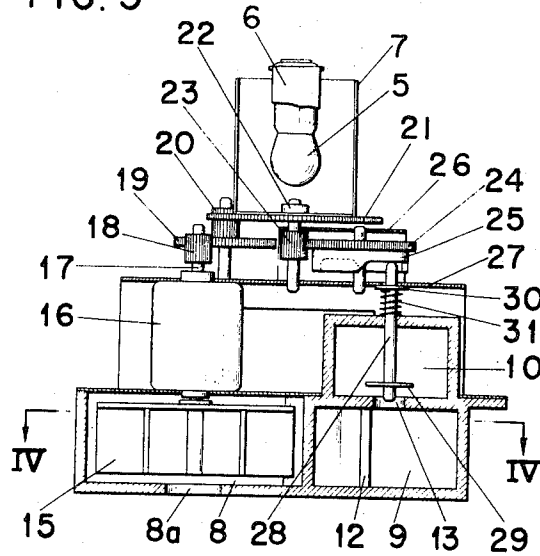


FIG. 4

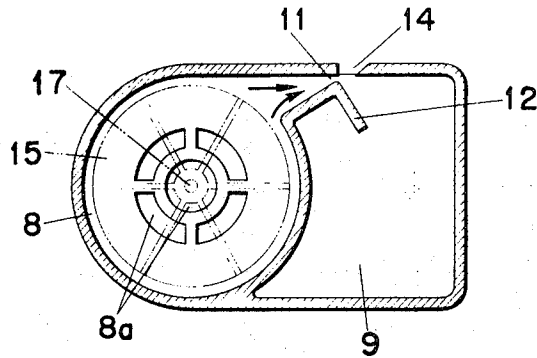
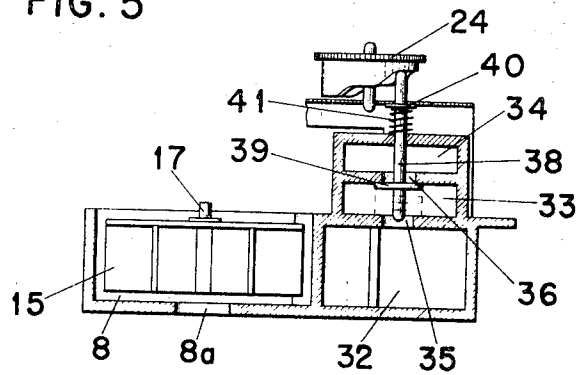


FIG. 5



## SOUNDING DEVICE

This invention relates to a sounding device, and more particularly, to a sounding device which is adapted to be mounted on vehicular toys and can blow a melodious tune in a wide range of tones clearly and continuously.

The conventional sounding device of the type as described is so constructed that a resonance chamber has a plurality of apertures which are opened or closed with respective valves to vary pitches of sounds. However, such conventional sounding device has effects that the structure thereof is rather complicated and a range of the sounds is limited within only two or three scales. Moreover, volume and quality of the sounds degrade when a resonance chamber smaller than a fixed size is employed.

Therefore, it is an object of the present invention to provide a sounding device which can clearly and loudly blow melodious sounds in a wide range of tones.

It is another object of the present invention to provide the sounding device which is widely applicable not only to vehicular toys such as a patrol car, a fire engine, an ambulance, etc. to make the toys attractive, but to instruments for auditory education.

It is still another object of the present invention to provide a sounding device which is simple in structure and easily manufactured at a low cost.

Essentially, according to this invention, there is provided a sounding device consisting essentially of a fan chamber containing a fan; a rotary means for rotating said fan; at least two resonance chambers one of which communicates with said fan chamber through a nozzle, each of said resonance chambers communicating with its adjacent resonance chamber through each aperture formed therebetween; a whistling mouth formed near said nozzle and having a diagonally edged end; a valve rod carrying valves and vertically movable to close or open said apertures with said valves, thereby varying pitches and tones of sounds issuing from said mouth.

Various, further and specific objects, features and advantages of the invention will be better understood from the following description of the preferred embodiments taken in connection with the accompanying drawings, in which;

FIG. 1 is a side elevational view of a sounding device which is an embodiment of the present invention with a transparent cap shown in a dotted line;

FIG. 2 is a plan view of the same with the cap removed;

FIG. 3 is a vertical sectional view taken along the line III — III of FIG. 2, showing the interior structure of the sounding device with its outer case removed;

FIG. 4 is a plan view shown in lateral section taken along the line IV — IV of FIG. 3; and

FIG. 5 is a vertical sectional view like FIG. 3, showing the essential portion of another embodiment of the invention.

Referring now to FIGS. 1 — 4, there is illustrated a sounding device according to this invention having two resonance chambers. The sounding device is generally denoted by numeral 1. An outer case 2 having grilles 2a for passing sound and air is provided around the interior structure. To said outer case 2 are fitted a transparent cap 3 in a desired color, for example, red for a patrol car, an ambulance, etc. and a bottom case 4 having a holding arm 4a for securely mounting the sound-

ing device on the toys. Said bottom case 4a is fitted to the outer case 2 with hooks as shown in FIG. 1 or other conventional means. In an upper plate 2b of the outer case 2 which may or may not be integrally formed with said outer case, there is formed an opening 2c through which a portion of the interior structure can be seen as shown in FIG. 2.

An electric lamp 5 is mounted on a supporting arm 6 projected through said opening 2c and surrounded with a barrier 7 which is open in one direction and adapted to rotate in synchronism with the interior gear system.

Referring to FIGS. 3 and 4, there is described the interior structure of the sounding device. A fan chamber 8 is integrally formed with a first and a second resonance chambers 9 and 10. Said fan chamber 8 communicates with said first resonance chamber 9 at a nozzle 11 through which an air from the fan chamber 8 is introduced into the first resonance chamber 9 along a guide wall 12. Said first resonance chamber 9 communicates with the second resonance chamber 10 through an aperture 13. A whistling mouth 14 is formed adjacent to said nozzle 11, one end of which mouth is diagonally edged as seen in FIG. 4.

The fan chamber 8 having a plurality of air passages 8a in its bottom contains a fan shown in a dotted line in FIG. 4. Said fan 15 is rotated by a motor 16 by means of a rotary shaft 17 extending through said motor and fan.

On the top portion of said rotary shaft, there is mounted a first gear 18 which meshes with a second gear 19. A third gear 20 which is coaxial with said second gear 19 meshes with a fourth gear 21 to which aforesaid barrier 7 is fixed by a nut 22. A fifth gear 23 which is coaxial with said fourth gear 21 meshes with a sixth gear 24. Said sixth gear 24 is provided thereunder with a cam 25 which is integrally formed or rigidly fixed thereto. Axles of said gears are supported by an upper and a lower support plates 26 and 27. The arm 6 for holding the electric lamp 5 which is shown in FIG. 3 partly cut away is fixed to said lower support plate 27. The barrier 7 which is open in one direction rotates around the lamp 5 with rotation of the fourth gear 21 i.e., rotation of the motor so that the light from the lamp can be seen turning round through the transparent cap 3.

Inserted into the resonance chamber 10 is airtightly mounted a valve rod 28 vertically movable in accordance with a cam face of the cam 25. Said rod 28 carries a valve 29 for closing the aperture 13 formed between the chambers 9 and 10. The rod is further provided with a washer 30 and a spring 31 in the top portion thereof between the support plate 27 and the chamber 10 thereby to urge said rod upward. The rod 28 is pressed down and urged upward by means of the cam face in combination with the spring force of said spring 31 to shut and open the aperture 13 with said valve 29.

When the aperture 13 is open, the total space of the chambers 9 and 10 acts as a large resonance chamber, and when the aperture 13 is closed, only the chamber 9 acts as a small resonance chamber thereby to vary pitches of the sounds.

Referring to FIG. 5, there is illustrated another embodiment of this invention in which three resonance chambers 32, 33 and 34 are provided. Apertures 35 and 36 are formed respectively between the chambers

32 and 33 and between the chambers 33 and 34. A cam 37 includes a cam face having three steps for pressing a valve rod 38 downward in three positions, namely, upper, middle and lower positions to open or close the aperture 35 or 36 with a valve 39. A washer 40 and a spring 41 are mounted on the rod in the same manner as shown in FIG. 3. The rest of the structure is exactly the same as in the former embodiment.

When the valve 39 is in the upper position to close the aperture 36 as shown in a solid line in FIG. 5, only the sum of the chambers 32 and 33 acts as a resonance chamber. When the valve 39 is in the middle position as shown in a dotted line, both the apertures 35 and 36 are open to make all the three chambers 32, 33 and 34 communicate with each other and the total space thereof acts as a resonance chamber. When the valve 39 is in the lower position as shown in another dotted line in FIG. 5, the aperture 35 is closed and only the chamber 32 acts as a resonance chamber. Thus, the sounds issued from the whistling mouth 14 are made different in pitch or tone in accordance with a configuration of the cam face.

The valves 29 and 39 in the both embodiments may be mounted on the valve rods 28 and 38 in any portion thereof to bring a desired effect. However, in the second embodiment shown in FIG. 5, there is employed only a single valve mounted on the valve rod 38 and confined within the middle chamber 33 to shut both the apertures 35 and 36, which can lower the production cost.

The rotary means for rotating the cam as well as the fan may be other means than the motor disclosed in the present specification. The gear system, number, shape and size of the resonance chambers and other components of the sounding device may also be modified within the scope of the present invention. If a number of chambers are formed in pile and selectively opened or closed by valves, a range of sounds is enlarged to produce more than ten different tones.

As described, the present sounding device can blow a melodious tune clearly and continuously with a simple structure and make vehicular toys much more attractive when employed therein. Further, such sounding device can be effectively utilized as auditory educational instruments.

What is claimed is:

1. A sounding device consisting essentially of a fan chamber containing a fan; a means for rotating said fan; at least two resonance chambers each chamber having an opening formed therein one of said resonance chambers communicating with said fan chamber through a nozzle, each of said resonance chambers communicating with its adjacent resonance chamber through said apertures; an opening formed near said nozzle and having a diagonally edged end; a valve rod carrying valves and vertically movable to close or open said apertures with said valves, thereby varying pitches and tones of sounds issuing from said opening.

2. A sounding device as claimed in claim 1 wherein three resonance chambers have respective apertures therein formed and a valve is adapted to take three positions within a middle one of said resonance chambers thereby to open both the apertures or close either one of the apertures with a single valve.

3. A sounding device as claimed in claim 1 which further comprises a cam means movable in association with rotation of said rotating means and effecting the vertical movement of said valve rod.

4. A sounding device as claimed in claim 3 wherein said valve rod is provided with a spring means thereby to urge said rod upwardly against said cam means.

5. A sounding device as claimed in claim 3 which further comprises a gear system for rotating said cam means in association with rotation of said rotating means.

6. A sounding device as claimed in claim 1 wherein said rotating means is an electric motor.

7. A sounding device as claimed in claim 1 which further comprises an electric lamp fixed thereto and surrounded by a barrier which opens in one direction and rotates in association with said rotating means whereby a light of said lamp is seen turning round in synchronism with the issue of the sounds.

8. A sounding device as claimed in claim 5 wherein said gear system includes a first gear mounted on a shaft of said rotating means, a second gear meshing with said first gear, a third gear coaxially mounted on said second gear, a fourth gear meshing with said third gear, a fifth gear coaxially mounted on said fourth gear and a sixth gear meshing with said fifth gear and carrying said cam thereunder.

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