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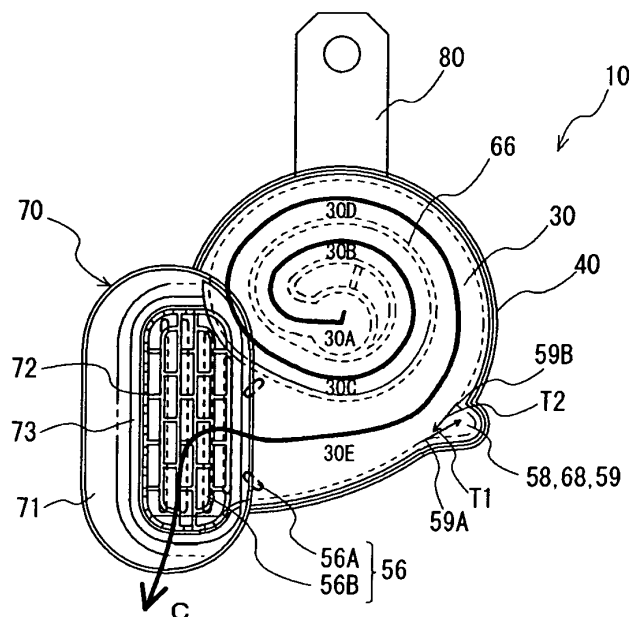
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(54) **Horn for vehicle**

(57) The horn is capable of preventing invasion of foreign matters and highly preventing attenuation of a warning sound. The horn (10) comprises: an oscillation member (20); a sound path (30) formed into a spiral path, which is spirally formed around a center axis (22) of the oscillation plate (20) and in which a distance from the center axis (22) is gradually increased toward an outer

end; and a sound output section (70) provided to the outer end of the sound path (30), the sound output section (70) outputting sound waves, which have passed through the sound path (30), in the axial direction of the center axis. The horn is characterized in that an opening part of the sound output section (70) has an elongate configuration, whose long axis is arranged in the vertical direction.

FIG.4



Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a horn for a vehicle, more precisely relates to a trumpet horn for a vehicle.

[0002] A horn is provided to a vehicle, e.g., automobile, motorbike, as a safety equipment. Generally, an electric power supplied from a battery of a vehicle oscillates an oscillation member, and thereby a horn outputs a warning sound. A disk horn, which is disclosed, for example, in Japanese Patent Gazette No. P1997-305181A, and a trumpet horn, which is disclosed, for example, in a web page whose URL is "http://www.maruko-horn.co.jp/seihin/trumpet_wide.html" and searched on 7th November 2007.

[0003] In the trumpet horn disclosed in said web page, rain drops and sands will invade into a sound output section, from which a warning sound is outputted outward. Therefore, sound output sections of most of trumpet horns attached to vehicles are faced to the ground surface.

[0004] A main purpose of the horn is to call attentions of other drivers and pedestrians by warning sound. In case that the sound output section of the trumpet horn is faced to the ground surface as described above, the warning sound will be attenuated before reaching other drivers or pedestrians. These days, a number of apparatuses are densely attached in a bonnet of a vehicle, in which the horn is also attached. Therefore, the warning sound of the horn will be significantly attenuated in the tight space. Namely, conventional horns insufficiently work.

[0005] If the horn is attached near a grill of the bonnet so as to merely reduce a distance between the horn and the outside and the sound output section is headed outward, the attenuation of the warning sound can be solved. However, foreign matters, e.g., rain drops, sands, easily invade into the sound output section and cause troubles. Fundamental structural modification of horns has been required.

SUMMARY OF THE INVENTION

[0006] The present invention was conceived to solve the above described problems.

[0007] An object of the present invention is to provide a horn for a vehicle, which is capable of preventing foreign matters from invading into a sound output section and highly preventing attenuation of a warning sound.

[0008] To achieve the object, the present invention has following structures.

[0009] Namely, the horn of the present invention comprises:

- an oscillation member;
- a sound path being formed into a spiral path, which

is spirally formed around a center axis of the oscillation plate and in which a distance from the center axis is gradually increased toward an outer end; and a sound output section being provided to the outer end of the sound path, the sound output section outputting sound waves, which have passed through the sound path, in the axial direction of the center axis, and

the horn is characterized in that an opening part of the sound output section has an elongated configuration,

and that the opening part of the sound output section is directed in the advancing direction of the vehicle and a long axis of the opening part is arranged in the vertical direction when the horn is attached to the vehicle.

[0010] In the horn, the sound output section may be connected to a part of the sound path which is horizontally formed. With this structure, invasion of foreign matters can be perfectly prevented.

[0011] In the horn, a shielding plate may be provided to the sound output section, and the shielding plate may hide the sound path when the sound path is seen from the sound output section side. With this structure, even if the sound output section is directed to a moving direction of the vehicle, invasion of foreign matters, e.g., rain drops, sands, can be prevented.

[0012] In the horn, a plate member may be vertically provided to a connection part between the sound path and the sound output section, and a surface of the plate member may be arranged perpendicular to a propagation direction of the sound waves propagating in the sound path.

[0013] In the horn, a plurality of the plate members may be placed at specified distance.

[0014] In the horn, heights of the plate members may be gradually increased from the upstream side of the sound path to the downstream side thereof.

[0015] In the horn, a height of a front end of each of the plate members may be gradually increased from the upstream side of the sound path to the downstream side thereof.

[0016] By employing the above described structures, the sound waves propagating in the sound path can be smoothly introduced to the sound output section, so that attenuation of the sound waves can be prevented and a loud warning sound can be outputted. Further, even if the sound output section is directed to the moving direction of the vehicle, invasion of foreign matters, e.g., rain drops, sands, can be suitably prevented.

[0017] In the horn, a small section part, which reduces a sectional passage area of the sound path, may be provided between the sound path and the sound output section. With this structure, invading foreign matters from the sound output section into the sound path can be suitably prevented. If the shielding plate and the plate mem-

ber are used, the invasion can be further effectively prevented.

[0018] In the horn, a foreign matter trapping space may be formed in an outermost part of the sound path and expanded outward.

[0019] In the horn, a configuration of a connection part between the foreign matter trapping space and the sound path may be defined by a downstream side tangent line and an upstream side tangent line, which are mutually connected,

the downstream side tangent line, which is defined by a side wall face of a downstream side connection part of the sound path, may be directed to the inner side of the foreign matter trapping space, and

the upstream side tangent line, which is defined by a side wall face of an upstream side connection part of the sound path, may be directed to the inner side of the sound path which is on the inner side of the side wall face defining the downstream side tangent line.

[0020] With the above described structures, even if foreign matters invade into the sound path, the foreign matters are trapped by the foreign matter trapping space. Therefore, no foreign matters invade into the inner part of the sound path, so that damaging the horn can be prevented.

[0021] Another horn of the present invention, which optionally has features of one of more of the above described structures, comprises:

an oscillation member; and

a main body section including a sound path formed into a spiral path and a sound output section provided to an outer end of the sound path, and

the horn is characterized in,

that the main body section includes:

a first member having a partition wall and a through-hole penetrating the partition wall in the thickness direction;

a second member having a partition wall, a side wall, a spiral plate, which is provided on the partition wall and whose one end is corresponded to the through-hole of the first member, and a tubular sound output section, which is provided to the other end of the spiral plate and which is extended in the direction perpendicular to the surface of the partition wall, wherein the partition wall, the side wall, the spiral plate and the sound output section are integrally formed, and

that the side wall of the second member and an end face of the spiral plate are connected to a wall face of the partition wall of the first member.

[0022] In the horn, a side wall may be integrally formed on an outer edge of the partition wall of the first member.

[0023] In the horn, a plate member may be integrally formed with the partition wall of the first member and face the other end of the spiral plate, and

a surface of the plate member may be arranged perpendicular to a propagation direction of sound waves.

[0024] In the horn, a small section part, which reduces a sectional passage area of the sound path and which is placed on the upstream side of the plate member, may be integrally formed with the partition wall of the first member.

[0025] In the horn, a shielding plate may be integrally formed with the sound output section of the second member.

[0026] With the above described structures, the horn can be easily assembled. Especially, even if the small parts, e.g., the shielding plate, the plate member, the small section part, are used, the horn can be easily assembled, and thereby the horn can be efficiently produced and production cost can be reduced.

[0027] In the horn of the present invention, the opening part of the sound output section is directed in the moving direction of the vehicle, so that the sound waves (warning sound) generated by the oscillation member can be outputted, as a loud sound, toward other drivers and pedestrians. Further, the sound path communicated to the sound output section is deviated from the moving direction of the vehicle, so that invasion of foreign matters from the sound output section into the sound path (the inner part of the main body section) can be suitably prevented. Since the invasion of foreign matters can be prevented and the sound output section can be directed in the moving direction of the vehicle, attenuation of the sound waves can be highly restrained even if the horn is attached in a tight space, e.g., bonnet.

[0028] In another aspect the invention provides a vehicle (generally a motor vehicle) including a horn embodying the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] Embodiments of the present invention will now be described by way of examples and with reference to the accompanying drawings, in which:

Fig. 1 is a front view of a horn of an embodiment of the present invention;

Fig. 2 is an exploded perspective view of a main body section of the horn seen from a front side;

Fig. 3 is an exploded perspective view of the main body section of the horn seen from a rear side;

Fig. 4 is a front view of the horn, wherein propagation of sound waves is explained;

Fig. 5 is a sectional view taken along a line A-A in Fig. 1;

Fig. 6 is a sectional view taken along a line B-B in Fig. 1;

Fig. 7 is a partially cutaway view of the horn, wherein inner structures of a sound output section and a guide path are shown; and

Fig. 8 is an explanation view of a foreign matter trapping space.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0030] Preferred embodiments of the present invention will now be described in detail with reference to the accompanying drawings. Fig. 1 is a front view of a horn of the present embodiment; Fig. 2 is an exploded perspective view of a main body section of the horn seen from a front side; Fig. 3 is an exploded perspective view of the main body section of the horn seen from a rear side; Fig. 4 is a front view of the horn, wherein propagation of sound waves is explained; Fig. 5 is a sectional view taken along a line A-A in Fig. 1; and Fig. 6 is a sectional view taken along a line B-B in Fig. 1.

[0031] As shown in Fig. 1, the horn 10 of the present embodiment is constituted by a main body section 40, which includes an oscillation member 20 (see Fig. 5) for generating sound waves, i.e., warning sound, and a sound path 30 being formed into a sound path for guiding the sound waves, and a tubular sound output section 70 for outputting the sound waves, which has propagated in the sound path 30, frontward. In the present embodiment, the sound output section 70 is connected to a part of the sound path, which is horizontally extended. An attaching plate 80, which is used to attach the horn 10 to a vehicle (not shown), is provided to a rear face of the main body section 40. An opening part of the sound output section 70 is directed in the advancing direction of the vehicle and a long axis of the opening part is arranged in the vertical direction when the horn is attached to the vehicle.

[0032] As shown in Figs. 2 and 3, the main body section 40 of the horn 10 includes: a first member 50 having an accommodating part 51, in which the oscillation member 20 is accommodated; and a second member 60 having the sound output section 70 for outwardly outputting the sound waves, which has been generated by the oscillation member 20, reflected in the direction perpendicular to the oscillating direction and propagated around a center axis 22 of the oscillation member 20 perpendicular to a surface of the oscillation member 20 (see Fig. 5), from the spiral path 32 in the direction parallel to the center axis 22 of the oscillation member 20.

[0033] A communication hole 54, which communicates the accommodating part 51 to the sound path 30 of the second member 60, is formed in a center part of a partition wall 52 of the first member 50. In the present embodiment, the center of the communication hole 54 is corresponded to the center axis 22 of the oscillation member 20. A side wall 53, which constitutes the accommodating part 51 with the partition wall 52, is formed along an outer edge of the partition wall 52. On the front side of the partition wall 52 or the rear side of the accommodating part 51, plate members 56 are provided to an outer end of the sound path 30 and perpendicularly extended from the surface of the partition wall 52.

[0034] In the present embodiment, two kinds of the plate members 56, i.e., first plate members 56A and second plate members 56B, and they are differently ar-

ranged on the partition wall 52. Namely, the first plate members 56A are obliquely extended with respect to the vertical direction when the horn 10 is actually attached to the vehicle; the second plate members 56B are extended in the vertical direction when the horn 10 is actually attached to the vehicle, are used. The first plate members 56A and the second plate members 56B are integrated with the side wall 53 and the partition wall 52.

[0035] Further, on the outer edge of the partition wall 52 of the first member 50, a projected part 58 is formed on the opposite side of the plate members 56 and outwardly projected from the partition wall 52.

[0036] A connection part between the projected part 58 and the side wall 53, which corresponds to the outer wall of the sound path 30, will be explained with reference to Fig. 4. In the connection part 59A on the sound output section 70 side (on the downstream side of the sound path 30), a downstream side tangent line T1, which is defined by an inner side wall face of the side wall 53, is directed to the projected part 58; in the connection part 59B on the upstream side of the sound path 30, an upstream side tangent line T2, which is defined by the side wall face of the side wall 53, is directed to the direction corresponding to the direction of the inner wall face of the side wall 53 on the connection part 59A side or directed to the inner side of the inner wall face of the side wall 53 on the connection part 59A side, i.e., the inner side of the sound path 30.

[0037] A side wall 63 is formed along an outer edge of a partition wall 62 of the second member 60. The sound output section 70 is located on the front side of the partition wall 62, which is the opposite side of the side wall 63 with respect to the partition wall 62. The tubular sound output section 70 is extended in the direction perpendicular to the surface of the partition wall 62. An opening part of the sound output section 70 is directed to the front side of the horn 10. The sound output section 70 is connected to a horizontal part of the sound path 30, which is the outer end of the sound path 30, by a guide path 64. In the guide path 64, a distance from the front surface of the partition wall 62 is gradually increased toward the sound output section 70.

[0038] The sound output section 70 is constituted by a trumpetlike funnel part 71, and a shielding plate 72 covering an outlet of the funnel part 71. The shielding plate 72 hides the sound path 30, so the sound path 30 is not directly seen from the sound output section 70 side. The shielding plate 72 is formed like a lattice or rough mesh. A narrow space 73 is formed between the shielding plate 72 and an inner face of the funnel part 71. The space 73 is communicated to spaces 56D (see Fig. 6) between the second plate members 56B. A discharge hole 74 is formed in the funnel part 71 so as to communicate the space 73 to the outside of the funnel part 71 and discharge foreign matters outside. The opening part of the sound output section 70 has an elongate configuration, whose long axis is arranged in the vertical direction.

[0039] As shown in Fig. 3, a spiral plate 66 for forming the sound path 30 is provided on the rear face of the partition wall 62, which faces the first member 50. The spiral plate 66 is perpendicularly extended from the partition wall 62. A center end (an inner end) of the spiral plate 66 is corresponded to the communication hole 54 of the first member 50.

[0040] A projected part 68, whose anterior configuration is the same as that of the projected part 58 of the first member 50, is formed in the partition wall 62 of the second member 60. The projected part 68 faces the projected part 58 and forms a foreign matter trapping space 59 with the projected part 58 when the main body section 40 is formed.

[0041] In the second member 60, the partition wall 62, the guide path 64, the spiral plate 66 and the sound output section 70 are integrally formed by resin molding.

[0042] The main body section 40 is formed by the steps of: bringing the first member 50 into contact with the second member 60 and making the inner surface of the first member 50, on which the plate members 56 are formed, and the inner surface of the second member 60, on which the spiral plate 66 is formed, face each other; and applying supersonic vibration to a connection part between the first member 50 and the second member 60 so as to weld the both members 50 and 60. Therefore, the sound path 30 constituted by the spiral path is formed, in the main body section 40, by the partition wall 52 and the communication hole 54 of the first member 50, the partition wall 62, the side wall 63, the guide path 64 and the spiral plate 66 of the second member 60.

[0043] Since the plate members 56, the guide path 64, the spiral plate 66 and the sound output section 70 are previously formed in the first member 50 and the second member 60, assembling costs can be highly reduced.

[0044] As shown in Figs. 4 and 5, the oscillation member 20, which is oscillated by electricity and generates sound waves, is accommodated in the accommodating part 51 of the main body section 40. The sound waves generated by the oscillation member 20 pass through the communication hole 54 and are reflected, by the partition wall 62 of the second member 60, in the direction perpendicular to the oscillating direction of the oscillation member 20. Then, the sound waves propagate around the center axis 22 of the oscillation member 20 via the sound path 30, which is constituted by parts 30A-30E. Namely, the sound waves gradually separate away from the center axis 22 of the oscillation member 20 and propagate toward the outer part of the sound path 30.

[0045] As shown in Fig. 4, the foreign matter trapping space 59, which is formed by the projected parts 58 and 68, is formed in the outermost part of the sound path 30. In the connection part 59B between the side wall 63 and the foreign matter trapping space 59 which is located in the upstream side part of the sound path 30, the downstream side tangent line T2, which is defined by the side wall face, is directed to the center side of the sound path 30 (main body section 40) with respect to the side wall

face of the connection part 59A between the foreign matter trapping space 59 and the side wall face of the sound path 30 on the downstream side. With this structure, the sound waves in the sound path 30 can propagate toward the sound output section 70 without entering the foreign matter trapping space 59.

[0046] Therefore, attenuation of the sound waves, which is caused by entering the foreign matter trapping space 59, can be prevented. The sound waves, which have spirally propagate in the sound path 30, are introduced to the sound output section 70 by the guide path 64 and the plate members 56, and then the sound waves are outputted, as a warning sound, ahead of the horn 10 or in the direction parallel to the center axis 22 of the oscillation member 20, as shown by an arrow C in Fig. 4, from the sound output section 70.

[0047] Next, the plate members 56 (56A and 56B) will be explained.

[0048] As shown in Figs. 2 and 6, the first plate members 56A, which are provided in the guide path 64 between the sound path 30 and the sound output section 70, act as a small section part, which reduces a sectional passage area of the sound path 30, which is increased by the guide path 64. The first plate member 56A are arranged to narrow the passage space toward the sound output section 70. With this structure, the sectional passage area of the sound path 30 can be reduced, so that the sound waves can be concentrated toward the sound output section 70.

[0049] The second plate members 56B are provided adjacent to the first plate members 56A and uniformly spaced. Heights of the second plate members 56B are gradually increased toward the downstream side part of the sound path 30. A front end part 56C of each of the second plate members 56B is formed into a slope face, whose height is gradually increased from the upstream side of the sound path 30 to the downstream side thereof (in the thickness direction of the second plate member 56B or the propagation direction of the sound waves).

[0050] The sound waves, which have propagated in the sound path 30, are smoothly introduced from the upstream side of the sound path 30 to the sound output section 70, as shown by an arrow Z in Fig. 6, by the front end parts 56C of the second plate members 56B. By introducing the sound waves from the sound path 30 to the sound output section 70 via the guide path 64, attenuation of the sound waves can be highly restrained by the second plate members 56B.

[0051] Fig. 7 is a partially cutaway view of the horn 10, wherein inner structures of the sound output section 70 and the guide path 64 are shown, and Fig. 8 is an explanation view of the foreign matter trapping space 59.

[0052] The plate members 56 introduce the sound waves from the sound path 30. Further, they prevent foreign matters, e.g., rain drops, sands, from invading into the sound path 30 with the shielding plate 72 of the sound output section 70.

[0053] The shielding plate 72 of the sound output sec-

tion 70 is formed like a lattice and capable of preventing foreign matters from linearly invading into the sound path 30 from the sound output section 70. The shielding plate 72 suitably prevents foreign matters, e.g., a spray of water caused by running the vehicle, pressurized water for washing the vehicle, from obliquely invading with respect to the shielding plate 72 as shown by an arrow X in Fig. 7. With this structure, the shielding plate 72 of the sound output section 70 is capable of preventing most of foreign matters from invading into the sound path 30 from the direction X. Foreign matters passing through the shielding plate 72 can be caught in the spaces 56D between the second plate members 56B. Further, the first plate members 56A narrow the sound path 30, so foreign matters invading into the sound path 30 can be securely caught.

[0054] In case that foreign matters, e.g., a large amount of water splashed by a bucket, invade into the shielding plate 72 in the direction shown by an arrow Y in Fig. 7, the shielding plate 72 can reduce an invading speed of the foreign matters but cannot always reduce the amount of the foreign matters. However, most of the foreign matters can be caught in the spaces 56D between the second plate members 56B. Further, the sound path 30 is narrowed by the first plate members 56A, so that the foreign matters invading into the sound path 30 can be securely caught as well as the above described case in which the foreign matters invade in the direction X.

[0055] As shown in Fig. 8, the foreign matter trapping space 59 is smoothly connected to the side wall of the sound path 30 from the downstream side of the sound path 30. Further, the foreign matter trapping space 59 is located in a part of the sound path 30 which is horizontally extended and then extended upward.

[0056] Even if foreign matters pass through the shielding plate 72 and the first and the second plate members 56A and 56B, and invade into the sound path 30, the foreign matters are introduced into and trapped by the foreign matter trapping space 59, so that invading the foreign matters into the inner or center part of the sound path 30 can be suitably prevented.

[0057] The discharge hole 74, which is communicated to the spaces 56D between the second plate members 56B and outside of the horn 10, is formed in the sound output section 70. Foreign matters, e.g., water, which have invaded into the sound output section 70 from the directions X and Y, can be discharged to the outside of the horn 10 via the spaces 56D between the second plate members 56B, the space 73 between the funnel part 71 and the shielding plate 72, and the discharge hole 74.

[0058] In the present embodiment, the horn 10 outputs the sound waves generated by the oscillation member 20 frontward as the warning sound, so the warning sound can be efficiently outputted. Even if the opening part of the sound output section 70 is headed to the front side of the horn 10, the shielding plate 72, the first and second plate members 56A and 56B and the foreign matter trapping space 59 are capable of securely preventing foreign

matters from invading into the horn 10. Therefore, a span of life of the horn 10 can be long.

[0059] The preferred embodiment of the present invention has been described, but the present invention is not limited to the above described horn 10.

[0060] In the above described embodiment, the horn 10 has the shielding plate 72, the first plate members 56A acting as the small section part and the second plate members 56B. Further, the horn, which can prevent foreign matters from invading from the sound output section without using said members, may be attached to the vehicle, with the sound output section being headed in the moving direction (advancing direction) of the vehicle, as far as the horn has: the oscillation member, the sound path being formed into the spiral path, which is spirally formed around the center axis of the oscillation plate and in which the distance from the center axis is gradually increased toward the outer end; and the sound output section being provided to the outer end of the sound path, the sound output section outputting sound waves, which have passed through the sound path, in the axial direction of the center axis, and the opening part of the sound output section has the elongate configuration, whose long axis is arranged in the vertical direction.

[0061] In the above described embodiment, the sound output section 70 is connected to the horizontally extended part of the sound path 30. Further, the sound output section 70 may be connected other parts as far as number of winding the sound path 30 is three or more. The sound output section 70 need not be connected to the horizontal part of the sound path 30, so it may be connected to other parts.

[0062] In the vehicle equipped with the horn, the opening part of the sound output section 70 is directed in the advancing direction of the vehicle and the long axis of the opening part is arranged in the vertical direction, and thereby the sound waves (warning sound) generated by the oscillation member 20 can be effectively outputted, as a loud sound, forward.

[0063] The invention may be embodied in other specific forms without departing from the spirit of essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

Claims

1. A horn for a vehicle, comprising:
 - an oscillation member (20);
 - a sound path (30) being formed into a spiral path, which is spirally formed around a center axis (22)

of the oscillation plate (20) and in which a distance from the center axis (22) is gradually increased toward an outer end; and a sound output section (70) being provided to the outer end of the sound path (30), the sound output section (70) outputting sound waves, which have passed through the sound path (30), in the axial direction of the center axis;

characterized in that an opening part of the sound output section (70) has an elongated configuration, and

the opening part of the sound output section (70) is directed in the advancing direction of the vehicle and a long axis of the opening part is arranged in the vertical direction when the horn is attached to the vehicle.

2. The horn according to claim 1, wherein the sound output section (70) is connected to a part of the sound path (30) which is horizontally formed.
3. The horn according to claim 1 or 2, wherein a shielding plate (72) is provided to the sound output section (70), and the shielding plate (72) hides the sound path (30) when the sound path (30) is seen from the sound output section (70) side.
4. The horn according to one of claims 1-3, wherein a plate member (56B) is vertically provided to a connection part between the sound path (30) and the sound output section (70), and a surface of the plate member (56B) is arranged perpendicular to a propagation direction of the sound waves propagating in the sound path (30).
5. The horn according to claim 4, wherein a plurality of the plate members (56B) are placed at specified distance.
6. The horn according to claim 5, wherein heights of the plate members (56B) are gradually increased from the upstream side of the sound path (30) to the downstream side thereof.
7. The horn according to claim 5 or 6, wherein a height of a front end of each of the plate members (56B) is gradually increased from the upstream side of the sound path (30) to the downstream side thereof.
8. The horn according to one of claims 1-7, wherein a small section part (56A), which reduces a sectional passage area of the sound path (30), is provided between the sound path (30) and the sound output section (70).

9. The horn according to one of claims 1-8, wherein a foreign matter trapping space (59) is formed in an outermost part of the sound path (30) and expanded outward.

10. The horn according to claim 9, wherein a configuration of a connection part between the foreign matter trapping space (59) and the sound path (30) is defined by a downstream side tangent line (T1) and an upstream side tangent line (T2), which are mutually connected, the downstream side tangent line (T1), which is defined by a side wall face of a downstream side connection part of the sound path (30), is directed to the inner side of the foreign matter trapping space (59), and the upstream side tangent line (T2), which is defined by a side wall face of an upstream side connection part of the spiral path (32), is directed to the inner side of the sound path (30) which is on the inner side of the side wall face defining the downstream side tangent line (T1).

11. A horn comprising:

an oscillation member (20); and
a main body section (40) including a sound path (30) formed into a spiral path and a sound output section (70) provided to an outer end of the sound path (30),

characterized in,

that the main body section (40) includes:

a first member (50) having a partition wall (52) and a through-hole (54) penetrating the partition wall (52) in the thickness direction;
a second member (60) having a partition wall (62), a side wall (63), a spiral plate (66), which is provided on the partition wall (62) and whose one end is corresponded to the through-hole (54) of the first member (50), and a tubular sound output section (70), which is provided to the other end of the spiral plate (66) and which is extended in the direction perpendicular to the surface of the partition wall (62), wherein the partition wall (62), the side wall (63), the spiral plate (66) and the sound output section (70) are integrally formed,

that the side wall (63) of the second member (60) and an end face of the spiral plate (66) are connected to a wall face of the partition wall (52) of the first member (50), the horn optionally having features of one of more of claims 1-10.

12. The horn according to claim 11, wherein a side wall (53) is integrally formed on an

outer edge of the partition wall (52) of the first member (50).

13. The horn according to claim 11 or 12,
wherein a plate member (56) is integrally formed with the partition wall (52) of the first member (50) and faces the other end of the spiral plate (66), and a surface of the plate member (56) is arranged perpendicular to a propagation direction of sound waves.
14. The horn according to claim 13,
wherein a small section part (56A), which reduces a sectional passage area of the sound path (30) and which is placed on the upstream side of the plate member (56), is integrally formed with the partition wall (52) of the first member (50).
15. The horn according to one of claims 11-14,
wherein a shielding plate (72) is integrally formed with the sound output section (70) of the second member (60).

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FIG.1

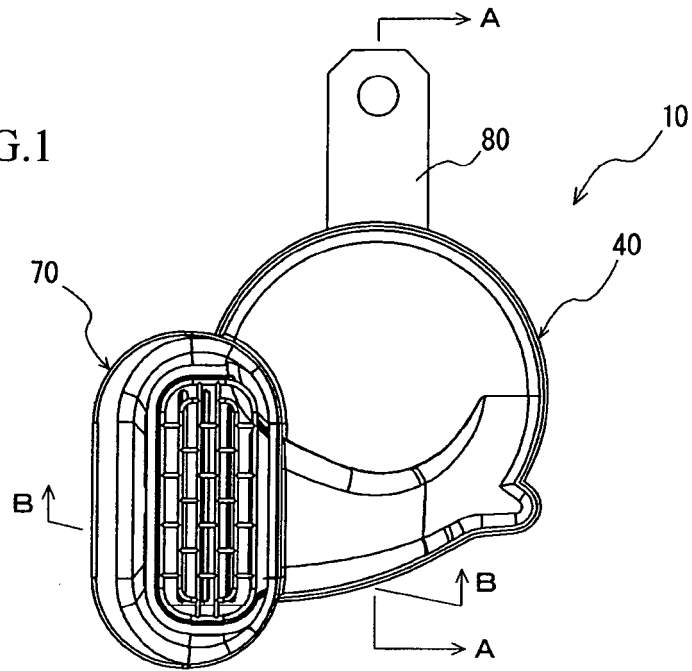


FIG.2

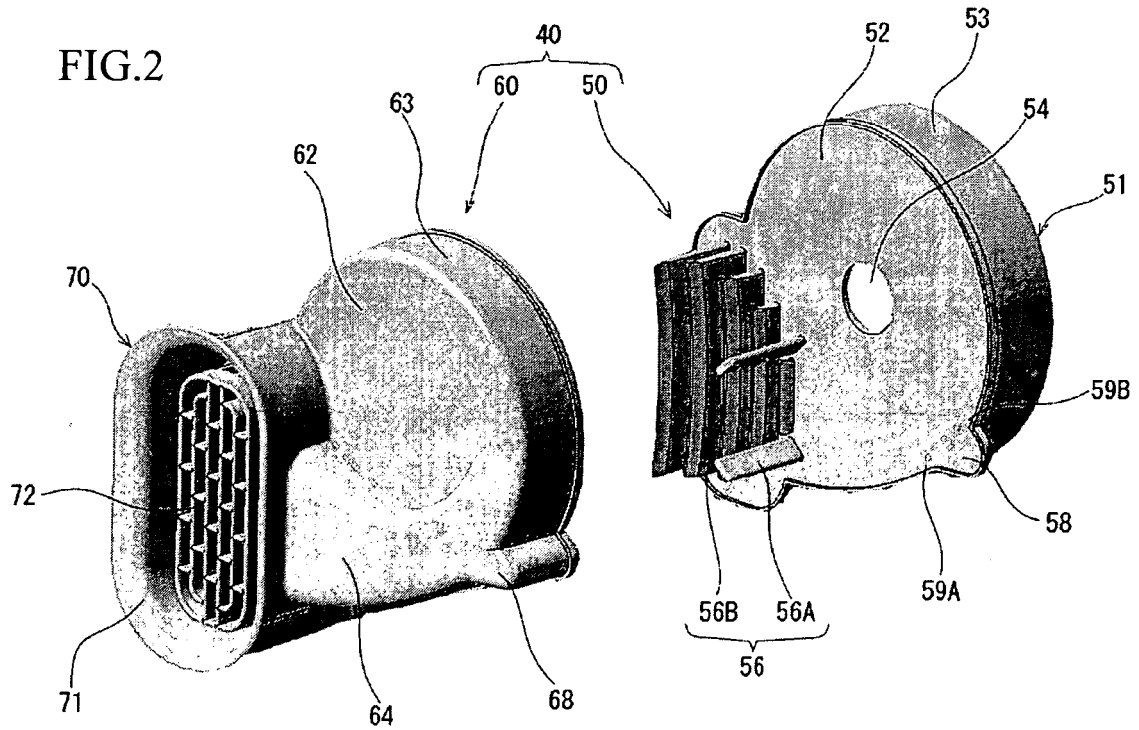


FIG.3

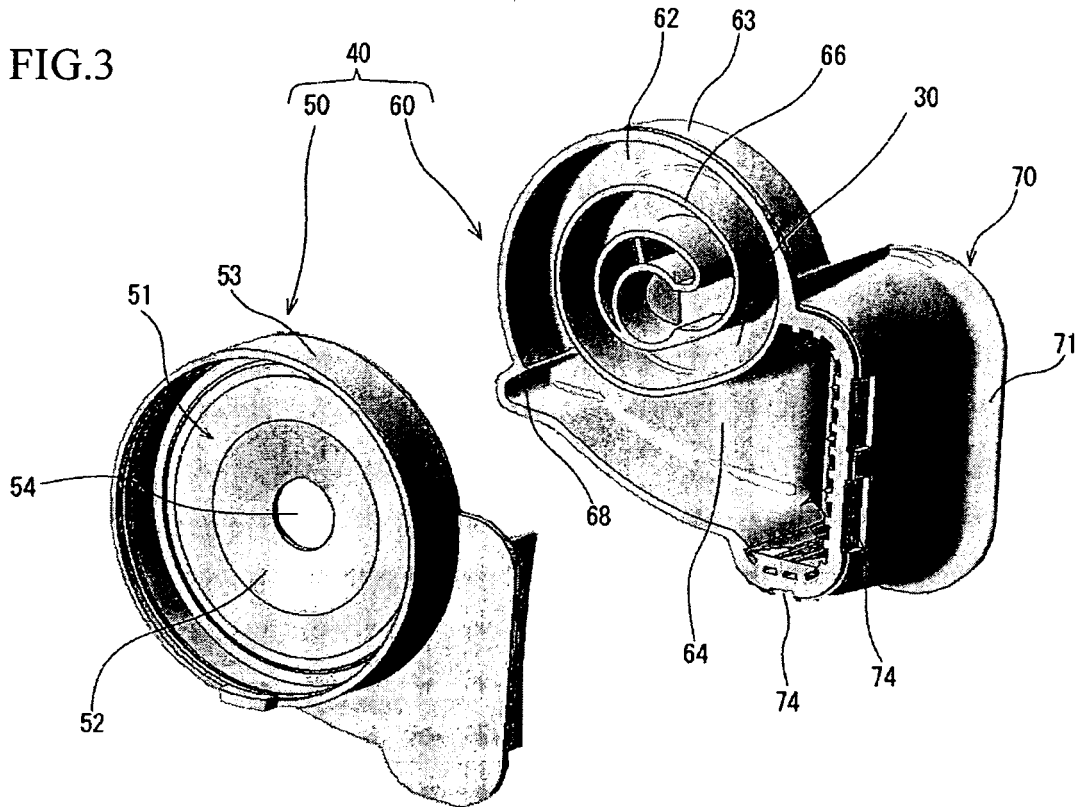


FIG.4

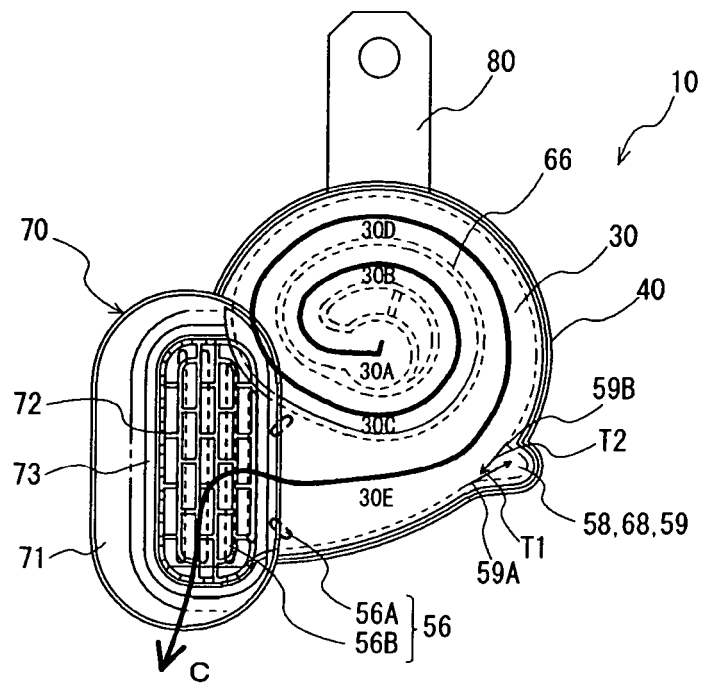


FIG.5

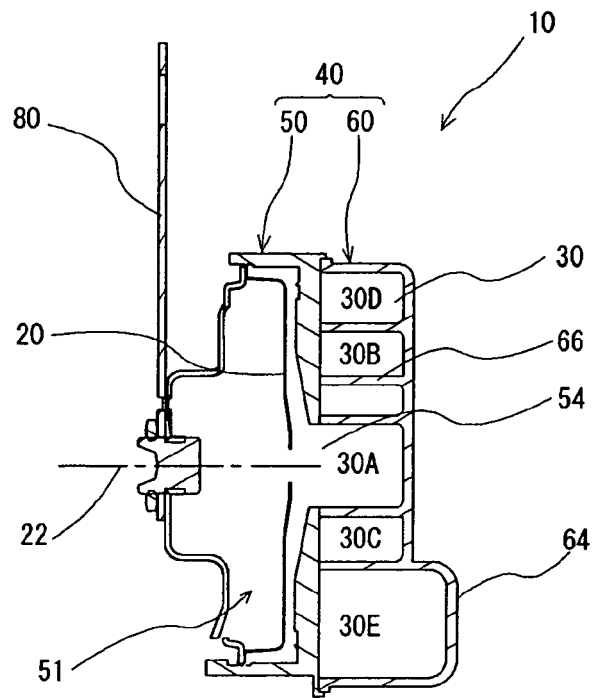


FIG.6

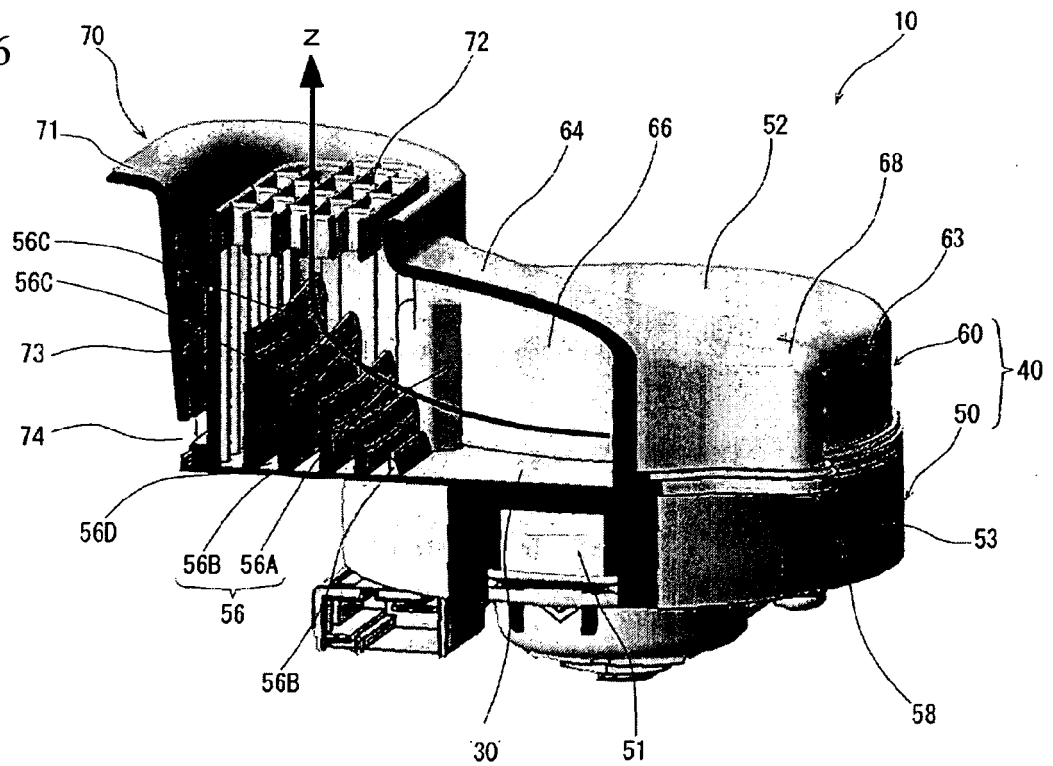


FIG.7

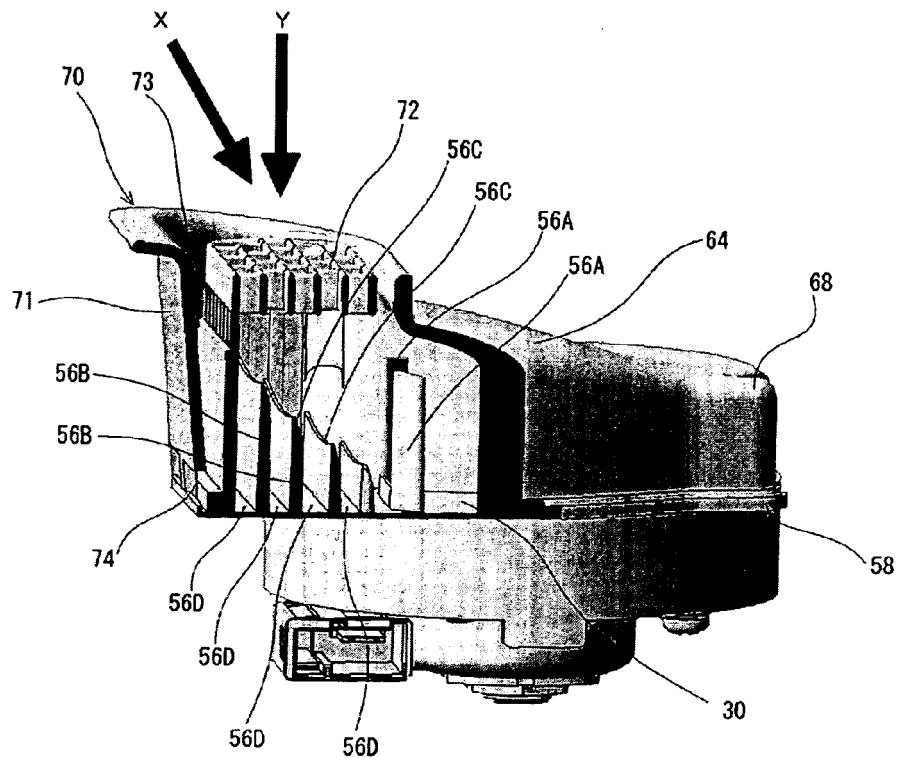
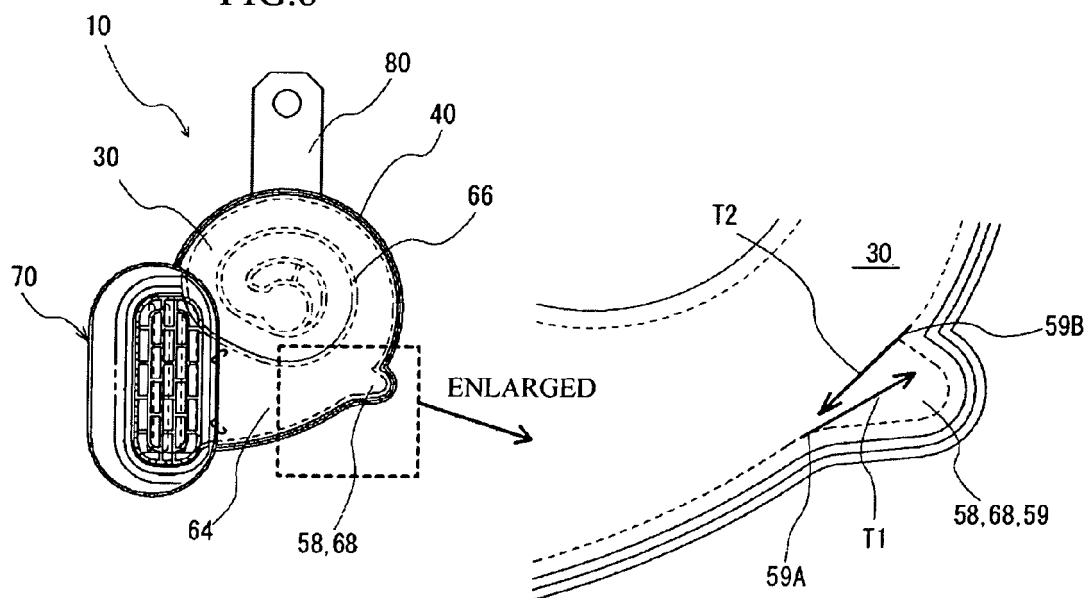


FIG.8



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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