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(54) **TRIGGER FILTER ARRANGEMENT**

(57) The invention concerns a trigger filter arrangement for a percussion instrument (15) having a rim (16) and a skin (18), the damper arrangement comprising a connector (12) for electric connection to an audio system. The trigger filter arrangement further comprises a fixture (2, 2') that can be connected to the rim of the percussion instrument when the trigger filter arrangement is in use, the fixture further comprises a first part (20, 20') that is designed to extend at least partially above the skin of the percussion instrument when the trigger filter arrangement is mounted on the percussion instrument and a second part (22, 22') that is designed to extend at least partially next to the rim of the percussion instrument on an outer side of the rim opposite the skin when the trigger filter arrangement is mounted on the percussion instrument. The first part comprises a skin sensor (28) and the second part comprising a rim sensor (32), the rim sensor defining a geometric area (32'), wherein the rim sensor (32) is attached to the second part in a cantilevered way so that a first portion of the geometric area is attached to the second part and wherein a second portion of the geometric area is arranged free without physical contact to the fixture and next to the rim.

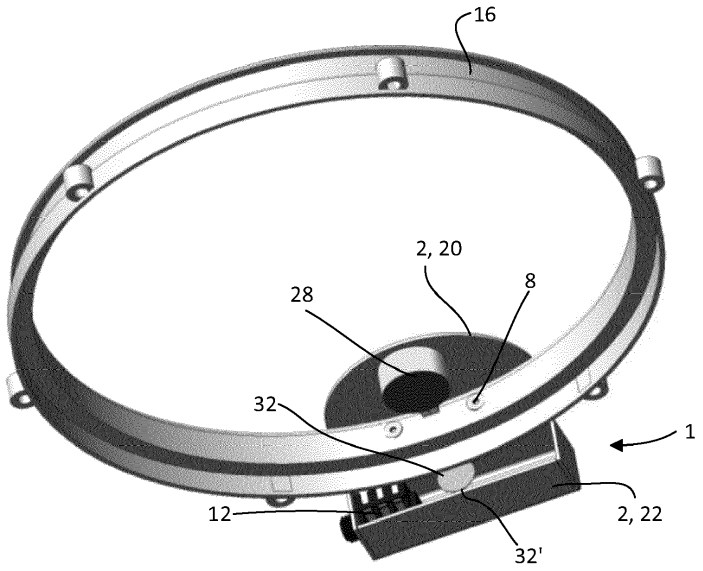

Fig. 1

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Description

Technical Field

[0001] The invention relates to the field of electronic trigger filter arrangements or damper arrangements for instruments in particular for conventional and electronic drums.

Background of the Invention

[0002] Electronic filters are used to distinguish impacts on percussion instruments in order to generate the correct and wanted sound or hit. In many cases it is wanted that a hit on the rim or frame of the drum must be distinguished from a hit on the head or skin for generating a correct and clear signal, in particular for recording and replay purposes. Current trigger solutions have sensors that are connected rigidly and with their entire surface to fixtures and then attached to a drum for example to a shell or rim of a drum as for instance shown in US 5,811,709 B1 where the sound-to electrical transducer or sensor is attached with its entire surface to the shell of the drum as shown in figure 1. The US 5,811,709 describes that the sensor is capable of sound attenuation in order to distinguish trigger signals from external signals such as ambient noise, sympathetic vibrations from the drum skin or hits on the stand of the drum.

[0003] Contrary to US 5,811,709 B1, which only discloses one sensor fully attached to the shell, fixtures typically comprise one skin sensor for the skin or head for detecting hits on the skin/head and one frame sensor for the rim or frame for detecting hits on the rim/frame. When the sensors are rigidly attached to the fixture with their entire surfaces then a hit on the skin generates a vibration or signal on the skin sensor while a hit on the frame generates a vibration or signal on the frame sensor. However, every hit on the skin generates also a signal on the frame sensor and every hit on the frame also generates a signal on the skin sensor both of which generate a falsified signal, which makes it difficult to filter out the unwanted trigger signal. When a drummer hits the skin the intention is to generate a hit signal on the skin and when she/he hits the frame then the intention is to generate a hit on the frame without any trigger signal from the other element. This is a problem with the fixtures that are available as of today.

[0004] US 7,396,991 B2 discloses an electronic percussion instrument comprising input means, comparison means and musical tone generation means. The input means detect an impact on the head or the rim. The comparison means compare allow for a comparison of the size of the vibration in the head section of the drum and a size of the vibration of the rim section and the musical tone generation means then generates a tone based on the comparison. The build-up in US 7,396,991 B2 is complicated and it does not allow for temporary mounting of a sensor on a drum. The entire sensor arrangement or systems needs to be installed on the drum in a long and rather complicated process. In addition, in particular the rim sensor, rim shot sensor 31 as shown in figure 2, is mounted in full contact with its vibration surface in order to detect the rim vibration, which will create problems when distinguishing impacts on the rim versus impacts on the head, as explained below.

Summary of the Invention

[0005] In view of the above described problems the inventor of the present invention has discovered that it is possible to distinguish an impact or shot on the rim from an impact on the skin/drumhead or the other way around in a very smart way for providing a clear signal that is used to produce or reproduce the correct sound. The solution proposed by the inventor works for a real drum comprising a shell or an acoustic drum only comprising a skin and a frame. By providing a fixture with a skin- or drum head sensor, which is configured to be in contact with the skin of the percussion instrument, such as a drum or an acoustic drum, and a frame or rim sensor that is only partially attached to the fixture in close proximity to the rim, it is possible to distinguish between a trigger signal that comes from the skin (thus a hit on the drum head) or a signal that comes from the frame (thus a hit on the frame). The arrangement of the sensors on the fixture thereby provide for a rather big difference in the trigger signal. The trigger signal from the rim sensor is approximately 20dB (decibel) louder than the trigger signal from the drumhead, which makes it easier to distinguish the signals and filter out the relevant signal and therewith the relevant sound.

[0006] An object of the present invention is to provide a trigger filter arrangement that provides better signal distinction and therewith clearer sound from a percussion instrument.

[0007] Disclosed herein is a trigger filter arrangement for a percussion having a rim and a skin or drum head, the damper arrangement comprising a connector for electric connection to an audio system or a sound module, a fixture that can be connected to the rim of the percussion instrument when the trigger filter arrangement is in use. The fixture further comprises a first part that is designed to extend at least partially above the skin of the percussion instrument when the trigger filter arrangement is mounted on the percussion instrument and a second part that is designed to extend at least partially next to the rim of the percussion instrument on an outer side of the rim opposite the skin when the trigger filter arrangement is mounted on the percussion instrument. The first part comprises a skin sensor and the second part comprises a rim sensor, whereby the rim sensor defines a geometric area and wherein the rim sensor is attached to the second part in a cantilevered way so that a first portion of the geometric area is attached to the second part and wherein a second part of the geometric area is arranged free without physical contact to the fixture and

next to the rim.

[0008] The above described embodiment provides for a very accurate and clear measurement of the trigger signal that is forwarded from the trigger filter arrangement to an audio system. The audio system receiving a trigger signal from the trigger filter arrangement can clearly distinguish whether the player or drummer intended to hit the rim or the skin/drumhead and therewith provide or reproduce a clear and exact sound signal.

[0009] The audio system may be mixer, an amplifier, a percussion synthesizer, a filter or any other electronic processing system such as a computer. The trigger signal is forward to the audio system via the connector and cables.

[0010] In addition to the above the described trigger filter arrangement increases the sensitivity of the skin sensor and the rim sensor. It is easier for a sound module or audio system to detected light hits or impacts on the skin and rim of the drum, respectively, while strong hits or impacts can be detected without crosstalk. This leads to better dynamic capabilities of the trigger filter arrangement.

[0011] A further advantage of the trigger filter arrangement according to the above is that the software that needs to analyze the trigger signals can be designed in a straight forward manner and rather simple so that the response time is reduced compared to prior art solutions.

[0012] Due to the design of the trigger filter arrangement it is further possible to directly mount it on the rim without the need to disassemble the drum first and/or mount the trigger filter arrangement within the drum with complicated mechanics.

[0013] The trigger filter arrangement according to the above is further economic to produce and rather easy to maintain.

[0014] The second part may comprise a projection or alternatively an edge or corner, which extends or is arranged next to the outer side of the rim at a distance to the rim, wherein the rim sensor is attached to the projection.

[0015] The projection may also be an edge or shoulder or the like.

[0016] The projection may be used to position the rim sensor in an optimal manner. It is however possible to do this also by forming the second part of the fixture accordingly so that the rim sensor can be mounted in a cantilevered way. This may for instance also or alternatively be achieved via an edge provided on the second part of the fixture.

[0017] The first portion of the geometric area that is attached to the second part may comprise of 5% to 40% of the total surface of the geometric area, preferably 10% to 35% and more preferably 15% to 35%.

[0018] In some embodiments the first portion may be 5% to 50% and preferably 10% to 45% of the geometric area 32'.

[0019] Alternatively this percentage may be further varied, it may for example be 20% to 30%. Preferably the attached area is of the rim sensor is less than 50% of the total surface of the geometric area defined by the rim sensor.

[0020] Attaching less than half of the geometric area of the rim sensor to the second part of the fixture provides a very clear and easily distinguishable signal from the skin sensor signal to the audio system.

[0021] The skin sensor and the rim sensor may be piezoelectric sensors.

[0022] Such sensors are used in audio system and easily available. In addition, they provide a good sensitivity and are easy to handle.

[0023] The geometric area of the rim sensor may define a circle. Alternatively, the geometric area and therewith the shape of the sensor may be triangular, oval, or rectangular or anything between thereof.

[0024] The geometric area may also define a rectangle or square or an elliptic shape. The first portion that is attached to the second part may be adapted accordingly.

[0025] In case the geometric area defines a circle, the first portion is in the form of a segment and an angle defining the segment as measured in the centre of the circle may preferably be less than 180°.

[0026] The angle may be in the range of 100° to 150°.

[0027] In an embodiment the fixture may comprise a fitting mechanism for fitting the fixture to the drum.

[0028] The fitting mechanism may comprise screws that are directly screwed into the rim of the drum. Alternatively, the fitting mechanism may be a clamping mechanism that is attached by clamping to the rim of the percussion instrument.

[0029] The rim sensor may comprise a first damper that reduces the vibrations on the rim sensor.

[0030] This first damper may improve the signal output from the rim sensor.

[0031] The skin sensor may comprise a second damper that reduces the vibrations on the skin sensor.

[0032] The second damper may improve the signal output from the skin sensor.

[0033] In an embodiment the first damper is in the form of two cables, a first cable for connection to earth via the connector and a second cable for providing the signal via the connector, wherein the first cable is connected to the rim sensor at a peripheral edge and wherein the second cable is also connected to the peripheral edge at a distance to the first cable.

[0034] The first and second cable being arranged at a distance to one another have improved damping properties on the rim sensor, which again results in a clearer trigger signal that can be easily distinguished form the trigger signal created by the skin sensor.

Brief Description of the Drawings

[0035] The present invention will now be described, for exemplary purposes, in more detail by way of an embodiment(s) and with reference to the enclosed drawings, in which:

Fig. 1 schematically illustrates a perspective view on a first embodiment of the invention;

Fig. 2 schematically illustrates a perspective view onto an enlarged part of the embodiment shown in figure 1;

Fig. 3 schematically illustrates a top down view onto a rim and a skin and a trigger filter arrangement according to the invention;

Fig. 4 schematically illustrates a cross-sectional view cut along the indicated axis IV-IV of figure 3;

Fig. 5 schematically illustrates a perspective view on a second embodiment of the invention;

Fig. 6 schematically illustrates a perspective view onto an enlarged part of the embodiment shown in figure 5;

Fig. 7 schematically illustrates the rim sensor and the geometric area it defines; and

Fig. 8a illustrates the trigger signal of a trigger filter arrangement according to the prior art; and

Fig. 8b illustrates the trigger signal of a trigger filter arrangement according to the present invention.

Detailed Description

[0036] Figure 1 schematically illustrates a trigger filter arrangement 1 arranged on a rim 16 of a drum. For the sake of illustration purposes the skin or head of the drum is omitted in figure 1. The trigger filter arrangement 1 comprises a fixture 2 arranged on the rim 16 via fitting mechanism 8, in the illustrated case screws that are inserted into threads in the rim 16. The fixture 2 comprises a first part 20 extending over the skin when the trigger filter arrangement 1 is mounted on the rim 16 and a second part 22 that extends next to the rim 16 on an outer side. The outer side is the side opposite the skin when a skin is mounted on the rim 16. On the first part 20 a skin or head sensor 28 is mounted, the skin sensor 28 is configured to be arranged above the skin of the drum and preferably in direct but light contact with the skin when the trigger filter arrangement 1 is mounted on the drum. The skin sensor 28 is configured to measure vibrations induced by hits or impacts from the drummer on the skin. The second part 22 comprises a rim sensor 32, which rim sensor 32 is arranged next to the rim 16 but at a distance from it in order to detect hits or impacts onto the rim 16 of the drum. As can be seen from figure 1 the rim sensor 32 is mounted in a special way so that a major part of it is cantilevered from the second part 22. Only a minor part of the surface or geometric area 32' is mounted on the second part 22. The rim sensor 32 may be mounted via an adhesive on the second part 22 so that the major part that is cantilevered and not attached to the second part 22 consists of more than half of the geometric area 32' or surface. In case of a circularly shaped rim sensor 32 a segment s (c.f. Figure 7) of the rim sensor 32 is attached to the second part 22, the segment is less than half of the geometric area 32' so that more than half of the geometric area 32' is arranged free and cantilevered.

[0037] Figure 2 illustrates a section of the embodiment of figure 1 where the fixture 2 is also visible and where a projection 30 is shown in the second part 22 of the fixture 2. The rim sensor 28 is mounted on the projection 30 so that a major part of the rim sensor 28 is arranged free and from the projection. The rim sensor 28 can thereby be attached via an adhesive, a physical connection for instance with screws and threads or the like or anything similar such as a magnetic connection.

[0038] Even if the rim sensor 28 is of another shape such as square or rectangular it is connected to the second part 22 and/or the projection 30 so that a major part of the geometric area (not shown) defined by the rim sensor is arranged free from the projection 30 and the second part 22, respectively.

[0039] Figure 3 illustrates a top down view onto the rim 16 and the skin/drumhead 18 of the drum. The fixture 2 with its first part 20 and the second part 22 is well visible and so is the connector 12. Additionally the rim sensor 32 is visible in figure 3 and how it is mounted on the edge 30.

[0040] Figure 4 illustrates a cross sectional view onto the embodiment shown in figure 3 illustrating the rim 16 and parts of the trigger filter arrangement 1 in a clearer manner. The trigger filter arrangement 1 is connected to the rim 16 via a screw 8 or generally via a fixing mechanism. The skin sensor 28 and the rim sensor 32 mounted to the edge or projection 30 are well visible and connected to the fixture 2 via the first part 20 and the second part 22. Figure 4 further illustrates cables 10 that are connected to the rim sensor 32 for earthing purposes and for delivering the signal to an audio system. The cables 10 will be explained in more detail referring to figures 5 and 6.

[0041] The projection 30 can also be designed as an edge 30' or the like as shown and visible in figures 5 and 6, which illustrate a drum 15 comprising a shell 17, as kin 18 and the rim 16. Figure 5 illustrates the fixture 2 slightly transparent in order to reveal and better illustrate other components arranged under fixture 2 such as the rim sensor 32 and cables 10. The trigger filter arrangement 1 shown in these two figures is built up in a similar manner as in the embodiments shown in figures 1 and 2 but the fixture 2' is designed a bit different in that the second part 22' comprises the edge 30' or shoulder 30' that provides the possibility to mount the rim sensor 32 in a cantilevered way so that the major part of it is arranged free without any physical contact to another element of the drum 15 or the trigger filter arrangement 1. The rim sensor 32 is connected to the connector 12 via two cables 10 that are connected to the rim sensor 32 at a distance from one another at the periphery of the rim sensor 32. Arranging the cables 10 in that way provides for a dampening effect when a hit or impact on the rim 16 is detected. Other dampers or first damper such as very small weights, foam rubber(s), cushion member(s)

or the like may also be used to improve the performance of the rim sensor 32. The skin sensor 28 may also comprise a second damper or the like in order to improve its performance when detecting impacts or hits on the skin.

[0042] Figure 7 illustrates the rim sensor 32 or its geometric area 32' and the segment s, via which segment s the rim sensor 32 is attached to the second part 22, 22' of the fixture 2. The segment s is defined by the angle α measured in the center z of the rim sensor 32, 32'. The angle α is thereby never greater than 180° and preferably it is in the range of 110° to 160°, which means that the segment s never occupies more than half of the surface or geometric area 32' of the rim sensor 32. The segment s may be described as a first portion of the geometric area 32' while the rest of the geometric area 32' thus that part or portion that is arranged free or "in the air" may be described as second portion. Even though figure 7 specifically illustrates a circular geometric area 32' and rim sensor 32 any other suitable form, shape or geometric shape of the rim sensor 32 may be considered and used, whereby the first portion is always smaller or the same than the second portion of the geometric area.

[0043] As explained in the introduction of this document, the sensitivity is improved when a signal or trigger from an impact on the rim thus the rim signal or rim trigger and a signal or trigger from the head or skin thus the skin signal or rim trigger can be distinguished clearly due to their volume as measured in decibel. Figure 8a illustrates the difference in volume in these two signals in a prior art trigger filter arrangement. The upper part of figure 8a illustrates the rim signal while the lower illustrates the head or skin signal. As can be seen from figure 8a, marked with black circles, the difference in these two signals is only 5 decibel and they are therewith difficult to distinguish by a software and therewith an audio system. It is thus not so easy for the audio system to replay or reproduce the generate tone or sound from the impact. In the prior art solutions the rim sensor is typically attached to the fixture with its entire surface.

[0044] Figure 8b illustrates the rim signal (upper part of figure 8b) and skin signal (lower part of figure 8b) in the trigger filter arrangement 1 according to the present invention. One can see, again marked with black circles, that the amplitudes of the rim signal and the skin signal differ in about 20 decibel, which makes it much easier for the audio system and/or the related software to detect the different signals and replay or reproduce them correctly. As one can understand this difference also substantially improves the sensitivity of the trigger filter arrangement 1 compared to prior art solutions.

[0045] The invention has now been described referring to two embodiments. Various combinations between the embodiments and also various hybrid versions of the two embodiments fall of course within the invention as long as it can be derived by the skilled person.

[0046] In one possible solution the rim sensor may be directly attached, as described according to any of the above embodiments, to the rim but in a cantilevered way in order to detect impacts or hits on the rim.

Claims

1. A trigger filter arrangement for a percussion instrument (15) having a rim (16) and a skin (18), the damper arrangement comprising a connector (12) for electric connection to an audio system, a fixture (2, 2') that can be connected to the rim of the percussion instrument when the trigger filter arrangement is in use, the fixture further comprising a first part (20, 20') that is designed to extend at least partially above the skin of the percussion instrument when the trigger filter arrangement is mounted on the percussion instrument and a second part (22, 22') that is designed to extend at least partially next to the rim of the percussion instrument on an outer side of the rim opposite the skin when the trigger filter arrangement is mounted on the percussion instrument, the first part comprising a skin sensor (28) and the second part comprising a rim sensor (32), the rim sensor defining a geometric area (32'), **characterized in that** the rim sensor (32) is attached to the second part in a cantilevered way so that a first portion of the geometric area is attached to the second part and wherein a second portion of the geometric area is arranged free without physical contact to the fixture and next to the rim.

2. The trigger filter arrangement according to claim 1, wherein the second part (28) comprises a projection (30), an edge (30') or shoulder, which is positioned next to the outer side of the rim (16) at a distance to the rim, wherein the rim sensor (32) is attached to the projection, edge or shoulder.

3. The trigger filter arrangement according to claim 1 or 2, wherein the first portion of the geometric area (32') that is attached to the second part (22) comprises of 5% to 40% of the total surface of the geometric area, preferably 10% to 35% and more preferably 15% to 35%.

4. The trigger filter arrangement according to any of the preceding claims 1 to 3, wherein the skin sensor (28) and the rim sensor (32) are piezoelectric sensors.

5. The trigger filter arrangement according to any of the preceding claims 1 to 4, wherein the geometric area (32') of the rim sensor (32) is defining a circle.

6. The trigger filter arrangement according to claim 5, wherein the first portion is in the form of a segment (s) and wherein an angle (α) defining the segment as measured in the centre of the circle is less than 180°.

7. The trigger filter arrangement according to any of the preceding claims 1 to 6, wherein the fixture (2) further comprises a fitting mechanism (8) for fitting the fixture to the drum (15).

8. The trigger filter arrangement according to any of the claims 1 to 7, wherein the rim sensor (32) comprises a first damper that reduces the vibrations on the rim sensor.

9. The trigger filter arrangement according to any of the claims 1 to 8, wherein the skin sensor comprises a second damper that reduces the vibrations on the skin sensor.

10. The trigger filter arrangement according to claim 8, wherein the first damper is in the form of two cables, a first cable for connection to earth via the connector (12) and a second cable for providing the signal via the connector, wherein the first cable is connected to the rim sensor at a peripheral edge and wherein the second cable is also connected to the peripheral edge at a distance to the first cable.

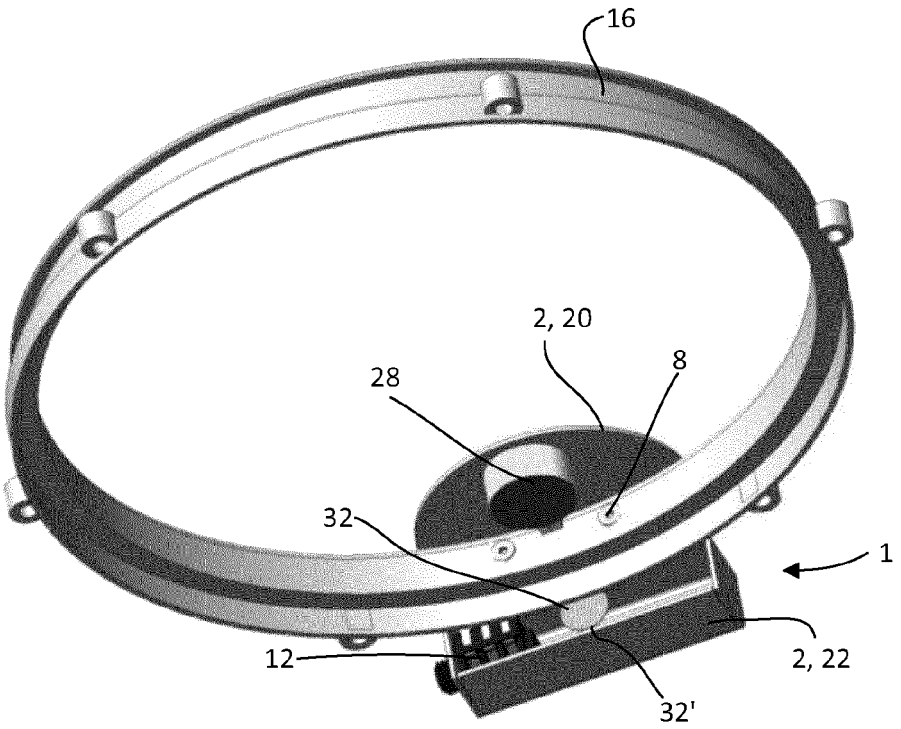


Fig. 1

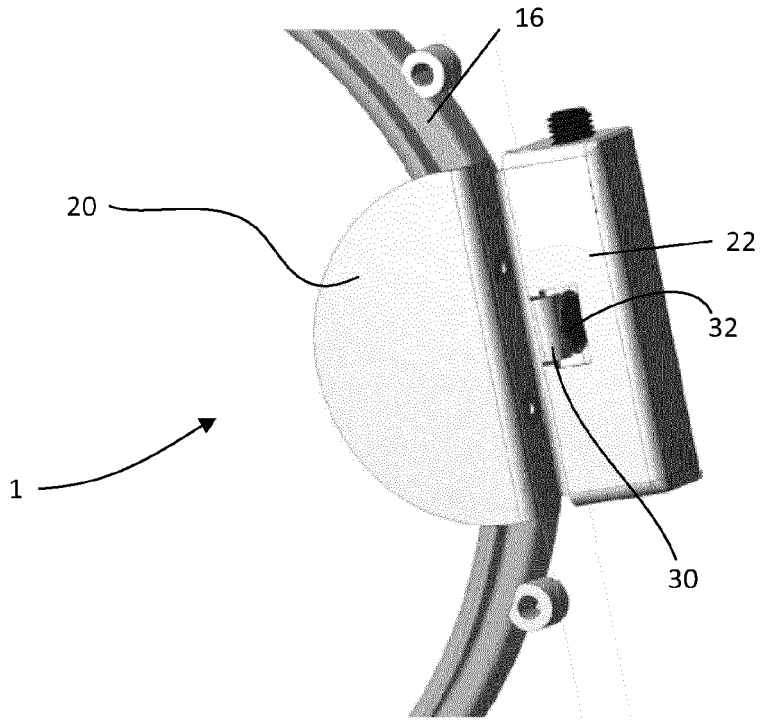


Fig. 2

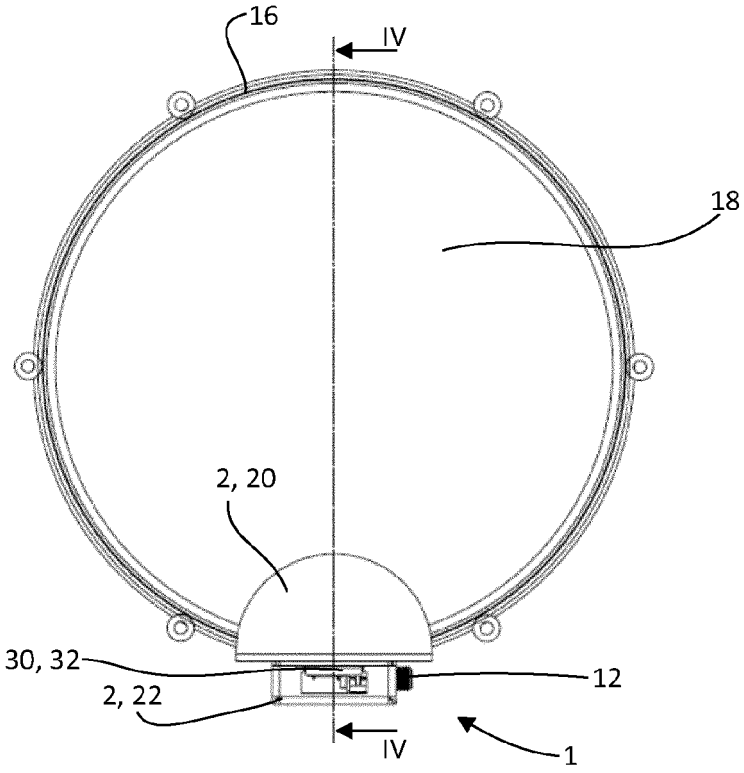


Fig. 3

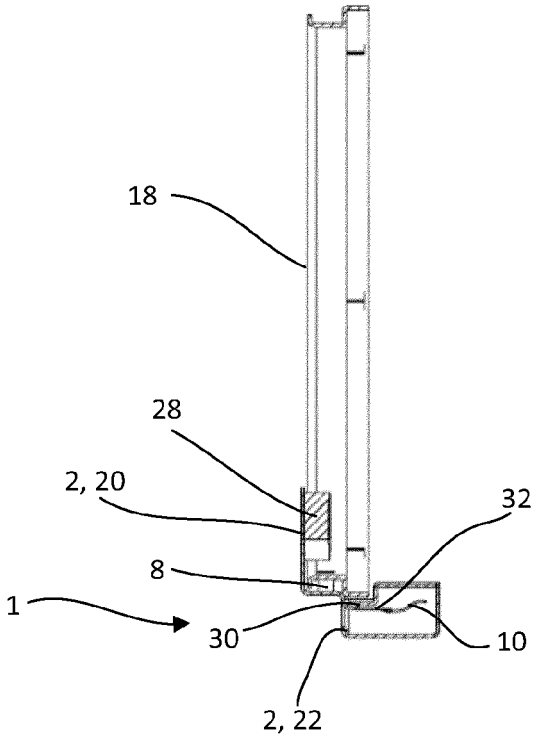


Fig. 4

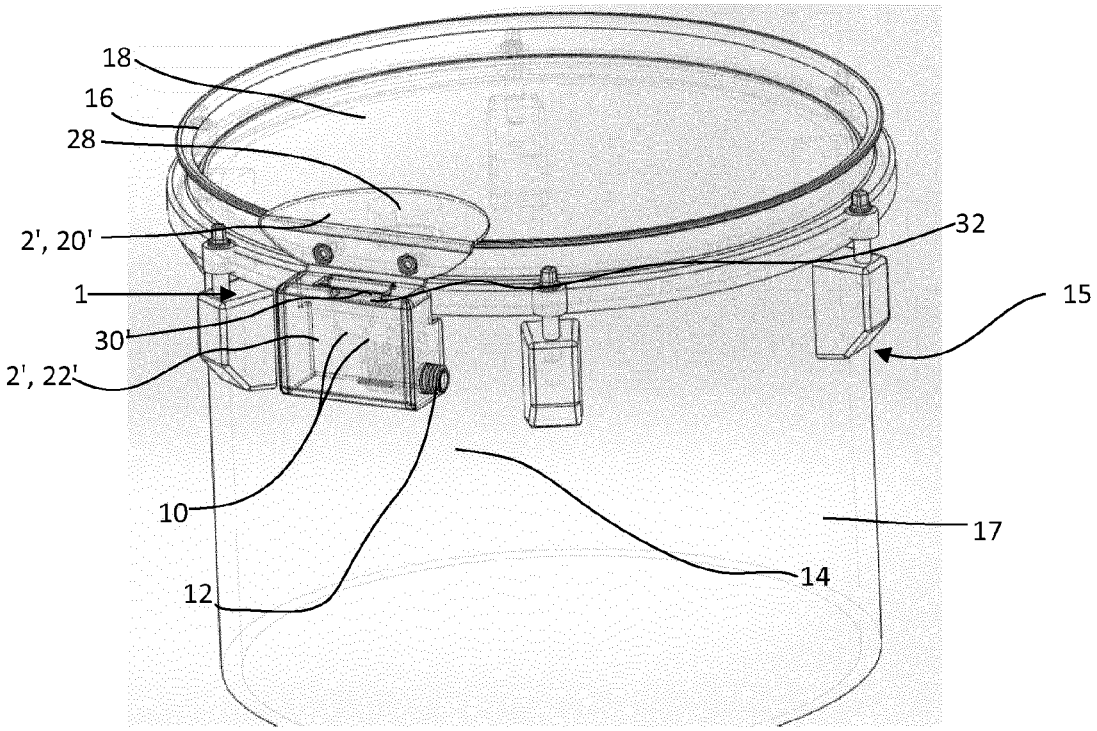


Fig. 5

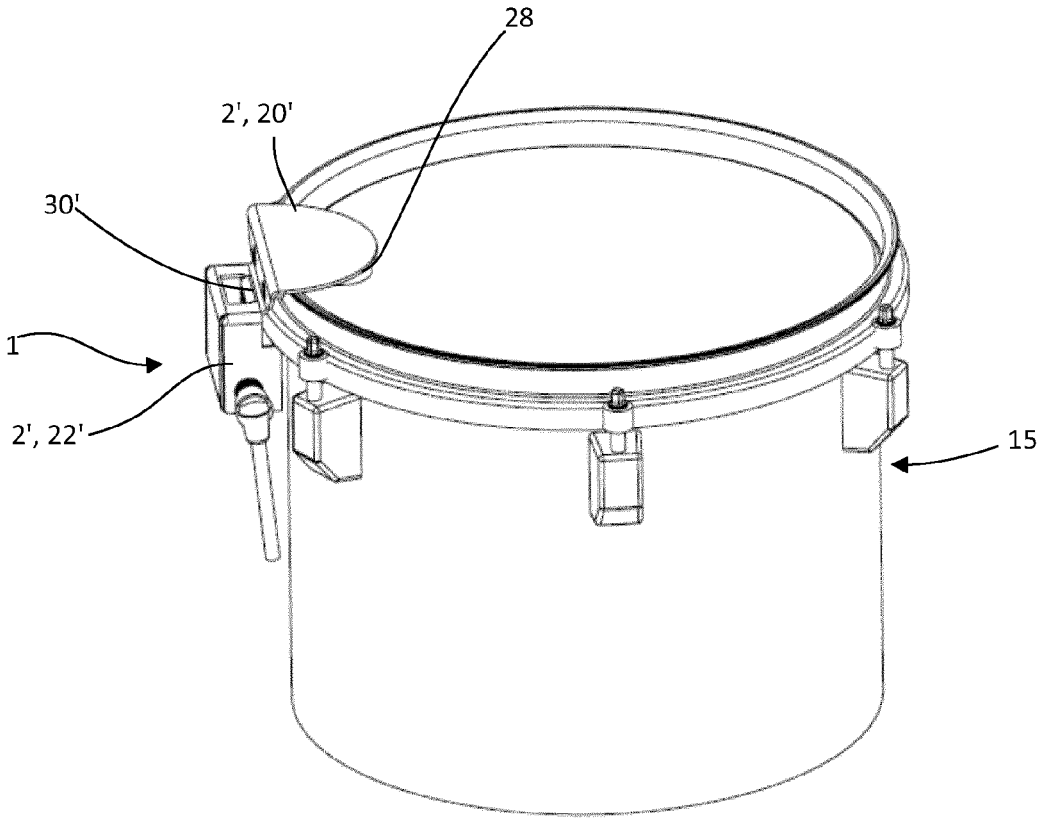


Fig. 6

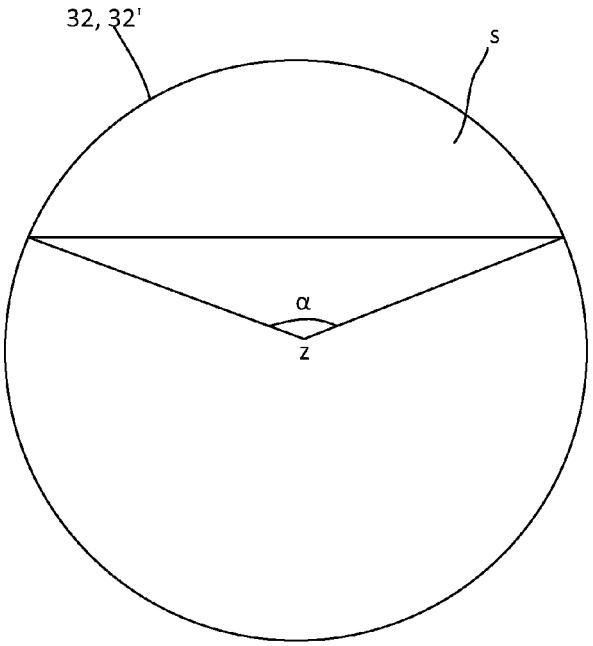


Fig. 7

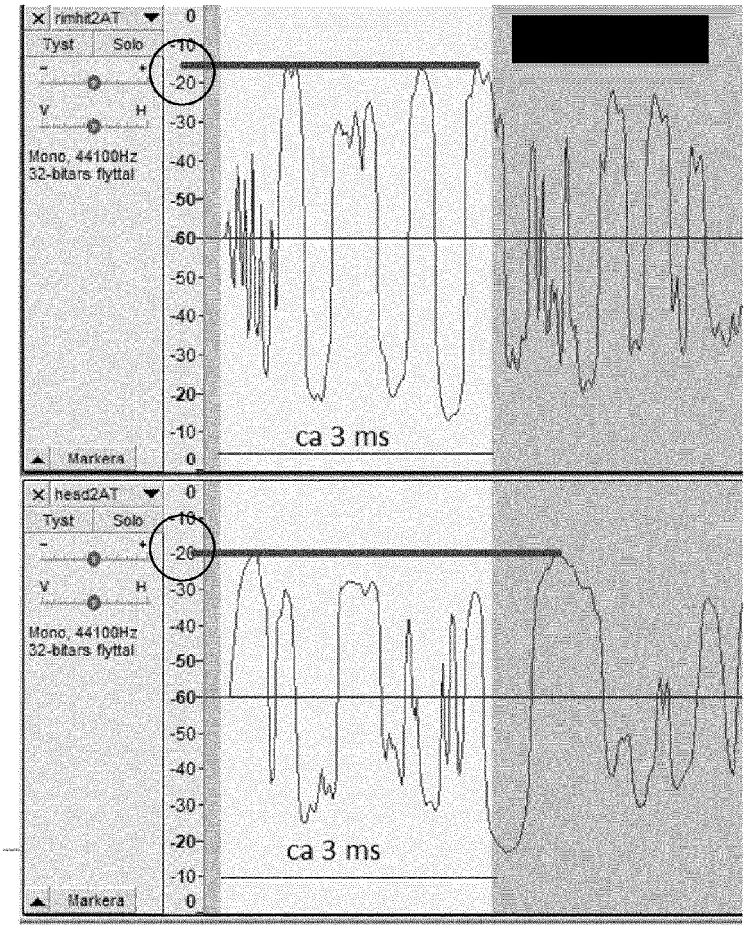
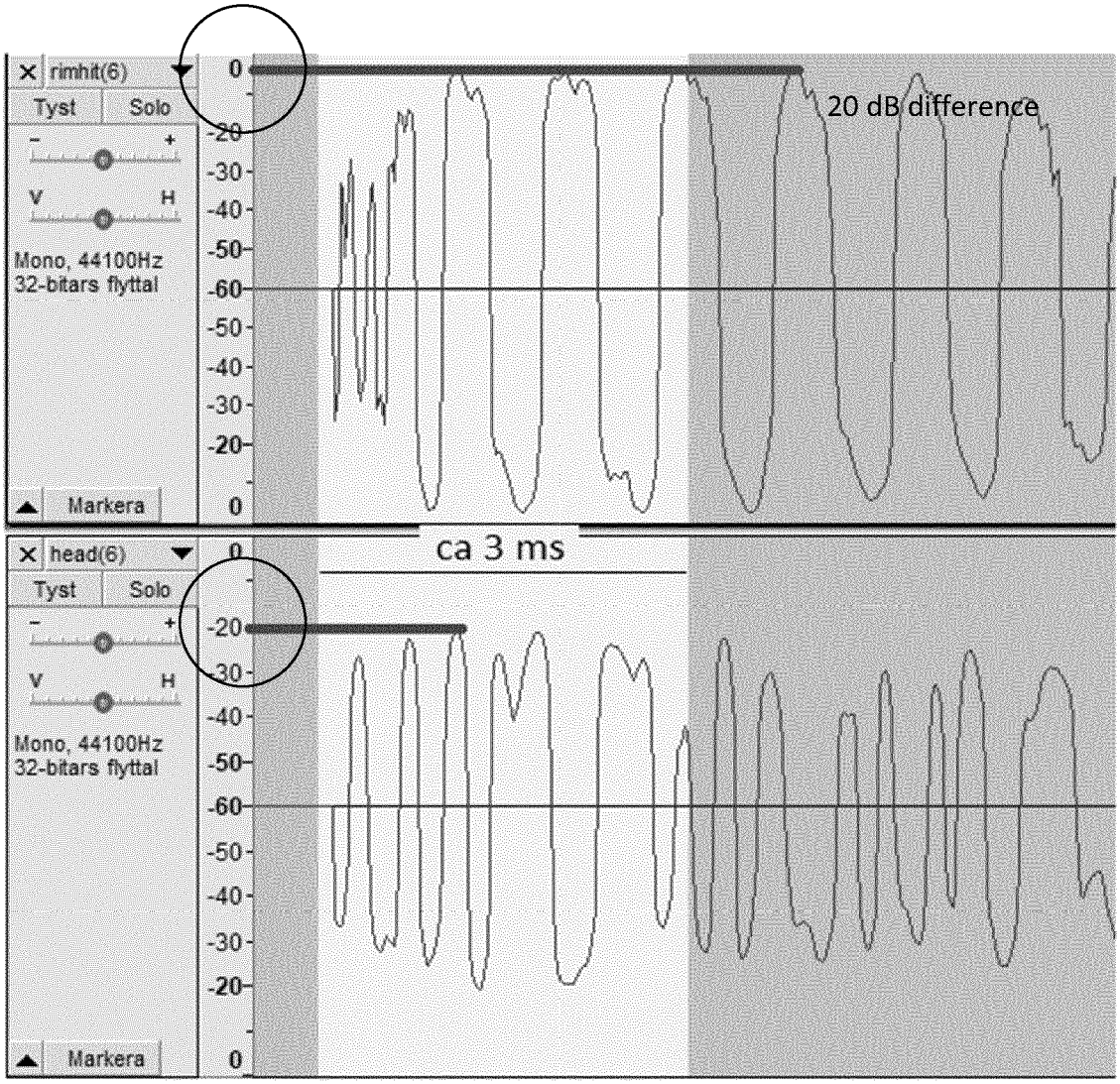


Fig. 8a – Prior Art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Markera

Fig. 8b

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EUROPEAN SEARCH REPORT

Application Number
EP 20 20 8678

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	EP 1 298 641 A1 (YAMAHA CORP [JP]) 2 April 2003 (2003-04-02) * abstract; figures 4-7,12-13, 17, * * paragraph [0123] - paragraph [0139] * * paragraph [0075] - paragraph [0084] *	1-10	TECHNICAL FIELDS SEARCHED (IPC) G10H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	20 April 2021	Lecointe, Michael

CATEGORY OF CITED DOCUMENTS

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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