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(54) Loudspeaker with static device for forcing and aligning loudspeaker cooling air-streams

(57) Static device for dorcing loud-speaker cooling air streams, comprising a diffusing device centralised in relation to the ring magnet, geometrically built so as to form several specific zones, similar to an inverted venturi, capable of transforming the air pulses issued by the diaphragm at its back end and under the cap, in a continuous flow in one way only and through the coil.

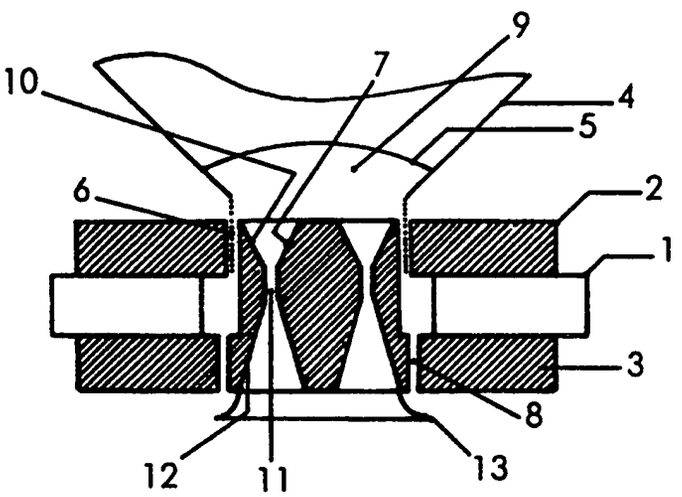

Fig. 2

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Description

SUMMARY

[0001] The following descriptive report of the invention patent refers to the development of a static device for forcing air streams for the cooling of loud-speakers, comprising of a diffusing device centered in relation to the ring magnet, geometrically built to form a converging zone, a cleft and a divergent zone, similar to an inverted venturi, provided with entrance ducts formed between the diffuser and the inner walls of the upper polar, lower polar, and ring magnet parts, capable of transforming the air pulsation issued by the diaphragm at its back end and under the cap, in a continuous flow, in one only way and through the voice coil.

STATE OF THE TECHNIQUE

[0002] Dynamic loud-speakers with mobile voice coils consist basically of a diaphragm or membrane, coupled to a mobile coil that moves in the space between the poles of a magnetic assemblage. The upper or outer rim of the diaphragm is fixed to a framework by an elastic suspension. When an alternate current flows through the coil, such coil together with the diaphragm is successively attracted an repealed by the permanent magnetic field in the free space between the poles. Such diaphragm displacement moves the air forth and back. Such motions are perceived as a sound, a vibratory motion of the air. (figure 1).

[0003] The electric current sent to the coil is thus transformed into a motion.

[0004] However, due to the ohmic resistance of the coil, a great part of the energy used to break this resistance is transformed into heat which is issued by the coil. The increase in the temperature increases even further the conductor's resistance. Therefore, this progressive process decreases the loud speaker's efficiency.

PROPOSED DEVELOPMENT

[0005] It is essential to keep the temperature under control within reasonable limits, specially in low frequency loud-speakers that require great power. Thus, the purpose of the present invention patent is to safeguard the integrity of the loud-speaker's internal components and obtain adequate results.

BRIEF DESCRIPTION

[0006] The invention is based on the concept of transforming the air pulses issued by the back of the diaphragm and under the cap, into a continuous air flow, in one sole way and through the coil.

[0007] The fresh air enters by the side of the coil, goes up to the chamber under the cap and is expelled by a central opening in the polar piece. This is due to the positioning of the device in question. (figure 3).

DYNAMICS OF THE DEVICE

[0008] Figure 2 illustrates a magnetic circuit that causes the diaphragm motion, making it later on, to aspirate the air through the ducts (8), as well as through the divergent piece (12). Due to the forced entering of air into the chamber (9), this one remains pressurised for a moment. The coil's retrogression due to the subsequent inverted pulse, causes a great influx of air over the upper angle of the diffuser (7) and consequently, on the convergent piece (10) between both flanks. This way, the behaviour is similar to an inverted vectorial venturi tube. The air passing through the round cleft (11) at high speed, causes the emptying of the chamber (9) and the absence of air makes fresh air to be suctioned again through the ducts (8). Therefore, an oriented and permanent flow is estabilished. In order to avoid turbulence at the outlet of the divergent piece (12), a ring with a curved brim (13) is placed over the polar piece (3), covering the ducts (8). This way, the re-entering of hot air is prevented. Affluent air guiding ring (figure 4).

PRACTICAL APPLICATIONS

[0009] The following must be considered by dimensioning the device:

a) the air volume in the chamber;
b) the diaphragm motion;
c) convergence angle;
d) angle of the divergent piece;
e) opening of the cleft;
f) inlet piece area;
g) divergent outlet area.

[0010] It must be pointed out that the cooling air flow orientation system has no defined geometrical shape; and it may vary in accordance with the type of loud-speaker to which it is applied.

[0011] The system's efficiency is limited to loud-speakers with a working frequency from 10 to 250 Hz. Frequencies lower than 10 Hz do not constitute a flow of air, because the chamber does not achieve to an initial pressurisation. Above 250 Hz, the diaphragm presents no excursion, and therefore no efficiency.

DESCRIPTION OF FIGURES

[0012] The characterising of the now proposed invention patent is carried out by means of drawings representing the air streams static forcing and orientation device for the cooling of loud-speakers, so that it may reproduced by an appropriate technique, materialising the proposed contents and allowing a full characterisation of the functionality of the requested object.

[0013] Beginning with the drawings elaborated, which

express the best way of accomplishing the product now idealised, the descriptive part of the report is based on a detailed and consecutive numbering, whereby the aspects that may be implied by the adopted representation are clarified, so as to clearly determine the protection now requested.

[0014] Such drawings are merely illustrative, and they may present variations, provided the initially requested goal is not missed.

[0015] In this case we have that:

FIGURE 1: shows a schematic drawing of the state of the technique;
FIGURE 2: shows a schematic view and in cross section of the proposed device;
FIGURE 3:_shows a cross section detail related to the polar piece and
FIGURE 4:_shows a detail of the incoming air guiding ring.

STATEMENT OF FACTS

[0016] Static air stream forcing device for the cooling of loud-speakers, containing, comprising a diffusing device (7) centered in relation to the ring magnet (1), geometrically built to form a divergent zone (10), a cleft (11) and a divergent zone (12) , similar to an inverted venturi, with entrance ducts (8) formed between the diffuser (7) and the internal walls of the upper polar (2) , lower polar (3), and ring magnet (1) pieces, capable of transforming the air pulses issued by the diaphragm (4) at its back end and under the cap (5), in a continuous flow, in one way only and through the coil (6).

[0017] Static device for forcing air streams for the cooling of loud-speakers, where an electric pulse moves the diaphragm (4), making the air to be aspirated by the ducts (8) and by the divergent piece (12), generating a small pressurisation in the chamber (9).

[0018] Static device for forcing air streams for the cooling of loud-speakers, where the coil retrogression caused by the subsequent inverted pulse causes a great influx of air over the upper angle of the diffuser (7) and, consequently, the convergence part (10) between both flanks.

[0019] Static device for forcing air streams for the cooling of loud-speakers, where the air passing through the circular cleft (11) at high speed, causes an emptying of the chamber (9), and the absence of air causes fresh air to be suctioned by the ducts (8).

[0020] This way, an oriented and permanent flow is estabilished.

[0021] Static device for forcing air streams for the cooling of loud-speakers, bearing a ring with curved brim (13) covering the ducts (8) and placed over the polar piece 83) preventing turbulence at the outlet of the divergent piece (12) and the re-entering of hot air.

Claims

1. Static device for forcing loud-speaker coling air streams, **characterised by** comprising a diffusing device (7) centered in relation to the ring magnet (1), geometrically built to form a convergent zone (10) with an outlet inside the chamber (9), a cleft (11) below the convergent zone (11) and located in the middle of the diffusing device (7) and a lower divergent piece zone (12), next to the inlet guiding ring (13), such diffuser 87) being featured as an inverted venturi provided with inlet ducts (8) formed between the diffuser (7) and the inner walls of the upper polar (2), lower polar (3) and ring magnet (1) pieces, capable of transforming the air pulses by the diaphragm (4) at its back end and under the cap (5), in a continuous flow, in one way only and through the coil (6).

2. Static device for forcing loud-speaker cooling air streams, as claimed in 1 and featured by an electric pulse moving the diaphragm (4) making the air to be aspirated by the ducts (8) and by the divergent piece (12) causing a little pressurisation in the chamber (9).

3. Static device for forcing loud-speaker cooling air streams,_as claimed in 1 and featured by the coil's retrogression due to the reverse pulse causing a great influx of air over the upper angle of the diffuser (7) and, consequently, the convergent piece (10) between both flanks.

4. Static device for forcing loud-speaker cooling airstreams, as claimed in 1 and featured by the existence of one circular cleft (11), where the air passing at high speed causes the emptying of the chamber (9), this emptied space being supplied by the suctioning of fresh air by the ducts. (8).

5. Static device for forcing loud-speaker cooling air streams as claimed in 1 and featured by a ring with a curved brim (13) covering the ducts (8) and placed over the polar piece (3), preventing turbulences at the outlet of the divergent piece (12) and the re-entering of hot air.

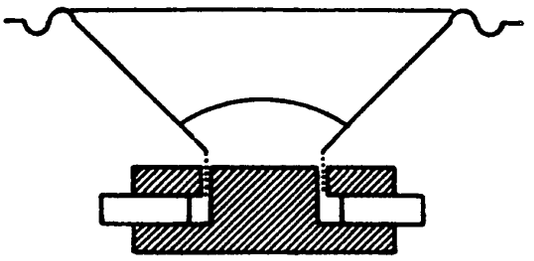


Fig. 1

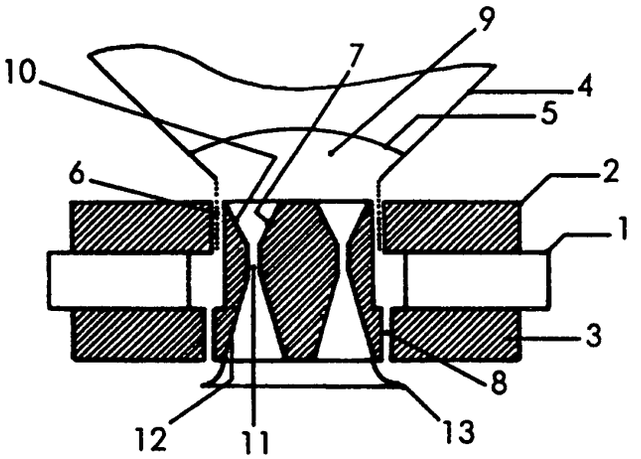


Fig. 2

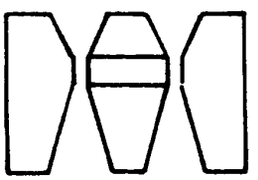
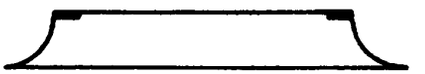


Fig. 3



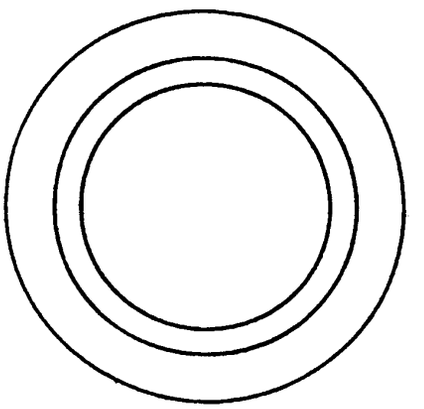


Fig. 4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 42 5772

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 6 549 637 B1 (RISCH JON M) 15 April 2003 (2003-04-15) * column 15, line 10 - line 35 * -----	1	H04R9/02
A	US 5 909 015 A (PLOURDE RICHARD G ET AL) 1 June 1999 (1999-06-01) * the whole document * -----	1	
A	US 5 357 586 A (NORDSCHOW DAVID D ET AL) 18 October 1994 (1994-10-18) * column 9, line 13 - line 68; compounds 4A,4B * -----	1	
A	PONNAPPAN R ET AL: "A NOVEL ELECTRONIC COOLING CONCEPT" AEROSPACE POWER. SAN DIEGO, AUG. 3 - 7, 1992, PROCEEDINGS OF THE INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE (IECEC), NEW YORK, IEEE, US, vol. VOL. 2 CONF. 27, 3 August 1992 (1992-08-03), pages 2411-2416, XP000366092 ISBN: 0-7803-0693-7 * page 2412, left-hand column, paragraph 4 - page 2414, right-hand column, paragraph 1; figures 1,2 * -----	1	TECHNICAL FIELDS SEARCHED (Int.Cl.7) H04R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	26 July 2004	Nieuwenhuis, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 03 42 5772

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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26-07-2004

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6549637 B1	15-04-2003	NONE	
US 5909015 A	01-06-1999	NONE	
US 5357586 A	18-10-1994	AU 2028292 A	30-12-1992
		WO 9221217 A1	26-11-1992

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