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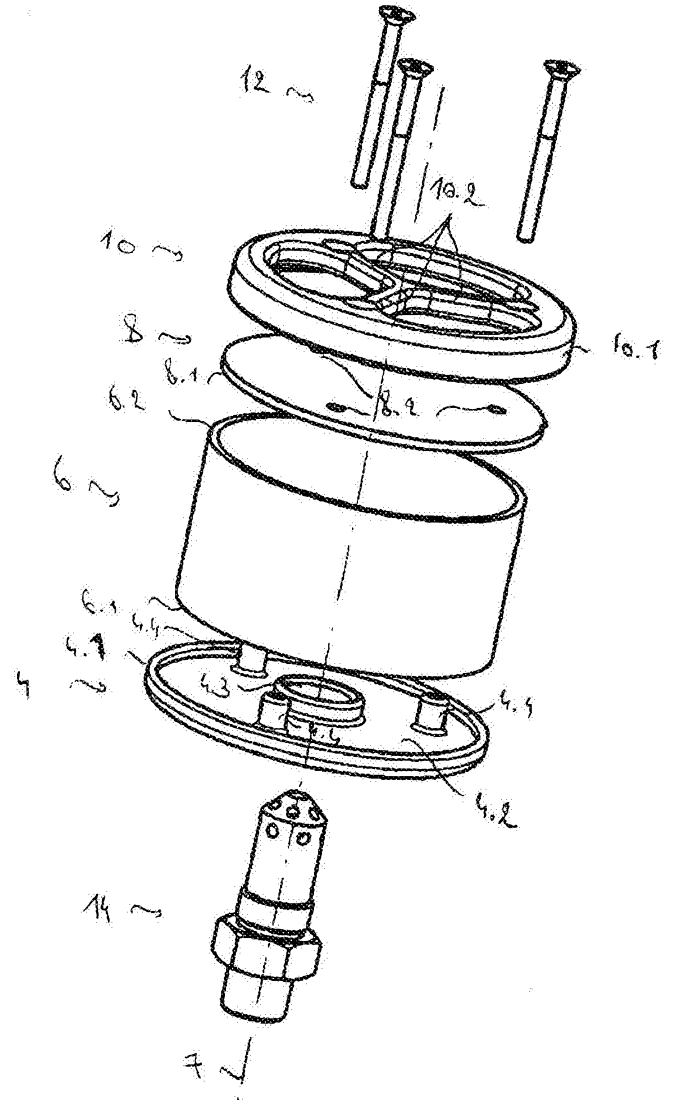
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(54)

SILENCED HEAD FOR FIRE EXTINGUISHING GAS DISCHARGE.

- 57 The invention is directed to a silenced head (2) for a gas discharge, in particular for a fire extinguishing gas discharge, comprising a base (4) with an opening (4.3, 14) forming a gas input; a closed wall (6) made of porous material and extending longitudinally from the base so as to form a distal opening; a front wall (8) made of porous material closing the distal opening of the closed wall (6); a fastening ring (10) arranged against an outer face of the front wall (8) and attached to the base (4) by longitudinal screws (12); wherein the ring (10) comprises a ring portion (10.1) so as to form contact surfaces for the front wall (8).

Fig. 2



Description**SILENCED HEAD FOR FIRE EXTINGUISHING GAS DISCHARGE****Technical field**

[0001] The invention is directed to the field of gas discharge, more particularly to the discharge of fire extinguishing gases. Even more specifically, the invention is directed to gas discharge nozzles and heads thereof.

Background art

[0002] Prior art patent document published EP 1 151 800 A2 discloses a silenced nozzle head for discharging fire extinguishing gases. The nozzle head comprises a body forming a cylindrical cavity housing filter elements made of porous material, and a perforated disk closing the cavity. The filter elements are made of sintered material and are two superimposed thick disks housed in the cavity. The body comprises a cylindrical wall that can be provided with apertures forming lateral or radial discharge passages. The massive construction of the filter element occupying most of the cavity generate a counter-pressure and a pressure drop for the gas being discharged there through.

[0003] Prior art patent document published EP 2 818 207 A discloses also a silenced nozzle head for discharging fire extinguishing gases. The nozzle head comprises a base with an opening forming a gas input, a closed wall made of porous material and extending longitudinally from the base so as to form a distal opening, a front wall made of porous material closing the distal opening of the closed wall, and a fastening ring arranged against an outer face of the front wall and attached to the base by longitudinal screws. Similarly to the previous reference, the cavity housed a filter element made of porous material causing a counter-pressure and a pressure drop for the gas being discharged there through. The closed wall shows an increased thickness at the location of the screws which extend through the wall. This renders the manufacturing of the wall more complex and expensive.

Summary of inventionTechnical Problem

[0004] The invention has for technical problem to provide a head for a gas discharge, in particular for a fire extinguishing gas discharge, that causes a reduced pressure while reducing the noise generated when discharging the gas.

Technical solution

[0005] The invention is directed to a silenced head for a gas discharge, in particular for a fire extinguishing gas discharge, comprising: a base with an opening forming a gas input; a closed wall made of porous material and extending longitudinally from the base so as to form a distal opening; a front wall made of porous material closing the distal opening of the closed wall; a fastening ring arranged against an outer face of the front wall and attached to the base by longitudinal screws; wherein the ring comprises a ring portion and webs extending radially from the ring portion so as to form contact surfaces for the front wall.

[0006] According to a preferred embodiment, the webs extend radially to the centre of the ring portion.

[0007] According to a preferred embodiment, the webs are three or more.

[0008] According to a preferred embodiment, the webs form with the ring portion apertures with a total cross-sectional area that is larger than 50%, preferably larger than 60%, of the area of the outer face of the front wall.

[0009] According to a preferred embodiment, the webs are integrally formed with the ring portion.

[0010] According to a preferred embodiment, the webs and apertures are formed by machining.

[0011] According to a preferred embodiment, the ring has an outer diameter and the webs have a minimum width that is larger than 5% and/or less than 10% of said outer diameter.

[0012] According to a preferred embodiment, the closed wall shows an inner side delimiting a cavity of the silenced head, the screws being located in the cavity.

[0013] According to a preferred embodiment, the screws are located radially distant from the closed wall.

- [0014] According to a preferred embodiment, the closed wall is cylindrical with a constant wall thickness.
- [0015] According to a preferred embodiment, the base is a circular plate with an outer edge forming a shoulder housing the closed wall.
- [0016] According to a preferred embodiment, the base comprises threaded nuts formed in or attached to the circular plate at locations radially between the opening and the shoulder.
- [0017] According to a preferred embodiment, the ring portion of the ring has an outer edge forming a shoulder housing the front wall and the closed wall.
- [0018] According to a preferred embodiment, the screws are located on the ring at a junction between the ring portion and the webs.
- [0019] According to a preferred embodiment, the opening of the base is configured for receiving a gas discharge nozzle.
- [0020] According to a preferred embodiment, the silenced head further comprises the gas discharge nozzle, said nozzle comprising a first series of discharge holes oriented radially and a second series of discharge holes oriented obliquely with regard to a radial plane and the longitudinal axis.
- [0021] According to a preferred embodiment, the porous material of the closed wall and/or of the front wall is a metallic sintered material.

Advantages of the invention

- [0022] The invention is particularly interesting in that it provides a gas discharge nozzle assembly that generates a limited counter-pressure and pressure drop while remaining silent, essentially by maximizing the surface of porous material and thereby limiting the flow speed of the gas.

Brief description of the drawings

- [0023] Figure 1 is a perspective view of a silenced head according to the invention.
- [0024] Figure 2 is an exploded view of the silenced head of figure 1.
- [0025] Figure 3 is a top view of the silenced head of figures 1 and 2.
- [0026] Figure 4 is a cross-sectional view of the silenced head of figures 1-3 along the longitudinal axis.

Description of an embodiment

- [0027] Figure 1 is a perspective view of a silenced head for a gas discharge, in particular for a fire extinguishing gas discharge, according to the invention.

- [0028] The silenced head 2 comprises a base 4 with a generally circular plate (not visible in figure 1), a gas inlet at the centre of the circular plate (at the bottom in figure 1), and an outer edge 4.1 forming a shoulder. For instance, a gas discharge nozzle 14 is mounted on the opening at the centre of the base 4. The silenced head 2 comprises also a circular wall 6 extending along the longitudinal axis 7 of the head 2, with a proximate edge 6.1 housed in the shouldered edge 4.1 of the base 4. The circular wall is preferably circular so as to form a cylinder. It is made of porous material, e.g. sintered metal, in order to act as a filter for diffusing the gas while reducing the amount of noise generated by the gas discharge.
- [0029] The silenced head 2 comprises also a front wall 8 arranged in contact with the proximal edge 6.2 of the closed wall 6, in order to close the opening formed by said wall. The front wall 8, similarly to the closed wall 6, is made of porous material, e.g. sintered metal, in order to act as a filter for diffusing the gas while reducing the amount of noise generated by the gas discharge.
- [0030] The silenced head 2 comprises also a ring 10 arranged on an outer face of the front wall 8. More specifically, the ring 10 comprises a ring portion 10.1 that can form a shoulder for receiving the front wall 8 and the distal edge 6.2 of the closed wall 6. The ring 10 comprises also webs 10.2 that extend in a radial plane, inwardly, from the ring portion 10.1. These webs 10.2 form support and contact surfaces for the front wall 8.
- [0031] Eventually, the silenced head 2 comprises also screw 12 that extend essentially longitudinally through the ring 10 and the cavity formed by the closed wall until the base 4.
- [0032] Figure 2 is an exploded view of the silenced head 2 of figure 1. The base 4 and the nozzle 14 are better visible than in figure 1.
- [0033] We can observe the circular plate 4.2 of the base 4, with a central opening 4.3 delimited by a collar which can form an inner thread for engaging with a corresponding thread on the nozzle 14. Nuts with female threads 4.4 can be formed on, or attached to the circular plate 4.2, for engaging with the screws 12.
- [0034] We can also observe that the front wall 8 comprises an outer edge 8.1 contacting the distal edge 6.2 of the closed wall 6. The front wall 8 comprises also openings 8.2 through which the screws 14 extend.

- [0035] Figure 3 is a top view of the silenced head 2. We can observe the shape of the ring portion 10.1 and webs 10.2 of the ring 10. Each of the, for instance, three webs 10.2 extends essentially radially inwardly until the centre that corresponds to the longitudinal axis 7. The webs 10.2 and the ring portion 10.1 form then, for instance, three apertures 10.3 with a total cross-section area that is advantageously larger than 50%, preferably 60%, of the front wall 8 (figures 1 and 2) contacting the webs 10.2. The ring 10 is advantageously made of a single piece where the apertures 10.3 can be formed by machining. Other techniques can however also be considered. We can also observe that the hole in the ring 10, through which the screws 12 extend, are located at junctions between the ring portion 10.1 and the webs 10.2.
- [0036] Still with reference to figure 3, the width of the webs 10.2 is advantageously less than 10% of the outer diameter d of the ring and/or more than 5% of said diameter d .
- [0037] Figure 4 is a cross-section view of the silenced head 2 according to the arrows in figure 3. We can observe that the nozzle 14 comprises a first series of discharge holes 14.1 oriented essentially radially at a mid-height of the cavity formed by the base 4 and the walls 6 and 8. It comprises also a second series of discharge holes 14.2 oriented obliquely with regard to the longitudinal axis 7 and also a radial plane. The holes of the second series 14.2 can be oriented with an angle α with the longitudinal axis 7 that is more than 30° and/or less than 60° , more preferably more than 40° and/or less than 50° .
- [0038] The gas being discharge can then be diffused both by the closed wall 6 and by the front wall 8 through the apertures 10.3. This means that the inner surfaces of the cavity able to diffuse the gas is maximized, leading to a reduced counter-pressure and pressure drop, while keeping the gas flow speed reduced and thereby the reducing the noise level.

Revendications

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1. Tête silencieuse (2) pour une décharge de gaz, en particulier pour une décharge de gaz d'extinction d'incendie, comprenant:
 - une base (4) avec une ouverture (4.3, 14) formant une entrée de gaz;
 - une paroi fermée (6) en matériau poreux et s'étendant longitudinalement à partir de la base de manière à former une ouverture distale;
 - une paroi avant (8) en matériau poreux fermant l'ouverture distale de la paroi fermée (6);
 - une bague de fixation (10) disposée contre une face externe de la paroi avant (8) et fixée à la base (4) par des vis longitudinales (12);caractérisée en ce que
la bague (10) comprend une partie annulaire (10.1) et des bras (10.3) s'étendant radialement à partir de la partie annulaire (10.1) de manière à former des surfaces de contact pour la paroi avant (8).
2. Tête silencieuse (2) selon la revendication 1, dans laquelle les bras (10.2) s'étendent radialement jusqu'au centre de la partie annulaire (10.1).
3. Tête silencieuse (2) selon l'une des revendications 1 et 2, dans laquelle les bras (10.2) sont au nombre de trois ou plus.
4. Tête silencieuse (2) selon l'une quelconque des revendications 1 à 3, dans laquelle les bras (10.2) forment avec la partie annulaire (10.1) des ouvertures (10.3) avec une section transversale totale supérieure à 50%, de préférence supérieure à 60% de la surface de la face externe de la paroi avant (8).
5. Tête silencieuse (2) selon l'une quelconque des revendications 1 à 4, dans laquelle les bras (10.2) sont formés d'un seul tenant avec la partie annulaire (10.1).
6. Tête silencieuse (2) selon les revendications 4 et 5, dans laquelle les bras (10.2) et les ouvertures (10.3) sont formées par usinage.
7. Tête silencieuse (2) selon l'une quelconque des revendications 1 à 6, dans laquelle la bague (10) a un diamètre extérieur (d) et les bras (10.2) ont une largeur minimale (w) supérieure à 5% et/ou inférieure à 10% dudit diamètre extérieur (d).

8. Tête silencieuse (2) selon l'une quelconque des revendications 1 à 7, dans laquelle la paroi fermée (6) présente un côté interne délimitant une cavité de la tête silencieuse, les vis (12) étant situées dans la cavité.
9. Tête silencieuse (2) selon l'une quelconque des revendications 1 à 8, dans laquelle les vis (12) sont situées radialement à distance de la paroi fermée (6).
10. Tête silencieuse (2) selon l'une quelconque des revendications 1 à 9, dans laquelle la paroi fermée (6) est cylindrique avec une épaisseur de paroi constante.
11. Tête silencieuse (2) selon l'une quelconque des revendications 1 à 10, dans laquelle la base (4) est une plaque circulaire (4.2) avec un bord externe (4.1) formant un épaulement logeant la paroi fermée (6).
12. Tête silencieuse (2) selon la revendication 11, dans laquelle la base (4) comprend des écrous filetés (4.4) formés dans ou fixés à la plaque circulaire (4.2) à des endroits situés radialement entre l'ouverture (4.3, 14) et l'épaulement (4.1).
13. Tête silencieuse (2) selon l'une quelconque des revendications 1 à 12, dans laquelle la partie annulaire (10.1) de la bague (10) présente un bord extérieur formant un épaulement logeant la paroi avant (8) et la paroi fermée (6).
14. Tête silencieuse (2) selon l'une quelconque des revendications 1 à 13, dans laquelle les vis (12) sont situées sur la bague (10) au niveau de jonctions entre la partie annulaire (10.1) et les bras (10.2).
15. Tête silencieuse (2) selon l'une quelconque des revendications 1 à 14, dans laquelle l'ouverture (4.3) de la base (4) est configurée pour recevoir une buse de décharge de gaz (14).
16. Tête de silencieux (2) selon la revendication 15, comprenant en outre la buse de décharge de gaz (14), ladite buse comprenant une première série de trous de décharge (14.1) orientés radialement et une seconde série de trous de décharge (14.2) orientés obliquement à un plan radial et à l'axe longitudinal (7).
17. Tête silencieuse (2) selon l'une quelconque des revendications 1 à 16, dans laquelle le matériau poreux de la paroi fermée (6) et/ou de la paroi avant (8) est un matériau fritté métallique.

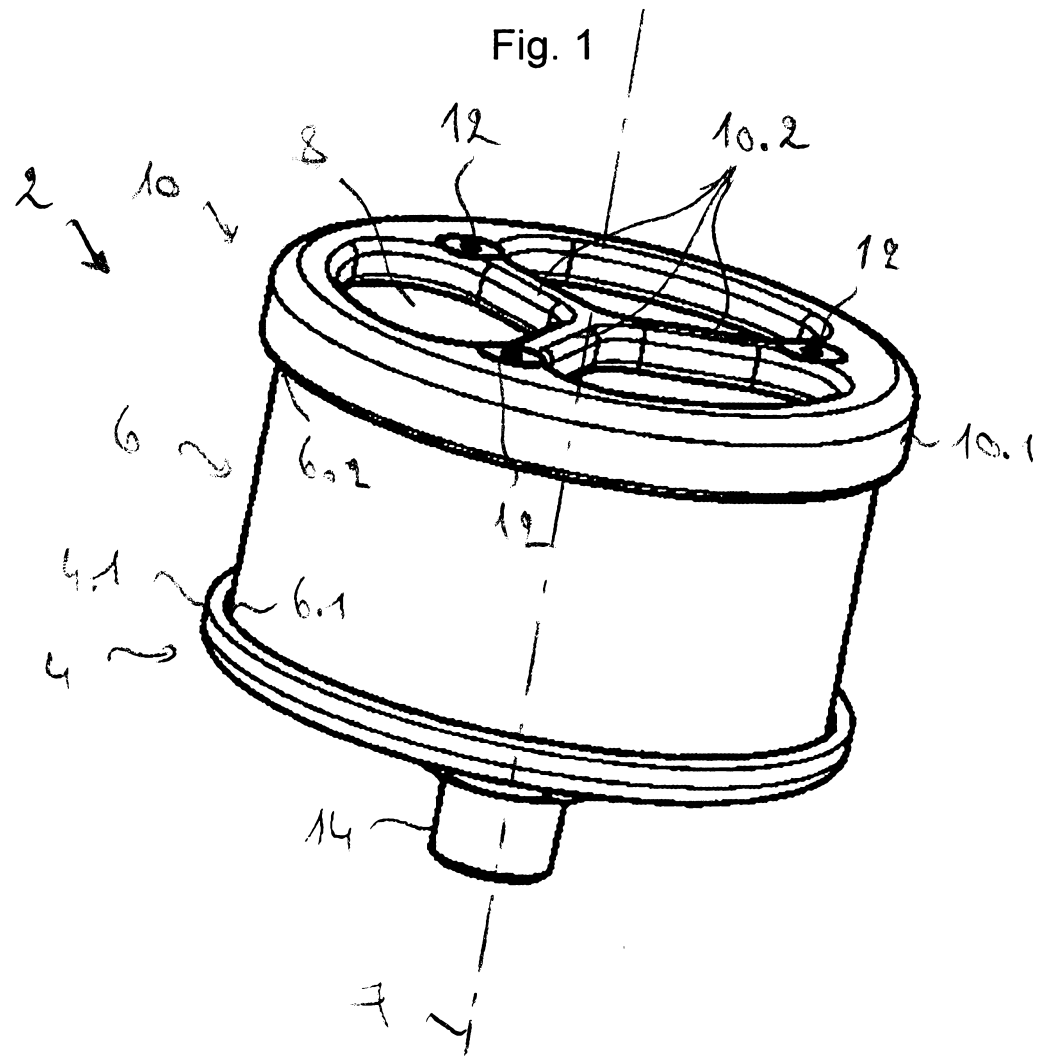
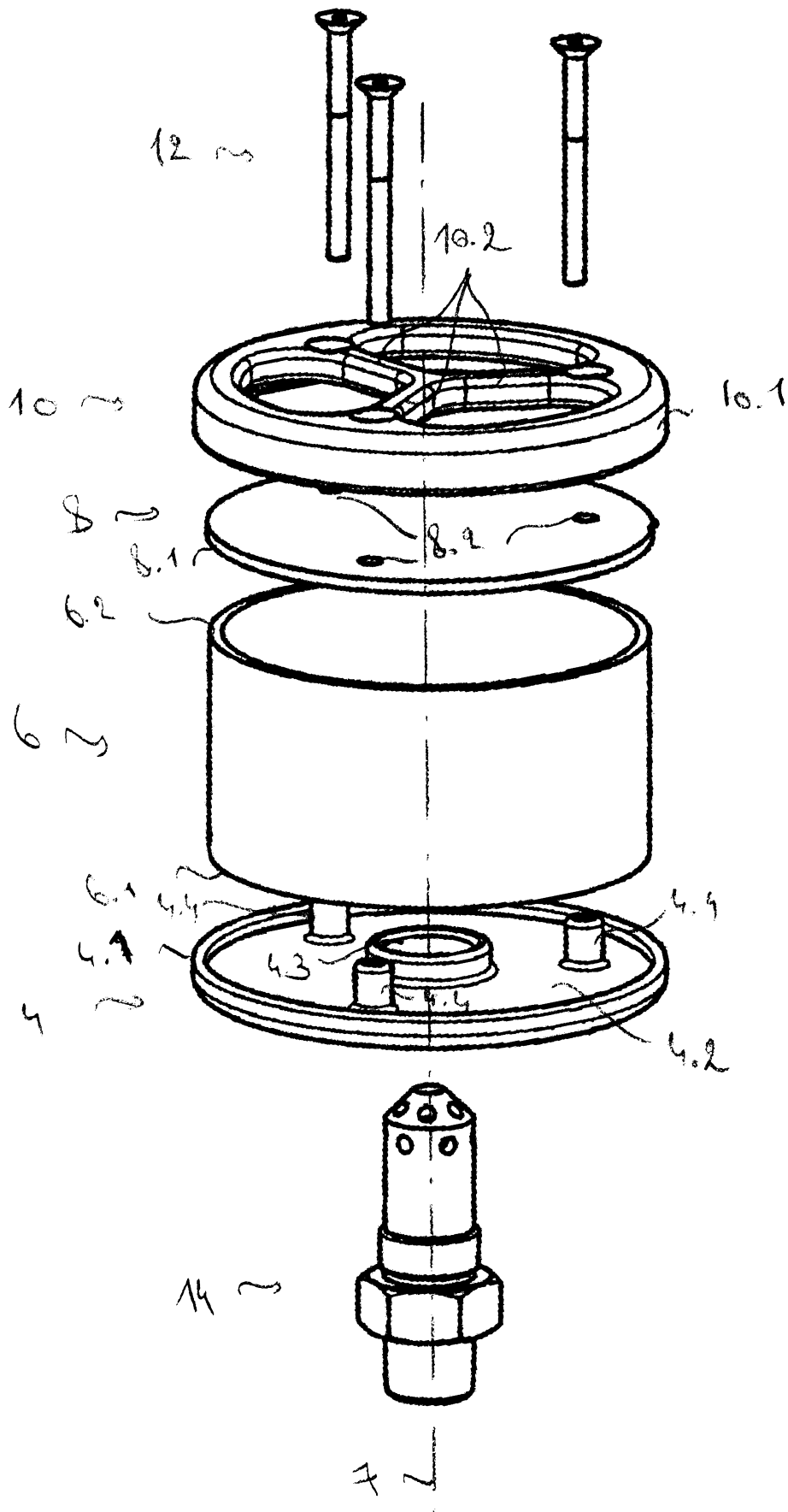


Fig. 2



Abstract

The invention is directed to a silenced head (2) for a gas discharge, in particular for a fire extinguishing gas discharge, comprising a base (4) with an opening (4.3, 14) forming a gas input; a closed wall (6) made of porous material and extending longitudinally from the base so as to form a distal opening; a front wall (8) made of porous material closing the distal opening of the closed wall (6); a fastening ring (10) arranged against an outer face of the front wall (8) and attached to the base (4) by longitudinal screws (12); wherein the ring (10) comprises a ring portion (10.1) and webs (10.3) extending radially from the ring portion (10.1) so as to form contact surfaces for the front wall (8).



SEARCH REPORT
in accordance with Article 35.1 a)
of the Luxembourg law on patents
dated 20 July 1992

LO 1878
LU 100679

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2014/069663 A1 (YABUSHITA MASAHIRO [JP] ET AL) 13 March 2014 (2014-03-13) * paragraph [0064]; figure 6 * -----	1-17	INV. A62C99/00 B05B1/00
A	JP 2017 104560 A (AIR WATER SAFETY SERVICE INC) 15 June 2017 (2017-06-15) * the whole document * -----	1-17	
A	WO 2017/216851 A1 (KOATSU CO LTD [JP]) 21 December 2017 (2017-12-21) * the whole document * -----	1-17	
			TECHNICAL FIELDS SEARCHED (IPC)
			A62C B05B
The present search report has been drawn up for all claims			
Date of completion of the search		Examiner	
25 September 2018		Rente, Tanja	
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

**ANNEX TO THE SEARCH REPORT
ON LUXEMBOURG PATENT APPLICATION NO.**

LO 1878
LU 100679

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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25-09-2018

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EPC FORM P457

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

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		JP 2017209524 A	30-11-2017
		JP 2018023846 A	15-02-2018
WO 2017216851 A1	21-12-2017	NONE	



WRITTEN OPINION

File No. LO1878	Filing date (day/month/year) 21.01.2018	Priority date (day/month/year)	Application No. LU100679
International Patent Classification (IPC) INV. A62C99/00 B05B1/00			
Applicant LUXEMBOURG PATENT COMPANY S.A.			

This report contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the application
- ☐ Box No. VIII Certain observations on the application

Form LU237A (Cover Sheet) (January 2007)	Examiner Rente, Tanja
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WRITTEN OPINION

Application No.

LU100679

Box No. I Basis of the opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ on paper
 - ☐ in electronic form
 - c. time of filing/furnishing:
 - ☐ contained in the application as filed.
 - ☐ filed together with the application in electronic form.
 - ☐ furnished subsequently.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes: Claims	1-17
	No: Claims	
Inventive step	Yes: Claims	1-17
	No: Claims	
Industrial applicability	Yes: Claims	1-17
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

- D1 US 2014/069663 A1 (YABUSHITA MASAHIRO [JP] ET AL) 13 March 2014 (2014-03-13)
- D2 JP 2017 104560 A (AIR WATER SAFETY SERVICE INC) 15 June 2017 (2017-06-15)
- D3 WO 2017/216851 A1 (KOATSU CO LTD [JP]) 21 December 2017 (2017-12-21)

D1 is regarded as being the prior art closest to the subject-matter of claim 1, and discloses a:

silenced head (fig. 6) for a gas discharge, in particular for a fire extinguishing gas discharge, comprising:

- a base (2, 21) with an opening (3) forming a gas input;
- a closed wall (42 (4)) made of porous material ([0064]) and extending longitudinally from the base so as to form a distal opening;
- a front wall (43 (4)) made of porous material ([0064]) closing the distal opening of the closed wall (6);
- a fastening ring (10) arranged against an outer face of the front wall (8) and attached to the base (2, 21) by longitudinal screws (5);

The subject-matter of claim 1 therefore differs from this known silenced head in that the ring comprises a ring portion and webs extending radially from the ring portion so as to form contact surfaces for the front wall and is therefore new.

The problem to be solved by the present invention may be regarded as reducing the pressure drop ([0004]).

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step for the following reasons:

Due to web like structure of the fastening ring, the stability is increased and the central member of the silencer ((41(4) in D1) would not be necessary any longer. Thus the reduction in silencing material results in a reduced pressure drop.

It is not obvious for the person skilled in the art to modify the silenced head of D1 according to the characterized portion of claim 1, since the reduction of silencing material would not only result in a reduced pressure drop but also most probably in less noise reduction.

None of the documents cited in the appended search report incites the skilled person to adapt or modify the treatment plant known from D1 in the hope of solving the above mentioned objective technical problem in expectation of some improvement or advantage to arrive at the silenced head according to claim 1.

Claims 2-17 are dependent on claim 1 and as such also meet the requirements of novelty and inventive step.