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(54) **Rotating nozzle for a high-pressure cleaning device**

Rotordüse für ein Hochdruckreinigungsgerät

Buse rotative pour appareil de nettoyage à haute pression

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(73) Proprietor: **Nilfisk A/S**

2605 Brøndby (DK)

(72) Inventor: **Jensen, Martin With Agerholm**

Vive

9560 Hadsund (DK)

(74) Representative: **Budde Schou A/S**

Hausergade 3

1128 Copenhagen K (DK)

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Description

TECHNICAL FIELD

[0001] The present invention relates generally to nozzles for high-pressure cleaning devices and particularly to such nozzles provided with means making the jet of pressure fluid leaving the nozzle rotate relative to the main body of the nozzle of the cleaning device.

BACKGROUND OF THE INVENTION

[0002] It is known within the art to apply rotating nozzles in connection with high-pressure cleaning devices, as in documents US 2003 209611, EP 0931594, or EP0879 644.

[0003] Thus EP 0 879 644 B1 describes a rotating nozzle section of a cleaning device comprising a cylindrical nozzle house chamber in which there is provided a nozzle member, the exit end of which is in engagement with a seat in such a manner that the nozzle member can undergo pivotal and rotational movement within the cylindrical nozzle house chamber under the influence of high-pressure fluid circulating in the chamber. The nozzle member comprises a frusto-conical portion, the outer surface of which rests against the inner wall of a corresponding portion of the cylindrical nozzle house chamber, when the nozzle member is rotating. The fluid inlet to the nozzle house chamber is through at least one tangential conduit, the direction of which has an axial component, the tangential direction providing a rotational movement of the fluid in the nozzle house chamber. The rotational velocity of the nozzle member about its longitudinal axis is controlled by the frictional force between the surface of the frusto-conical portion of the nozzle member and the corresponding cylindrical portion of the inner wall of the nozzle house chamber, and this document indicates specific materials suitable for these parts and specific coefficients of friction for obtaining a desired rotational velocity.

SUMMARY OF THE INVENTION

[0004] Based on the above background it is an object of the present invention to provide a rotating nozzle of the above kind, which is optimized with regard to the production process, in which the nozzle house is cast or produced by cutting by stock removal.

[0005] It is a further object of the present invention to provide a rotating nozzle of the above kind, in which the forces between the seat in the nozzle house and the corresponding end portion of the nozzle member are reduced.

[0006] These and further objects and advantages are according to the invention attained with a rotating nozzle for a high-pressure cleaning device as defined in claim 1. By providing the nozzle house chamber with a frusto-conical wall section, a possible casting of the nozzle house may advantageously use a core, which is easily

pulled out of the cast member in contrast to pulling out such a core when the chamber is cylindrical. If the nozzle house is manufactured by cutting by stock removal, this conical geometry provides the advantage that the cut-off material is easier removed backwards out of the nozzle house during machining, this being an advantage whether using plastic or metallic materials for the nozzle house.

[0007] The geometry of the nozzle member is less critical whether manufactured by casting or cutting by stock removal.

[0008] A further advantage is provided by having the reaction force between the nozzle member and the nozzle house directed with a component in a direction reducing the force provided by the pressure in the nozzle house towards the seat in which the nozzle member is positioned during operation.

[0009] Advantageous embodiments, the advantages of which will be evident from the following detailed description, are revealed in the subordinate claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] In the following detailed part of the present description, the invention will be explained in more detail with reference to the exemplary embodiment of a rotating nozzle for a high-pressure cleaning device according to the invention shown in the drawings, in which

figure 1 shows a cross-sectional view of the rotating nozzle for a high-pressure cleaning device in accordance with the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0011] In the following, a detailed description of a preferred embodiment of the rotating nozzle for a high-pressure cleaning device according to the invention is given, but it is understood that a person skilled in the art will be able to conceive other embodiments of the basic inventive concept set forth in the summary of the invention without deviating from the scope of the invention as defined by the independent claim.

[0012] Thus, with reference to figure 1, this figure shows a longitudinal cross-sectional view of the rotating nozzle for a high-pressure cleaning device according to a preferred embodiment of the invention generally indicated by reference numeral 1. The rotating nozzle 1 comprises a nozzle house 2 forming a body of revolution about a longitudinal axis 9. At one longitudinal end, the nozzle house 2 is provided with at least one fluid inlet 5, through which cleaning fluid under pressure is lead into the nozzle house chamber 13. The fluid inlet 5 is directed in a plane perpendicular to the longitudinal axis 9 of the nozzle house 2, and in a slightly tangential direction in relation to the nozzle house chamber 13, whereby the fluid in the nozzle house chamber 13 is forced to a rotational movement in the nozzle house chamber 13. Other possible orientations of the fluid inlet are possible, as

long as the resulting rotational movement of the fluid in the nozzle chamber 13 is provided.

[0013] In the nozzle house chamber 13, a hollow nozzle member 3 is pivotable and rotationally guided by engagement between a first end portion 8 of the nozzle member 3 and a corresponding seat 4. This seat 4 is provided at a fluid exit opening 14 of the nozzle house 2 longitudinally opposite the fluid inlet 5.

[0014] The nozzle member 3 comprises a substantially tubular rotational symmetrical body having a longitudinal axis 10. The nozzle member 3 is provided with an internal nozzle chamber at one longitudinal end terminated by a fluid outlet 12 provided in a rounded (spherical) portion for engagement with a similarly shaped inner portion of the seat 4. This arrangement allows the nozzle member 3 to undergo pivotable and rotational movement relative to the seat 4 and hence to the nozzle house 2. The fluid passing through the nozzle member 3 leaves the nozzle house chamber 13 through the fluid exit opening 14. The longitudinal end of the nozzle member 3 opposite the first end portion 8 is provided with rectifier 11 for providing a more laminar flow of the fluid inside the nozzle house chamber 13. The rectifier 11 can be considered a plug having a number of circular cylindrical openings there-through, through which the fluid enters the nozzle house chamber 13.

[0015] The nozzle member 3 is provided with a rolling surface 7, which in the embodiments shown in figure 1 is a cylindrical surface. The nozzle house 2 is provided with a corresponding frusto-conical wall section 6, and the rolling surface 7 and the frusto-conical wall section 6 are provided in such a way that the nozzle member 3 can perform a rolling movement with the rolling surface 7 in contact with the frusto-conical wall section 6 along its generatrix.

[0016] In an alternative embodiment, the rolling surface 7 may also be frusto-conical, narrowing towards first end portion 8 of the nozzle member 3, and the corresponding frusto-conical wall section 6 should thus be provided with an increased conicity in order to provide a contact between the rolling surface 7 and the frusto-conical wall section 6 along its generatrix.

[0017] During operation of the rotating nozzle, cleaning fluid rotates within the nozzle house chamber 13 due to the tangential component of the fluid inlet opening 5 into said nozzle house chamber 13. This fluid rotation causes the end of the nozzle member longitudinally opposite the first end portion 8 to rotate within the nozzle house chamber 13 along the frusto-conical wall section 6, providing line contact between said frusto-conical wall section 6 and the rolling surface 7 of the nozzle member 3. During this rotation of the complete nozzle member 3, the nozzle member is forced to undergo rotation in the opposite rotational direction about its longitudinal axis 10, due to friction at the contact between the frusto-conical wall section 6 and the rolling surface 7. However, also the rotational direction of the fluid in the nozzle house chamber 13 will act on the nozzle member 3, and this action will

try to rotate the nozzle member 3 in an opposite direction of the above-mentioned. By a suitable adjustment of the friction between the frusto-conical wall section 6 and the rolling surface 7, the rotation of the nozzle member 3 about its longitudinal axis 10 can be minimised. This has the advantage that the cleaning fluid will leave the nozzle member in a jet without disintegration thereof due to the rotational velocity of the nozzle member 3 about its longitudinal axis 10.

[0018] It will be appreciated that the reaction force between the nozzle member 3 and the nozzle house, i.e. the forces between the frusto-conical wall section 6 and the rolling surface 7, will have a component directed away from the first end portion 8 of the nozzle member 3 and thus decrease the force with which the nozzle member 3 is pressed against the seat 4 by the pressure in the nozzle house chamber 13.

[0019] A vast number of different materials may be chosen for the nozzle house 2 and the nozzle member 3, e.g. plastic materials, composite materials, ceramics, metals, such as brass, aluminum, stainless steel, etc., rubber and other suitable materials, possibly in combination, for parts of the nozzle house 2 and the nozzle member 3. Suitable materials for the seat 4 in the nozzle house 2 and the end portion 8 of the nozzle member 3 could be ceramic materials or metallic materials in order to avoid problems with these elements due to wear. Other parts of the rotating nozzle system 1 are chosen primarily in order to provide a simple processing and production of the individual parts.

Claims

1. Rotating nozzle (1) for a high-pressure cleaning device comprising a nozzle house (2) provided with a fluid exit opening comprising a seat (4) co-operating with a first end portion (8) of a nozzle member (3) such that the nozzle member (3) can undergo a pivotal and rotational movement relative to a longitudinal axis (9) through the nozzle house, at least one fluid inlet (5) to the nozzle house (2) providing a rotational movement of the fluid in said nozzle house (2),
characterised in that said nozzle house (2) comprising a frusto-conical wall section (6) and said nozzle member (3) comprising a rolling surface (7), said rolling surface (7) of the nozzle member (3) rolling on said frusto-conical wall section (6) and resting with line contact on the latter along its generatrix.
2. Rotating nozzle (1) for a high-pressure cleaning device in accordance with claim 1, **characterized by** said nozzle member (3) rolling surface (7) being a cylindrical surface.
3. Rotating nozzle (1) for a high-pressure cleaning device in accordance with claim 1 or claim 2, **characterized by**

terized by the dynamical friction coefficient between the nozzle member (3) rolling surface (7) and the nozzle house (2) frusto-conical wall section (6) being 0.22 or less.

4. Rotating nozzle (1) for a high-pressure cleaning device in accordance with any of the preceding claims, **characterized by** the fluid inlet (5) being directed in a direction in a plane perpendicular to the longitudinal axis (9) through the nozzle house (2).
5. Rotating nozzle (1) for a high-pressure cleaning device in accordance with any of the preceding claims, **characterized by** said nozzle member (3) comprising a rectifier (11), through which the cleaning fluid enters a nozzle member (3) chamber (13), said rectifier (11) providing a more laminar flow of the fluid in said chamber (13).

Patentansprüche

1. Rotordüse (1) für ein Hochdruckreinigungsgerät umfassend ein Düsengehäuse (2), das mit einer Flüssigkeitsauslassöffnung versehen ist, umfassend einen Sitz (4), der mit einem ersten Endteil (8) eines Düsenelements (3) derart zusammenwirkt, dass das Düsenelement (3) einer Schwenk- und Drehbewegung relativ zu einer Längsachse (9) durch das Düsengehäuse unterzogen werden kann, wenigstens einem Flüssigkeitseinlass (5) zu dem Düsengehäuse (2), der eine Drehbewegung der Flüssigkeit in dem Düsengehäuse (2) bereitstellt, **dadurch gekennzeichnet, dass** das Düsengehäuse (2) einen kegelstumpfförmigen Wandbereich (6) umfasst, und das Düsenelement (3) eine Rollfläche (7) umfasst, wobei die Rollfläche (7) des Düsenelements (3) auf dem kegelstumpfförmigen Wandbereich (6) abrollt und mit Linienkontakt auf letzterem längs der Erzeugenden aufliegt.
2. Rotordüse (1) für ein Hochdruckreinigungsgerät nach Anspruch 1, **dadurch gekennzeichnet, dass** die Rollfläche (7) des Düsenelements (3) eine zylindrische Oberfläche ist.
3. Rotordüse (1) für ein Hochdruckreinigungsgerät nach Anspruch 1 oder Anspruch 2, **dadurch gekennzeichnet, dass** der dynamische Reibungskoeffizient zwischen der Rollfläche (7) des Düsenelements (3) und dem kegelstumpfförmigen Wandbereich (6) des Düsengehäuses (2) 0,22 oder weniger ist.
4. Rotordüse (1) für ein Hochdruckreinigungsgerät nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** der Flüssigkeitseinlass (5) in einer Richtung in einer Ebene senkrecht zu der

Längsachse (9) durch das Düsengehäuse (2) geleitet wird.

5. Rotordüse (1) für ein Hochdruckreinigungsgerät nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** das Düsenelement (3) einen Gleichrichter (11) umfasst, durch welchen die Reinigungsflüssigkeit in eine Kammer (13) des Düsenelements (3) eintritt, wobei der Gleichrichter (11) eine laminare Strömung der Flüssigkeit in der Kammer (13) bereitstellt.

Revendications

1. Buse rotative (1) pour appareil de nettoyage à haute pression comprenant un boîtier de buse (2) fourni avec une ouverture de sortie de fluide comprenant un siège (4) coopérant avec une première partie d'extrémité (8) d'un élément de buse (3) de manière à ce que l'élément de buse (3) peut être subi à un mouvement pivotant et de rotation par rapport à un axe longitudinal (9) à travers le boîtier de buse, où au moins une entrée de fluide (5) au boîtier de buse (2) fournissant un mouvement de rotation du fluide dans ledit boîtier de buse (2), **caractérisée en ce que** le boîtier de buse (2) comprend une section de paroi tronconique (6) et ledit élément de buse (3) comprend une surface de roulement (7), ladite surface de roulement (7) de l'élément de buse (3) roulant sur ladite section de paroi tronconique (6) et restant en contact de ligne sur cette dernière le long de sa génératrice.
2. Buse rotative (1) pour appareil de nettoyage à haute pression selon la revendication 1, **caractérisée en ce que** ladite surface de roulement (7) d'élément de buse (3) est une surface cylindrique.
3. Buse rotative (1) pour appareil de nettoyage à haute pression selon l'une des revendications 1 ou 2, **caractérisée en ce que** le coefficient de friction dynamique entre la surface de roulement (7) d'élément de buse (3) et la section de paroi tronconique (6) du boîtier de buse (2) est de 0,22 ou moins.
4. Buse rotative (1) pour appareil de nettoyage à haute pression selon l'une quelconque des revendications précédentes, **caractérisée en ce que** l'entrée de fluide (5) est dirigée dans une direction dans un plan qui est perpendiculaire à l'axe longitudinal (9) à travers le boîtier de buse (2).
5. Buse rotative (1) pour appareil de nettoyage à haute pression selon l'une quelconque des revendications précédentes, **caractérisée en ce que** ledit élément de buse (3) comprend un rectificateur (11) à travers lequel le liquide de nettoyage entre dans une cham-

bre (13) d'élément de buse, ledit rectificateur (11) fournissant un écoulement plus laminaire du fluide dans ladite chambre (13).

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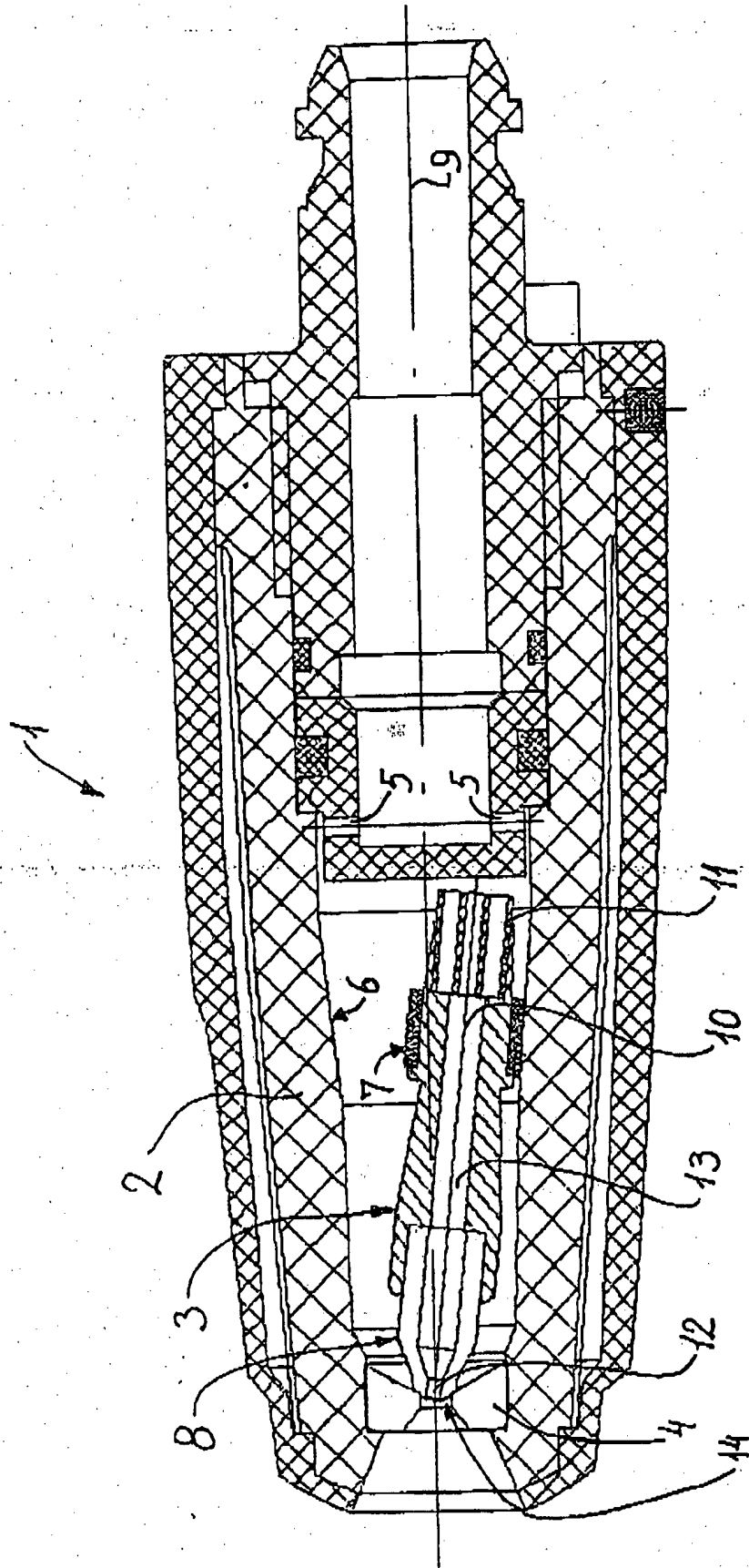


Fig. 1

REFERENCES CITED IN THE DESCRIPTION

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