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### (54) PAINTING GUN PROVIDED WITH AN IMPROVED NOZZLE

(57) A nozzle assembly (9) for painting gun (3), said nozzle assembly (9) comprising a nozzle (10) and a spray head (11),  
the nozzle (10) comprising a hollow tubular body along a longitudinal axis (A) and provided with a coupling portion (10a) configured to allow connection of the nozzle (10) to a body (4) of the painting gun (3) and an end portion (10b) defining an opening (8) fluidically connected to a source of painting fluid of the gun (3),  
the spray head (11) comprising a hollow main body

housed around the nozzle (10) along the axis (A) and comprising a coupling portion (11a) configured to allow connection of the spray head (11) to the body (4) and an end portion (11b) defining with the nozzle a chamber (25) and an opening (21) fluidically connected to the chamber (25),  
the nozzle (10) and the spray head (11) being optimized to mix pressurized air and painting fluid in an optimal manner.

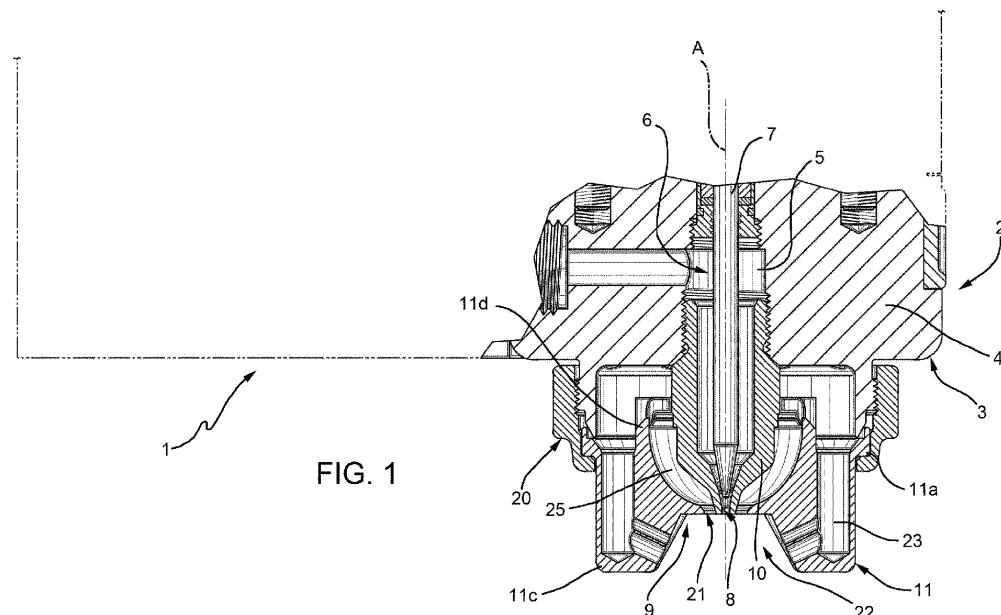


FIG. 1

**Description****CROSS-REFERENCE TO RELATED APPLICATIONS**

**[0001]** This patent application claims priority from Italian patent application no. 102022000015067 filed on July 18, 2022, the entire disclosure of which is incorporated herein by reference.

**TECHNICAL FIELD**

**[0002]** The present invention concerns a painting gun, in particular a spray gun provided with an improved nozzle.

**PRIOR ART**

**[0003]** The known painting systems usually comprise at least one painting gun configured to spray a painting fluid onto an object to be painted.

**[0004]** Said gun, which is a spray gun, therefore comprises an opening for the outflow of said painting fluid, usually pressurized, directed towards the object to be painted.

**[0005]** As known per se, the painting fluid coming from the nozzle is mixed with pressurized air, channelled between the nozzle and a spray head, to allow spraying towards the object to be painted.

**[0006]** However, the known systems have multiple problems due to non-optimal mixing of the painting fluid with the pressurized air. Said non-optimal mixing affects the painting quality.

**[0007]** The need is therefore felt to improve the painting guns of known type so as to improve mixing of the painting fluid with the pressurized air in order to enhance the painting quality.

**[0008]** The object of the present invention is to meet the above needs in an optimized inexpensive manner.

**SUMMARY OF THE INVENTION**

**[0009]** The above-mentioned object is achieved by a nozzle assembly and a painting gun as claimed in the attached claims.

**BRIEF DESCRIPTION OF THE DRAWINGS**

**[0010]** For a better understanding of the present invention, a preferred embodiment is described below, by way of nonlimiting example, and with reference to the attached drawings in which:

- Figure 1 is a schematic view, with parts removed for clarity and partially sectioned, of a painting gun comprising a nozzle assembly according to the invention;
- Figure 2 is a perspective view of a nozzle according to the invention of the gun of figure 1;
- Figure 3 is an overhead view of the nozzle of figure 2;

- Figure 4 is a partially sectioned view of the nozzle assembly according to the invention;
- Figures 5 and 6 are section views illustrating the nozzle according to the invention in a first and a second section view.

**DETAILED DISCLOSURE OF THE INVENTION**

**[0011]** Figure 1 illustrates a portion of a painting system 1 comprising at least one painting assembly 2 each provided with a painting gun 3. The figure illustrated shows a single painting assembly 2, for the sake of simplicity. In particular, the painting gun 3 extends along a longitudinal axis A.

**[0012]** The painting gun 3 defines a casing 4, preferably cylindrically shaped and configured to delimit an inner space 5 adapted to house a flow regulation system 6 for regulating the painting fluid as described below.

**[0013]** As known, the flow regulation system 6 comprises a rod 7 configured to open or close the free section of an opening 8, preferably defined as outlet section of a nozzle assembly 9. The opening 8 is fluidically connected to the inner space 5 and to a painting fluid source, as known per se.

**[0014]** In particular, the rod 7 is connected to adjustment means (not illustrated) configured to adjust the maximum vertical position of travel along the axis A of said rod 7 as described below. The rod 7 further comprises a main body 7' and a tip 7" extending from the main body 7' and configured to selectively cooperate in contact with the opening 8 as described below.

**[0015]** The nozzle assembly 9 essentially comprises a nozzle 10 and a spray head 11 fixed to the casing 4 as better described below.

**[0016]** In particular, with reference to the nozzle 10 (illustrated externally in figures 2 and 3 and internally in figures 5 and 6) it essentially comprises a hollow tubular body along the axis A provided with a coupling portion 10a configured to allow coupling of the nozzle relative to the casing 4 and an end portion 10b extending axially along the axis A on the opposite side of the coupling portion 10a and defining the opening 8.

**[0017]** The coupling portion 10a advantageously comprises a threaded portion adapted to cooperate with a respective threaded portion provided in the space 5.

**[0018]** The nozzle 10 further comprises a plurality of cantilevered portions 10c, in particular four cantilevered portions 10c, extending from the hollow tubular body, advantageously at the connection between the end portion 10b and the coupling portion 10a, relative to the longitudinal extension along the axis A of the nozzle 10.

**[0019]** As better shown in figures 5 and 6, the cantilevered portions 10c comprise a portion 10c' radial to the hollow tubular body and extending perpendicular to the axis A from the outer surface of the latter and an axial portion 10c" extending parallel to the longitudinal axis A starting from the radial ends of the end portions 10b.

**[0020]** Preferably the axial portion 10c" has a substan-

tially triangular shape where one outer side is substantially parallel to the longitudinal axis A and one inner side is inclined relative to the axis A. In particular, said side is inclined so as to increase the radial distance relative to the end portion 10b being closer in the direction of the opening 8. Advantageously the cantilevered portions 10c, in particular the radial portions 10c', are perpendicular to one another and coupled by a radius of approximately 10mm to the hollow tubular body of the nozzle 10 where preferably the centre of said radius belongs to the outer perimeter of the cantilevered portions 10c.

**[0021]** In particular, it therefore defines four lobed openings 13 delimited on the body of the nozzle 10 by circular profiles of the above-mentioned radius.

**[0022]** The nozzle 10 further comprises a gripping portion 10d extending between the end portion 10b and the cantilevered portions 10c and having a substantially polygonal shape, such as hexagonal, adapted to be coupled to a gripping element adapted for the purpose.

**[0023]** With reference to the sections of figures 5 and 6, the end portion 7' of the rod 7 has a substantially conical shape, advantageously with cone angle of 21° relative to the longitudinal axis A.

**[0024]** The end portion 10b has a tapered shape tapering from the coupling portion 10a towards the opening 8 where it has minimum diameter. In particular it has a substantially conical shape, advantageously frustoconical.

**[0025]** In further detail, the end portion 10b defines a cylindrical hollow end portion 15 defining at one end the opening 8 and a conical hollow portion 16 connected to an end in continuity with the hollow end portion 15.

**[0026]** The hollow end portion 15 advantageously has a diameter greater than the smaller diameter of the end portion 7" of the rod 7. The conical hollow portion 16 advantageously has a cone angle of 24°.

**[0027]** The spray head 11 comprises a coupling portion 11a configured to cooperate with the casing 4 to allow coupling of the spray head 11 to the casing 4.

**[0028]** In the embodiment described, the coupling portion 11a is coupled to the casing 4 by means of a ring nut 20 adapted to lock the coupling portion 11a to the casing 4.

**[0029]** The spray head 11 comprises a main body having substantially hollow and annular shape so as to be housed around the nozzle 10 coaxially to the axis A. In particular, it defines an opening 21, advantageously coaxial with the opening 8 from an end portion 11b opposite to the coupling portion along the axis A.

**[0030]** The spray head 11 also defines a protuberance 11c extending longitudinally along the axis A beyond the end portion 11b and extending circumferentially, at least partially, around the axis A so as to delimit a space 22 facing the opening 21.

**[0031]** The protuberance 11c further defines a plurality of channels 23 fluidically connected to a source of pressurized air connected by means of appropriate ducts provided in the casing 4 to the channels 23. The latter are

configured to introduce said pressurized air into the space 22, namely towards the openings 8 and 21.

**[0032]** On the opposite side of the protuberances 11c, the spray head 11 defines cooperation portions 11d configured to be facing the axial portions 10c" of the cantilevered portions 10c of the nozzle 10 and cooperate in contact with them.

**[0033]** In particular, the cooperation portions 11d have a circular, advantageously spherical, shape preferably with radius of 16 mm, relative to those of the inclined wall of the axial portion 11c" of the cantilevered portions 11c. In this way, the cooperation portions 11d and the cantilevered portions 11c are in contact along a contact circumference between the spray head 11 and the nozzle 10.

**[0034]** The main body of the spray head 11 defines with the nozzle 10 a chamber 25 axially delimited along the axis A on one side by the end portion 10b of the nozzle 10 and communicating with the source of pressurized air by means of the lobed openings 13, on the opposite side axially delimited by the end portion 11b and communicating with the outside via the opening 21 and radially delimited by part of the cantilevered portions 10c of the nozzle 10 and the main body of the spray head.

**[0035]** In particular, the main body of the spray head 11 defines a chamber 25 having substantially spherical shape centered on the longitudinal axis A, advantageously with radius of approximately 10mm.

**[0036]** The nozzle 10 extends along the axis A so that the openings 8 of the nozzle 10 and the opening 21 of the spray head are at the same distance along the axis A, namely contained in the same plane.

**[0037]** The operation of the embodiment of the nozzle assembly for painting gun as described above is the following.

**[0038]** In a first operating condition, referring to figures 4 and 5, the pressurized air flows from the lobed openings 13 into the chamber 25 and out of the opening 21. In a parallel manner, the pressurized air flows from the ducts 23 towards the space 22. The painting fluid is sprayed in the same space, passing through the opening 8. In particular, coming from the space 5, it passes (figure 5) between the tip 7" and the conical 16 and cylindrical 15 portions, accelerating and flowing out of the opening 8. Optimal mixing of the painting mixture is obtained in the space 22 due to the high speeds reached by the pressurized air and the painting fluid.

**[0039]** In a second operating condition, referring to figure 6, the tip 7" is inserted in the cylindrical portion 15 and cooperates in close contact with the conical portion 16 given the inclination difference with the tip 7". Consequently, a good fluid seal is obtained, avoiding losses of painting fluid and simultaneously the air flow towards the lobed openings 13 and the ducts 23 is interrupted.

**[0040]** From the above, the advantages of a nozzle assembly for painting gun according to the invention are evident.

**[0041]** Due to the lobed openings 13, the pressurized

air flows in large quantities into the space 25, aiding mixing with the painting fluid.

**[0042]** In particular, creation of the lobed apertures 13 is particularly facilitated and allows a nozzle 10 to be produced in an inexpensive manner.

**[0043]** Furthermore, the cantilevered portions 10c cooperate with the spray head 11 so as to centre it, facilitating assembly of the spray gun 2.

**[0044]** In addition, the spherical shape of the main body of the spray head, substantially spherical, improves channeling of the pressurized air flow towards the opening 21.

**[0045]** Furthermore, due to the different inclination of the tip 7" of the rod 7 relative to the conical portion 16 of the nozzle 10 and the relative dimension of the cylindrical portion 15, it is possible to obtain a hermetic seal of the flow of painting fluid and fine adjustment thereof with low movements of the tip 7".

**[0046]** Lastly, it is clear that modifications and variations that do not depart from the protective scope defined by the claims can be made to the nozzle assembly for painting gun according to the present invention.

**[0047]** Clearly there can be a different number of cantilevered portions or they can have a different relative orientation with respect to the axis A.

**[0048]** Similarly, the geometry described of the parts of the nozzle 10 or of the spray head can vary according to the claims.

**[0049]** The above values are provided merely by way of example.

## Claims

1. Nozzle assembly (9) for painting gun (3), said nozzle assembly (9) comprising a nozzle (10) and a spray head (11), said nozzle (10) comprising a tubular body hollow along a longitudinal axis (A) and provided with a coupling portion (10a) configured to allow connection of said nozzle (10) to a body (4) of said painting gun (3) and an end portion (10b) defining an opening (8) fluidically connected to a painting fluid source of said painting gun (3),

said spray head (11) comprising a hollow main body housed around said nozzle (10) along said axis (A) and comprising an coupling portion (11a) configured to allow connection of said spray head (11) to said body (4) and an end portion (11b) defining with said nozzle a chamber (25) and an opening (21) fluidically connected to said chamber (25),

said nozzle (10) comprising a plurality of cantilevered portions (10c) extending between said coupling portion (10a) and said end portion (10b), said cantilevered portions (10c) being separated by lobed openings (13) fluidically connecting said chamber (25) to a pressurized air

source of said gun (3).

2. Nozzle assembly according to claim 1, wherein said cantilevered portions (10c) cooperating in contact with respective cooperating portions (11d) extending from the hollow main body of said spray head.
3. Nozzle assembly according to claim 1 or 2, wherein said opening (8) of said nozzle (10) is coaxial with said opening (21) of said spray head (11).
4. Nozzle assembly according to any one of claims 1 to 3, wherein said opening (8) of said nozzle (10) is placed at the same position along said axis (A) with respect to said opening (21) of said spray head (11).
5. Nozzle assembly according to any one of the preceding claims, wherein said chamber (25) is spherical in shape.
6. Nozzle assembly according to any one of claims 2 to 5, wherein said cantilever portions (10c) each comprise a radial portion (10c') extending radially with respect to said axis (A) and an axial portion (10c') extending parallel to said axis (A) from one end of said radial portion (10c'), said axial portion (10c') comprising an inclined wall configured to correspond in contact with said cooperation portions (11d) of said spray head.
7. Nozzle assembly according to any one of the preceding claims, wherein said spraying head (11) defines at least one protuberance (11c) extending along said axis (A) from an end portion (11b) defining said opening (21), said at least one protuberance (11c) delimiting a space (22) containing said opening (21), said protuberance (21) defining a plurality of channels (23) fluidically connected to said source of pressurized air and fluidically connected to said space (22).
8. Nozzle assembly according to any one of the preceding claims wherein said coupling portion (10a) of said nozzle (10) comprises a threaded portion configured to cooperate with a respective portion made in said body (4).
9. Nozzle assembly according to any one of the preceding claims wherein said coupling portion (11a) of said spray head (11) is secured to said body (4) by a ferrule/ring nut (20).
10. Nozzle assembly according to any of the preceding claims wherein said end portion (10b) of said nozzle (10) defines a cylindrical hollow portion (15) defining at one end said opening (8) and a conical hollow portion (16) extending from the opposite end of said cylindrical hollow portion (15).

11. Nozzle assembly according to claim 10, wherein the diameter of said cylindrical hollow portion (15) is smaller than the diameter of a tip (7") of a rod (7) of an adjustment system of said gun (3).

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12. Nozzle assembly according to claim 10 or 11, wherein the inclination of said conical hollow portion (16) along said axis (A) is different from the inclination of a tip (7") of a rod (7) of an adjustment system of said gun (3).

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13. Nozzle assembly according to claim 12, wherein said inclination of said conical hollow portion (16) is greater than the inclination of said tip (7").

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14. Nozzle assembly (9) for painting gun (3), said nozzle assembly (9) comprising a nozzle (10) and a spray head (11), said nozzle (10) comprising a tubular body hollow along a longitudinal axis (A) and provided with a coupling portion (10a) configured to allow connection of said nozzle (10) to a body (4) of said painting gun (3) and an end portion (10b) defining an opening (8) fluidically connected to a painting fluid source of said painting gun (3),

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said spray head (11) comprising a hollow main body housed around said nozzle (10) along said axis (A) and comprising an coupling portion (11a) configured to allow connection of said spray head (11) to said body (4) and an end portion (11b) defining with said nozzle a chamber (25) and an opening (21) fluidically connected to said chamber (25),  
 said nozzle (10) comprising a cylindrical hollow portion (15) defining at one end said opening (8) and a conical hollow portion (16) extending from the opposite end of said cylindrical hollow portion (15).

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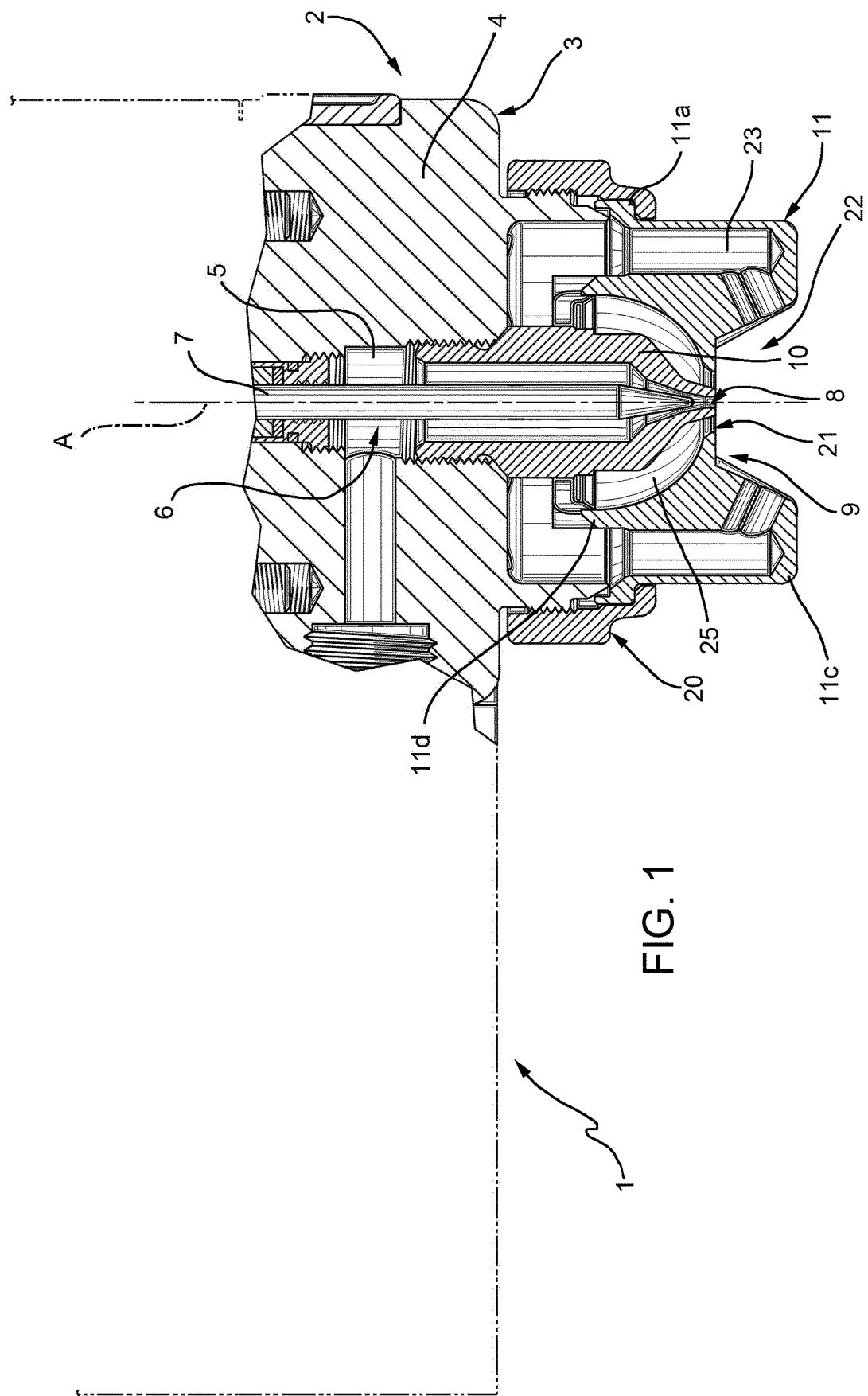
15. A painting gun (3) configured to paint an article, said painting gun (3) defining a body (4) extending along a longitudinal axis (A), said body (4) being configured to house flow regulating means (6) suitable for regulating the passage of painting fluid from a source of painting fluid, said flow regulating means (6) comprising a rod (7) having a tip (7") end along said axis (A), said body (4) further defining paths for pressurized air comprises from a source of pressurized air and comprising a nozzle assembly (9) according to any one of the preceding claims.

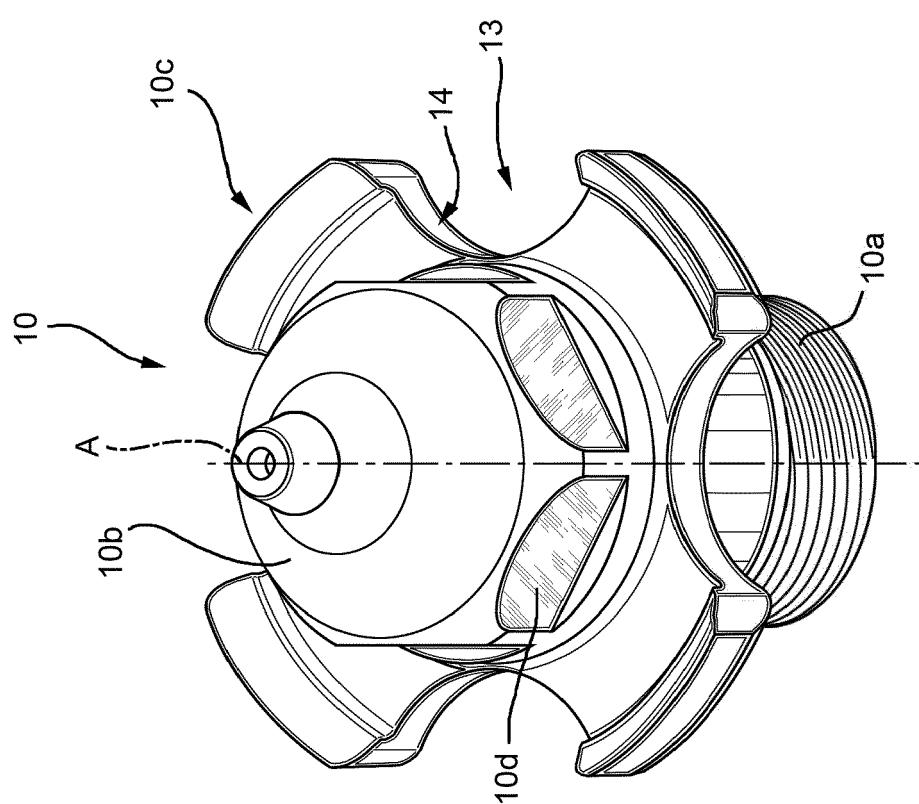
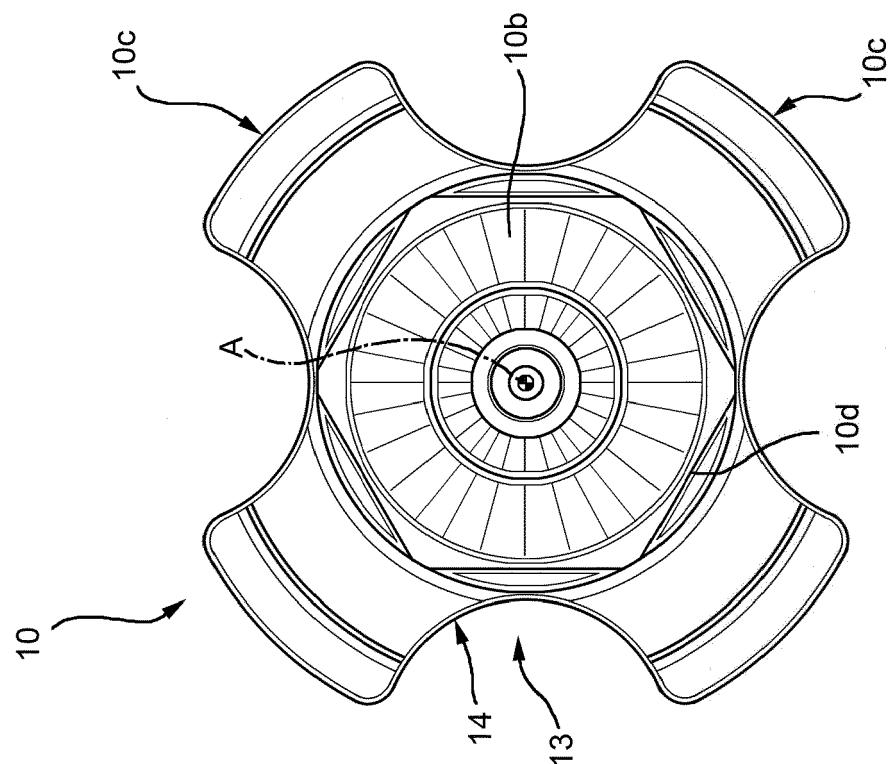
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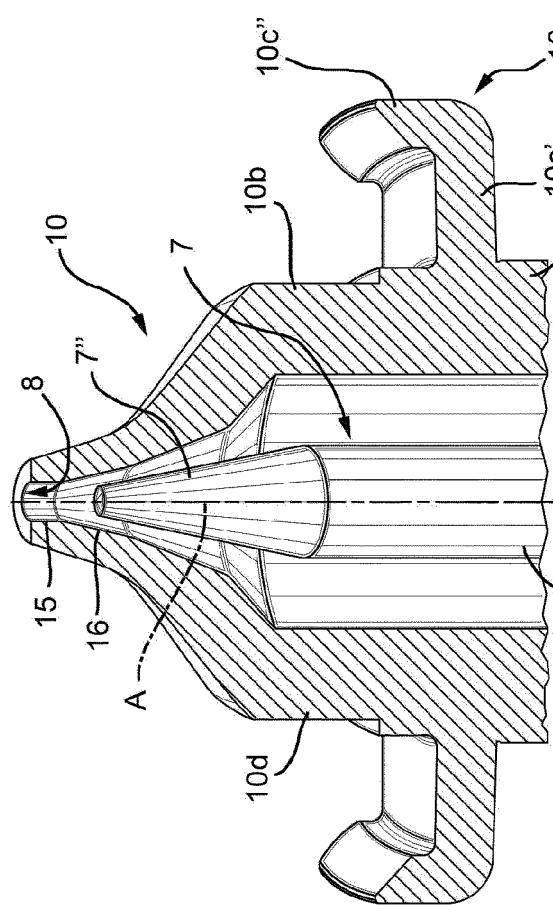
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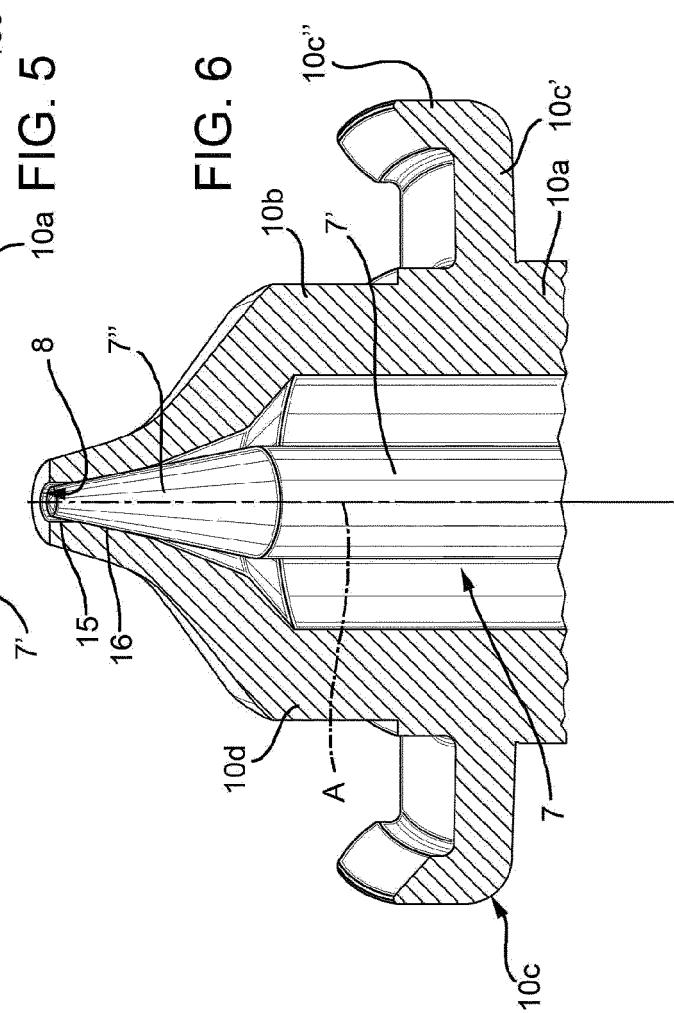
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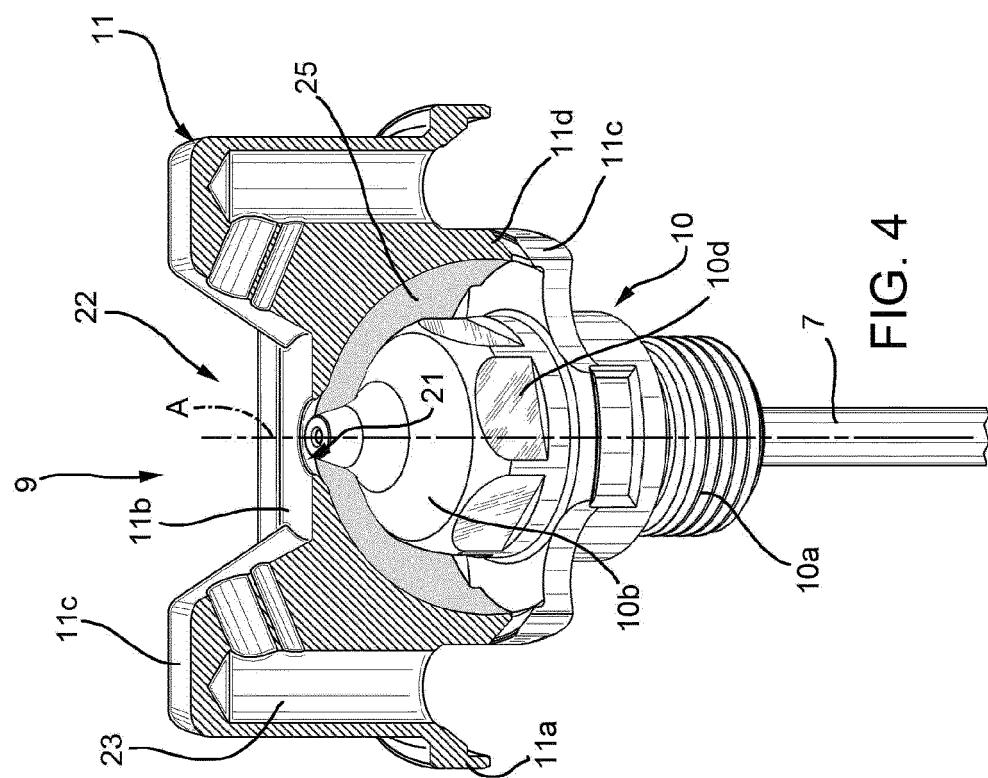




10a FIG. 5



10c FIG. 6



10a FIG. 4



## EUROPEAN SEARCH REPORT

Application Number

EP 23 18 5792

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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20	A US 2020/038892 A1 (VOLK EVA [DE] ET AL) 6 February 2020 (2020-02-06) * abstract; figures 1-18 * -----	1-15	
25	A US 2022/080448 A1 (VOLK EVA [DE] ET AL) 17 March 2022 (2022-03-17) * abstract; figures 1-6 * -----	1-15	
30			TECHNICAL FIELDS SEARCHED (IPC)
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50	1 The present search report has been drawn up for all claims		
55	1 Place of search Munich	Date of completion of the search 26 October 2023	Examiner Frego, Maria Chiara
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**REFERENCES CITED IN THE DESCRIPTION**

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