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(54) **A quick connection/disconnection nozzle and a process for the making of the same**

(57) A spraying tip (1;21) for a nozzle to be inserted in a removable manner into a fixing support (2;22) of said nozzle, comprises first locking means (3;24,24') for co-operating with second locking means (6,8;26,28) integral to said fixing support (2;22), obtaining a reversible locking of said spraying tip (1;21) onto said fixing support (2;22) after insertion and a pre-set rotation along a longitudinal axis (AS). The invention further provides a process for the production of said tip (1;21) and said support (2;22).

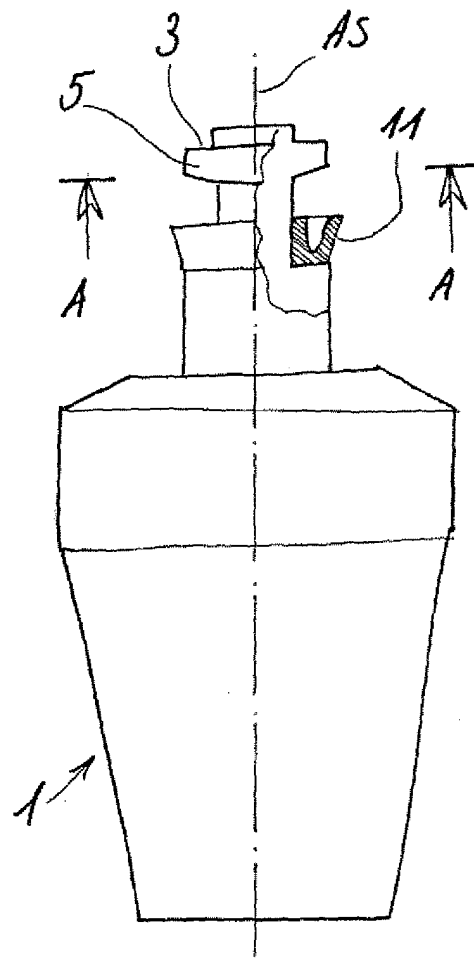


Fig. 1

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DescriptionField of the invention

[0001] The present invention relates to a fast connection/disconnection nozzle and to the corresponding process for the making of the same.

Prior art

[0002] Fast connection/disconnection nozzles are nozzles in which a spraying tip can be quickly inserted and/or taken out from a fixing support with a precise and repeatable angular positioning with respect to the fixing support itself. Such kind of nozzles are used, for example, in plants for the pre-treatment prior to a painting step, or in plants for pickling, degreasing or phosphating of motor-vehicle bodies and parts of bodywork or parts of electrical household appliances made of metal sheets, or else in systems for washing purposes, e.g. for washing vegetables with water on a conveyor belt.

[0003] The above plants and systems frequently comprise even a very large number -some hundreds - of spray nozzles which generate blade-like jets or in any case jets having an asymmetrical shape. Consequently, fast connection/disconnection nozzles are used in order to enable their fast replacement during maintenance operations and the precise re-insertion into their pre-set spatial and angular positions and the clamping thereof, by performing a rotation of a fraction of a turn (for example, a quarter of a turn).

[0004] Examples of fast connection/disconnection nozzles are known, for example, from patents Nos. US 4 438 884 and EP 450 946.

[0005] In the above nozzles, the parts for the coupling that enable a fast connection/disconnection between the spraying tip and the corresponding support and the precise angular positioning thereof, have shapes which in the case they are made of metal, such shapes they are not particularly suited to being made by machining operations involving removal of chips. In this case, such shapes render necessary or economically convenient operations of pre-forming and roughing by hot pressing or casting.

[0006] The main object of the present invention is to provide a fast connection/disconnection nozzle that can be produced with machining operations which are more simplified and economically advantageous when compared to the nozzles of the state of the art.

Summary of the invention

[0007] With the aim of solving the main object, the invention provides a spraying tip and a fixing support according to claim 1.

[0008] Further, the invention provides a process for the production of said tip according to claim 21, and a process for the production of a fixing support according

to claim 22.

[0009] Further advantages that can be achieved with the fast connection/disconnection nozzle of the present invention will be more evident, to the person skilled in the sector, from the following detailed description of two particular non-limiting example of embodiment, with reference to the attached figures.

List of figures

[0010]

Figure 1 is a partially sectioned elevation view of a first embodiment of a spraying tip for a fast connection/disconnection nozzle, according to the present invention;

Figure 1A is a partial view of a first detailed part of the spraying tip of view of Figure 1;

Figure 2 is a plant schematic view of a second detailed part of the spraying tip viewed from cross section A-A of Figure 1;

Figure 3 is a partially sectioned schematic elevation view of a fixing support for the spraying tip of Figure 1;

Figure 4 is a partial cross section view of the fixing support of Figure 3 taken from cross sectional plane D-D of Figure 3;

Figure 5 is a partial longitudinal section of the fixing support of Figure 3 when viewed from plane E-E;

Figure 6 is a schematic illustration of an enlarged detail of the cross section, according to a plane passing through the axis of insertion AS, of a fixing support according to a second embodiment of a nozzle according to the present invention;

Figure 7 is a schematic view in an axial direction of a spraying tip of a fast-connection/disconnection nozzle according to a third embodiment of the present invention;

Figure 8 is a schematic side view of the spraying tip of Figure 7;

Figure 9 is a schematic cross-sectional side view according to a median plane of the spraying tip of Figure 7;

Figure 10 is a schematic cross-sectional side view according to a median plane of a fixing support for the spraying tip of Figure 7;

Figure 11 is a schematic view in an axial direction of the fixing support of Figure 10;

Figure 12 is a schematic illustration of a cross section of the tubular gasket to be inserted into the support of Figure 10, according to a plane of cross section normal to the axis of insertion of the fixing support; and

Figure 13 is a schematic cross-sectional side view according to a median plane of the gasket of Figure 12.

Detailed description

[0011] Now, will be given a detailed description of a first embodiment of the fast connection/disconnection nozzle according to the present invention and with reference to figures 1 to 5.

[0012] According to the embodiment, the nozzle comprises a spraying tip 1 and a fixing support 2, the latter having an outer spherical shape. In this embodiment, the fixing support 2 constitute a component of a ball joint for allowing a full orientation of the tip within the space.

[0013] With reference to Figure 1, the spraying tip 1 is provided with a fixing end, which defines an oval engagement cam 3. The cam 3 has a shape such as to be introduced into the internal cavity 4 within the fixing support 2, and engaged thereto by means of a rotation of $\frac{1}{4}$ of a turn about the axis of insertion AS, in order to clamp the spraying tip 1 onto the support 2 both axially and within a precise angular position with respect to said axis AS.

[0014] According to this embodiment, the axis AS is the axis of symmetry of the spraying tip 1 and the relevant cam 3 thereof, and for the fixing support 2.

[0015] With particular reference to Figure 2 and 4, the cam 3 comprises two first engaging surfaces 5 which are designed to abut a corresponding second engaging surfaces 6 within the fixing support 2, the second surfaces being substantially complementary to said first engaging surfaces 5 and having a curved and chamfered profile which is complementary to the profile of the first engaging surfaces 5.

[0016] According to an advantageous aspect of the present invention, the profile of the first engaging surfaces 5 have a substantially curved and chamfered outer profile that is substantially without any sharp edges, therefore the same can be readily obtained or in any case easily machined, e.g. by means of a numeric-control lathe, saving costs and time.

[0017] As can easily seen from figures 1 and 2, the engagement cam 3 when viewed from top plan has a substantially oval shape with two engagement lobes, which are chamfered and without any sharp edges. Said two lobes of the engagement cam 3 define two engagement projections, which extend radially with respect to the axis AS and enable the spraying tip 1 to be withheld axially with respect to the fixing support 2 when inserted therein.

[0018] More precisely and with particular reference to Figures 3 and 4, the engagement cam 3 is shaped so as to be slid through an oval opening 7 with transverse walls 8 obtained at the internal cavity 4 within said fixing support 2. After insertion of the cam 3, by rotating the spraying tip 1 about the axis of insertion AS, said two engagement lobes of the cam 3 abut on top of the transverse walls 8, so clamping the tip 1 thereto and avoiding a sliding-off of the tip 1 from the fixing support 2.

[0019] According to this embodiment and with particular reference to figure 2, in order to guide the spraying

tip 1 in a precise rotation and position always within and with respect to the fixing support 2, the bottom surfaces of the lobes of the engaging cam 3 have each a sloped surface 9 so that they show a thickness that decreases from point P1 to point P2.

[0020] On the other hand, referring to figures 4 and 5, the transverse walls 8 each have an area 10 with a thickness that increases in the direction of disengagement of the cam. Further, underlying the transverse wall 8 there is provided an inclined surface 12 which when engaged with the cam 3 tends to rotate the latter with a counterclockwise rotation (as viewed in Figure 4) and abut the latter onto said second engaging surface 6.

[0021] In this manner, when the engagement cam 3 is inserted within the support 2 and rotated in a counterclockwise direction as viewed in Figure 4, the lobes pass from a first area 10, where there is a greater axial interference with the transverse wall 8, to a second area with a smaller axial interference and corresponding to abut the second engaging surfaces 6, thus being the tip 1 quickly clamped and withheld in a precise angular position with respect of said support 2.

[0022] As shown in figure 6, according to a different embodiment of the transverse wall 8 onto the fixing support 2, the lead-in surface 12 can be replaced by a step shaped as a tooth 13 or a projection in an axial direction so as to provide appropriate blocking means from rotate the cam 3 of the spraying tip 1 when inserted therein.

[0023] Furthermore and with reference to Figure 1, the spraying tip 1 is further provided with an annular gasket 11 or other elastic means having both the sealing function and elastic function for biasing the engagement cam 3 against the two transverse walls 8 within the fixing support 2 and in the direction of the axis AS.

[0024] Now will be given a detailed description of a second embodiment the fast connection/disconnection nozzle according to the present invention with reference to Figures from 7 to 13.

[0025] According to this embodiment, the nozzle comprises a spraying tip 21, a fixing support 22, and a tubular gasket 20. The fixing support 22 has the shape of an externally threaded nipple. When functioning, the tubular gasket 20 is inserted into a top cavity 23 within the fixing support 22. The spraying tip 21 is provided with a first engagement cam 24 and a second engagement cam 24' positioned within a preset distance one from the other.

[0026] With reference to Figures 7 and 8, both cams 24 and 24' have surfaces having a substantially curved and chamfered outer profile without sharp edges, and when viewed in top plan (direction of arrow C in figure 8) they have an oval profile with two lobes.

[0027] According to this embodiment, bottom surfaces 29 and 29' of both cams 24 and 24', respectively may be completely horizontal with respect to the longitudinal direction of said axis AS, e.g. they are not sloped.

[0028] On the other hand, the gasket 20 has internally thereof two second engaging surfaces 26 and two radial

engaging projections 25 which are made of a wall of rubber or elastomeric material. The engaging projection 25 are radially resilient and projects in a direction which is normal to the axis of insertion AS and towards the inside of the gasket.

[0029] With reference to Figures 10 and 11, For functioning the spraying tip 21 is first inserted into the fixing support 22 through the gasket 20, the first engagement cam 24 passing through the oval opening 27 of the support 22. Then, by rotating the spraying tip 21 in a counter-clockwise direction (as viewed in Figure 11), the first cam 24 will underlay the transverse wall 28 of the nipple 22 engaging the same and the axial sliding of the tip 21 from the nipple 22 being prevented, whilst the second cam 24' passes beyond the two retention projections 25 deforming the latter and abut the surfaces 26. In this condition, the tip 21 results in being blocked in a defined angular position with respect to the nipple 22.

[0030] Moreover, the tubular gasket 20 is shaped in such a way as to press the bottom surfaces 29 of the cam 24 against the transverse wall 28 in the axial direction along axis AS.

[0031] According to this embodiment, the tubular gasket 20 can be reversibly inserted into and removed from the fixing support 22. This arrangement has the advantage of enabling a replacement of the same at a very contained costs when needed, e.g. when the gasket shows incrustations or is worn out, given that this type of nozzle is frequently used for spraying liquids that contain particles and other solid impurities, or else viscous liquids.

[0032] Furthermore, the gasket 20 can be advantageously replaced without having to dismantle/reassemble the fixing support 22.

[0033] On the other hand, according to this embodiment, the oval shape of the two cams 24 and 24' allows an easy and convenient production of the same by a numeric control lathe.

[0034] According to the present invention, the nozzles described above may be realised with all of the parts which constitute the same made of the same material, e.g. metal or plastic or similar, or with the spraying tip 1 or 21 made of metal and the fixing support 2 or 22 made of plastic material, or vice versa.

[0035] Furthermore, according to the present invention, there is the main advantage that said nozzles are suitable to be produced with extensive use of machining operation at relatively contained costs, both in the case they are to be made of metal or of plastic material, instead of the nozzles of the state of the art where there is needed forming operations of pressing, or moulding, or forging.

[0036] It will be apparent to the persons skilled in the art that the present invention may undergo numerous modifications and variations, without departing from the scope of protection of the present invention defined by the appended claims.

Claims

1. A spraying tip (1;21) for a nozzle to be inserted in a removable manner into a fixing support (2;22) of said nozzle,
characterised in that it comprises first locking means (3;24,24') for co-operating with second locking means (6,8;26,28) integral to said fixing support (2;22), the arrangement being such that a reversible locking of said spraying tip (1;21) onto said fixing support (2;22) is obtained after insertion and a pre-set rotation along a longitudinal axis (AS) of said spraying tip (1;21) within said fixing support (2;22) by engaging said first locking means (3; 24,24') with said second locking means (6,8; 25,26,27,28).
2. A spraying tip (1;21) according to claim 1, wherein said first locking means comprises at least an engagement cam (3;24,24') having at least a couple of lobes, said couple of lobes defining two engagement projections extending radially with respect to said axis (AS).
3. A spraying tip (1;21) according to claim 2, wherein said a couple of lobes have each a first engaging surface (5;29,29').
4. A spraying tip (1) according to claims 3, wherein each lobe of said couple of lobes has a side or bottom sloped surface (9).
5. A spraying tip (1) according to claim 1, wherein said tip (1) further comprises resilient means (11) for the sealing function and for biasing said engagement cam (3) against said second locking means (6,8) within said fixing support (2) in the direction of said axis (AS).
6. A spraying tip (1) according to claim 5, wherein said elastic means comprises an annular gasket (11) mounted on top of said engagement cam (3) and shaped for co-operating with a top region of said fixing support (2) after insertion of said tip (1) therein.
7. A fixing support (2) according to the preceding claims, further comprising an internal cavity (4) housing said second locking means (6,8).
8. A fixing support (2) according to the preceding claim, wherein said internal cavity (4) has an opening (7) at the centre of said fixing support (2) which has a shape that is complementary to the shape of said lobes of said cam (3).
9. A fixing support (2) according to claim 7 or 8, wherein said second locking means comprises second

engaging surfaces (6) having a profile which is complementary to the profile of said first engaging surfaces (5) onto said lobes.

10. A fixing support (2) according to claim 7 or 8 or 9, wherein said second locking means further comprises transverse walls (8) obtained at said internal cavity (4) within said fixing support 2, said transverse walls (8) being shaped in order to co-operate with said surfaces side surface (9) onto said lobes.
11. A fixing support (2) according to the preceding claim, wherein said transverse walls (8) have an inclined surface (12).
12. A fixing support (2) according to claim 7 having an outer spherical shape.
13. A spraying tip (21) according to claim 1-3, comprising two engagement cams (24,24') having each a couple of lobes with engaging side surfaces (29,29').
14. A spraying tip (21) according to the preceding claim, wherein said engaging side surfaces (29,29') are substantially horizontal with respect to the longitudinal direction of said axis (AS).
15. A fixing support (22) according to claims 1-3 and 13 or 14, wherein said second locking means comprises a top cavity (23) having a transverse wall (28) with an opening (27) shaped to be complementary to the shape of said at least one cam (24,24').
16. A fixing support (22) according to claim 15, further comprising a resilient means (20) for the sealing function and for resiliently biasing said engagement cam (24,24') against said second locking means (25,26,27,28).
17. A fixing support (22) according to the preceding claim, wherein said resilient means comprises a tubular gasket (20) suitable to be housed in a removable manner into said top cavity (23).
18. A fixing support (22) according to the preceding claim, wherein said second locking means further comprises two second engaging surfaces (26) and two radial engaging projections (25) formed onto said tubular gasket (20), said second engaging surfaces (26) being complementary to said cams (24, 24') and said projections (25) being radially resilient and projecting in a direction which is normal to said axis (AS) and towards the inside of said gasket (20).
19. A fixing support (22) according to the preceding claim, wherein said gasket (20) is made of a resilient material such as rubber or elastomeric material.
20. A spraying nozzle incorporating a spraying tip (1; 21) and a fixing support (2;22) according to the preceding claims.
21. A process for the production of a spraying tip (1;21) according to the preceding claims, **characterised in that** it comprises a step of machining said first locking means (3;24,24') of said spraying tip (1;21).
22. A process for the production of a fixing support (2; 22) for a spraying tip (1;21) according to the preceding claims, **characterised in that** it comprises a step of machining said second locking means (6,7,8;23,27,28) of said support (2;22).

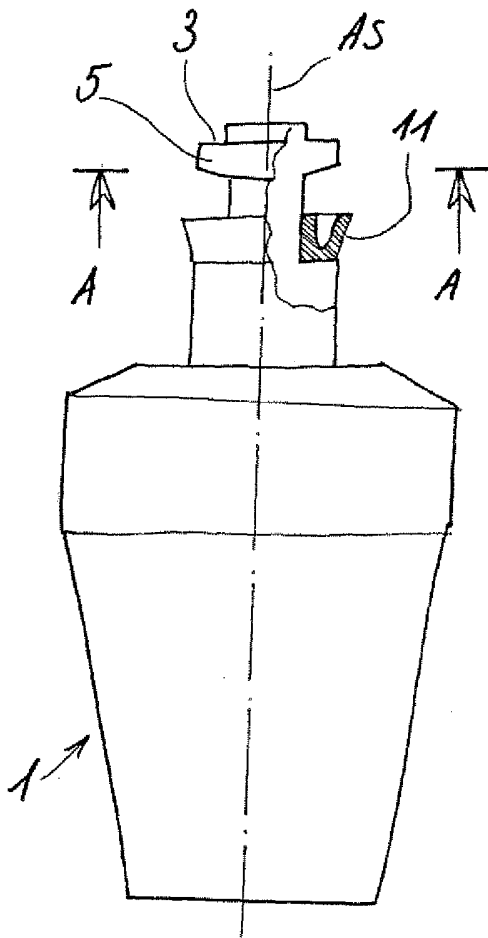


Fig. 1

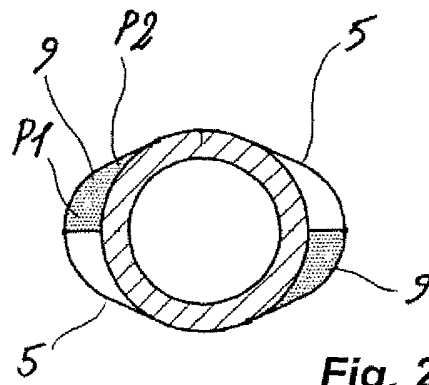


Fig. 2

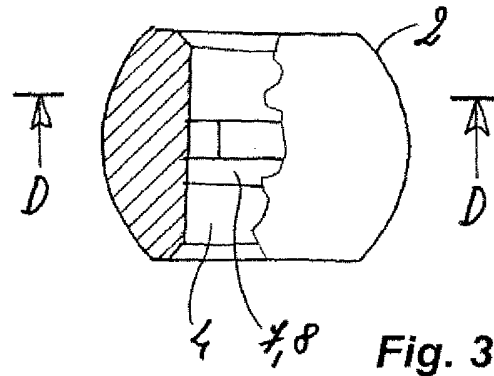


Fig. 3

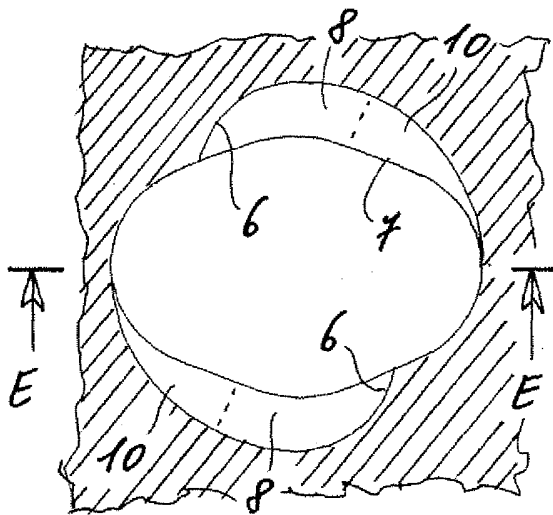


Fig. 4

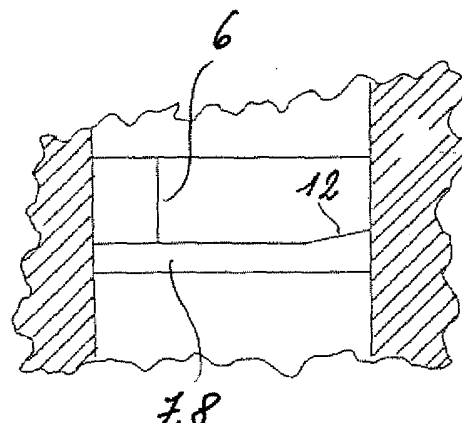


Fig. 5

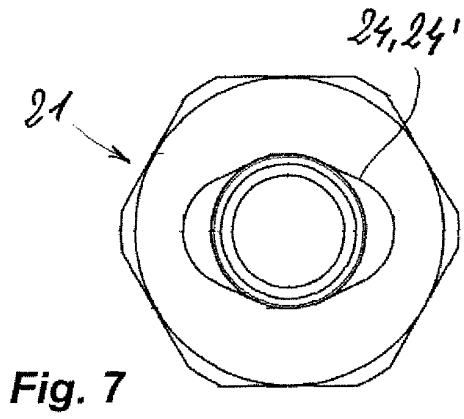


Fig. 7

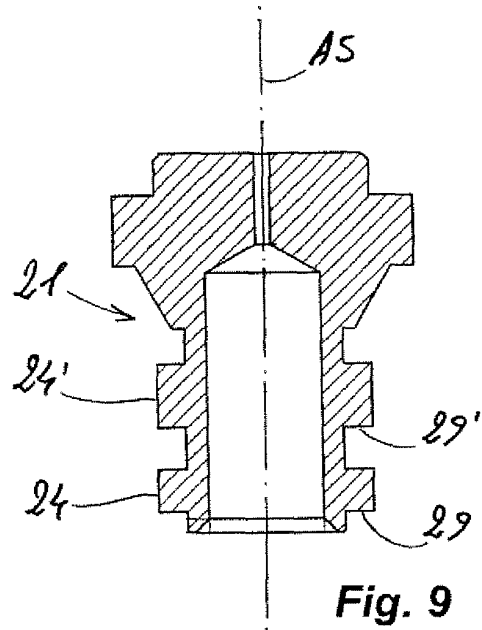


Fig. 9

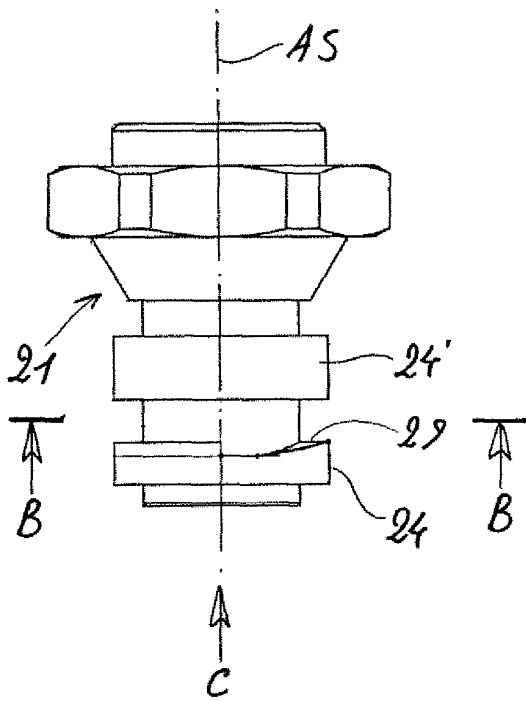


Fig. 8

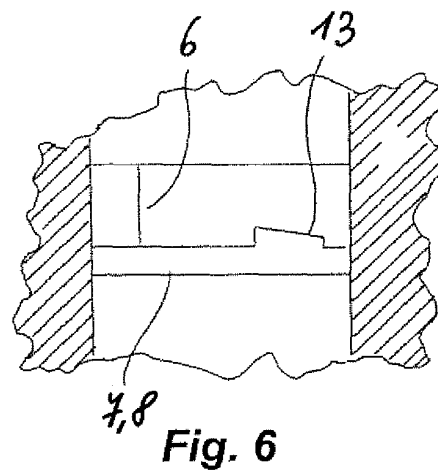


Fig. 6

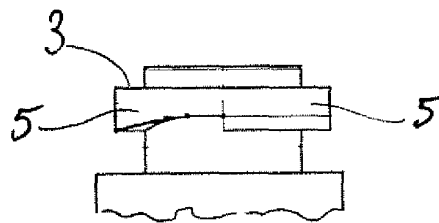


Fig. 1A

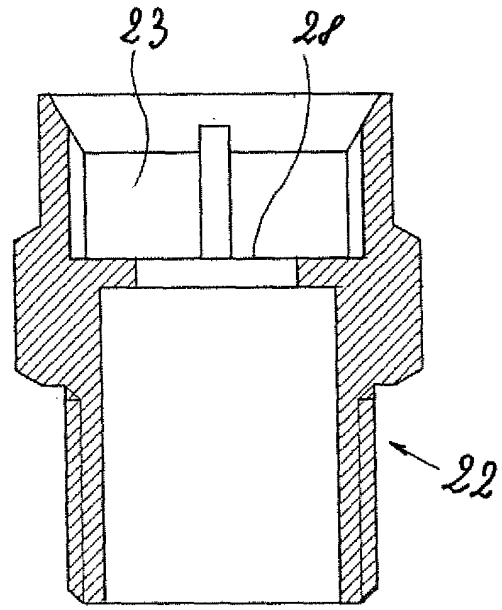


Fig. 10

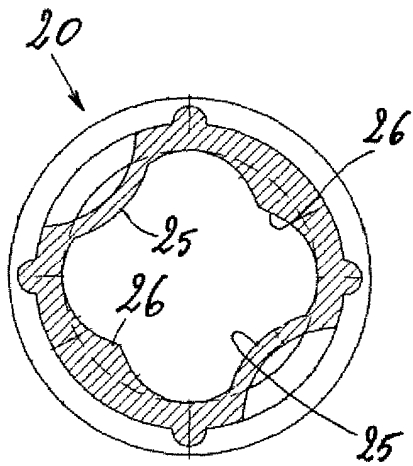


Fig. 12

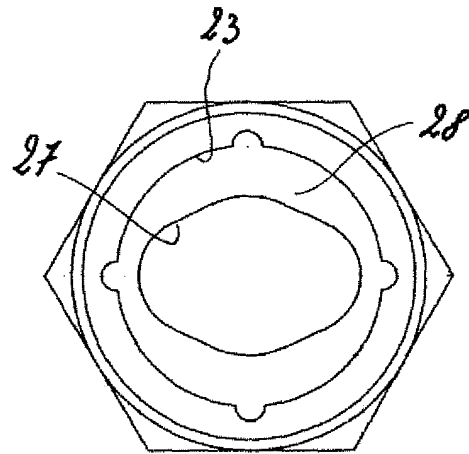


Fig. 11

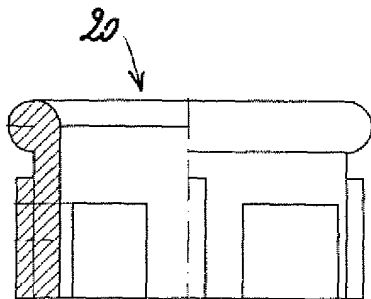


Fig. 13