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(54) **CLASP FOR SPRAY NOZZLE ASSEMBLY**

VERSCHLUSS FÜR EINE SPRITZDÜSENANORDNUNG

AGRAFE POUR ENSEMBLE DE BUSE DE PULVÉRISATION

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Description

AREA OF THE INVENTION

[0001] This invention relates a clasp for a spray nozzle assembly, particularly the type of spray nozzle having a check valve which is specifically adapted to be used with spray drying nozzles, but can also be used in association with other nozzles.

BACKGROUND TO THE INVENTION

[0002] The following references to and descriptions of prior proposals or products are not intended to be, and are not to be construed as, statements or admissions of common general knowledge in the art. In particular, the following prior art discussion does not relate to what is commonly or well known by the person skilled in the art, but assists in the understanding of the inventive step of the present invention of which the identification of pertinent prior art proposals is but one part.

[0003] For ease of description, we shall refer to such a spray nozzle assembly in terms of one associated with spray drying of milk, but it is envisaged that the spray nozzle assembly made according to the invention can be used to spray other fluids, particularly fluids having a tendency to coagulate or for its residue to assume a viscous, solid or gluey consistency having a tendency to gum or jam components parts, making their removal for replacement or servicing more difficult.

[0004] In general spray nozzles which are provided with swirl chambers and orifice discs have these components manufactured from tungsten carbide or the like which is very hard but also brittle and prone to damage when dropped or otherwise roughly treated during assembly and disassembly.

[0005] When ordinary spray nozzles are used for spray drying milk, a certain percentage of the liquid simply fall as drops from the nozzles, without being atomized, and this material can well lead to spoiling of the product.

[0006] To avoid this problem, a unitary check valve was developed for spray drying nozzles, and other nozzles, which caused little restriction in the flow through the nozzle and which, at the same time, did not have any parts, or break-off parts thereof, likely to be passed into the fluid stream.

[0007] Conventional check valves, however, have sealing problems when operated at high pressures and are not necessarily as compact as would be desirable.

[0008] Prior art nozzles generally have stepped annular shoulders that ensure coaxial alignment and concentricity of respective, axially aligned wear parts. However, because the flow material (like proteinous milk products) can set or dry to a viscous or glue-like consistency, it is necessary to build in clearance gaps including radial gaps (lateral gaps to the side of the wear parts) or axial (longitudinal gaps between the wear parts and the nozzle components axially containing them). These gaps be-

tween the wear parts and the nozzle cylinder need to provide sufficient play or movability of the respective parts relative to each other to facilitate removal for replacement, cleaning and repair. Also, normal manufacturing tolerances dictate a gap requirement to prevent component jams axially and radially. Therefore the prior art designs inherently lack accurate concentricity which has adverse affects on spray nozzle performance, predictability of spray patterns and/or spray line production. Stepped annular shoulders in the internal wall of the nozzle cap mean prior art caps are structurally weak and introduce stress concentrations at the sharp angled corners within these steps.

[0009] DE 10 2006 025301 A1 discloses a jet regulator designed in such a way that is mountable and demountable in a simple and fast manner.

[0010] It is an object of the invention to ameliorate the above problems associated with spray nozzles, and particularly those used in association with check valves, and to provide general improvements in the assembly and construction of spray nozzle components.

OUTLINE OF THE INVENTION

[0011] The invention in one aspect provides one or more housings within a spray nozzle assembly for protecting one or more wear components, such as the swirl chamber and orifice disc from damage.

[0012] In one aspect of the invention, there is provided: a clasp for a spray nozzle assembly, wherein the spray nozzle assembly includes a spray nozzle and a wear part releasably trapped in a protective housing, comprising the protective housing with a housing chamber having a lower base on which the wear part may be seated, an upper opening through which the wear part may axially enter the housing chamber or be removed therefrom, and a chamber wall comprising a substantially rigid, part-cylindrical retaining wall having a first upper radially inwardly extending protrusion and at least one resiliently deflectable wall section having a further upper radially inwardly extending protrusion.

[0013] The first and further protrusions may be adapted to radially and axially releasably retain the wear part in the housing chamber in substantially concentric relationship to the housing chamber. This may, in part, be achieved by providing that the protective housing is axially screwed into the complementarily threaded spray nozzle to achieve concentricity. The extent of axial engagement of the protective housing in the spray nozzle may not affect the registration of the swirl chamber relative to the protective housing so that fluid flow is not affected because the wear part is located against rotation in the housing chamber. Furthermore, the wear part may be adapted to be concentrically located within the housing chamber without long longitudinally aligned surfaces. This may be achieved by providing the housing base with a chamfered inner wall. The chamfered inner wall may cooperate with a bevelled lower circumferential edge of

the wear part to centre the wear part in the housing chamber.

[0014] The radial extent of the first protrusion may be substantially smaller than the radial extent of the further protrusion. The first protrusion extending from a substantially rigid structure is radially smaller to permit the passage of the wear part through the housing opening, so that the deflectable wall section does the deflecting to permit entry or exit of the wear part.

[0015] However, the further protrusion is significantly radially larger as it is mounted to the deflectable wall section and preferably occupies a much smaller arc of the housing wall in a diametrically opposed position relative to the first protrusion.

[0016] The part-cylindrical retaining wall may extend circumferentially to form an arc that extends greater than halfway around the cylindrical chamber or describes an angle of greater than 180 degrees. In comparison, the deflectable wall section may be dimensioned to be circumferentially small in width in that its arc describes an angle less than 30 degrees, and preferably about 20 degrees.

[0017] The protective housing is preferably generally cylindrical. The deflectable wall section is preferably in the form of a post defined by a slot in the housing chamber wall either side of the post. The inwardly extending protrusion may be located at or near the upper or downstream end of the housing wall. The further protrusion is preferably adapted to prevent the wear part from inadvertently axially escaping from the housing chamber.

[0018] The wear part may comprise an orifice disc. The wear part or the spray nozzle assembly may additionally include a swirl chamber. The housing chamber inner wall includes a longitudinally aligned projection that provides an axial key for the swirl chamber. The axial key preferably cooperates with a complementary feature on an outer side wall of the wear part to prevent the wear part from rotating in the housing chamber. The swirl chamber entrance or cavity mouth is then always in registry with an opening in the protective housing so that good flow is ensured.

[0019] The axial key may extend along the deflectable wall as a longitudinally aligned reinforcing rib that resists permanent deformation of the deflectable wall.

[0020] In the housing chamber, the swirl chamber may support the orifice disc that is aligned axially with the housing chamber and the swirl chamber. The orifice disc may be sized to be axially trapped immediately under the first and further protrusions as well as radially trapped by the retaining and deflectable walls. The swirl chamber may be sized slightly radially smaller than the orifice disc to clear the first and further protrusions, so that the orifice disc holds the swirl chamber in the housing chamber.

[0021] The base of the post may be located at the base of the housing or may be intermediate the height of the housing chamber wall. The axial key may extend upstream towards the base of the housing chamber beyond the base of the deflectable wall section.

[0022] An upper peripheral region of the wear part may have a tapered, bevelled, stepped or other wall feature that is adapted to cooperate with the first and further protrusions. The wear part may have a radial step such that the top of the wear part is radially smaller than the outer step portion of the wear part, the radial step engaging with the first and further protrusions.

[0023] The protective housing wall may extend upstream of the base of the housing chamber. The protective housing wall may have a slot that provides access to an intermediate chamber upstream of the housing chamber. The slot may permit the insertion of a wear part removing tool. The slot and the housing opening, registered with the swirl chamber mouth, may provide flow communication between the intermediate chamber and the housing chamber. The slot may be accessible by a cam tool. The cam tool may have a disc cam intermediate a shaft to enable the disc cam to be rotated and to bear against the wear part to overcome a retaining force of the protrusions. This may be achieved by forcing the deflection of the deflectable wall section to allow the wear part to be removed from the protective housing.

[0024] The deflectable wall section may comprise a post defined by a slot in the chamber wall either side of the post. The post may include an inwardly extending protuberance at or near its end which is adapted to prevent the wear part from axially escaping from the chamber.

[0025] The wear part may be made from a hard and abrasion resistant material such as a ceramic, metal or plastic component or a composite thereof. Abrasion resistant plastic materials may be achieved by impregnating polymeric materials with abrasion resistance fibres or particles such as glass, other silicon-based minerals and carbides. Preferably the wear part is made from a metal alloy, metal-mineral composite or metal-carbide, such as iron or tungsten carbide. As such wear parts are hard-wearing but prone to brittleness it is preferred that the housing is manufactured from a durable material such as a metal alloy, including steel, and preferably a corrosion resistant metal, such as stainless steel. However, any appropriate material is included within the scope of the invention.

[0026] In another aspect of the invention, there is provided a spray nozzle assembly including at least one wear part made from a hard and abrasion resistant material and a protective housing made from a strong and resilient material and having a chamber adapted to receive one or more of the wear parts in releasably trapped relationship, the chamber having a wall including an arm or post adjacent at least one slot in the chamber wall, the post including a protuberance extending inwardly towards the center of the housing, the protuberance at or near the end of the arm or post and adapted to prevent the wear part from axially inadvertently escaping from the chamber.

[0027] Hereinafter, reference to the post will include reference to the arm or post. The chamber is preferably

a downstream chamber.

[0028] The housing and the downstream chamber are preferably generally cylindrical, but may include a number of symmetrical or irregular cross sectional shapes, particularly to prevent axial rotation of the wear parts. The downstream chamber is preferably open-ended.

[0029] The housing may be a generally hollow cylinder. The housing may have shoulders for seating the wear parts.

[0030] Preferably, the present housing provides tapered seats for wear parts and the wear parts have complementary annular tapered or bevelled edges. The tapering of the edges and corners enables the wear parts to cooperate with the housing seats to achieve self-alignment and concentricity as the parts are axially compressed into axial alignment on assembly. The wear parts naturally coaxially align with the housing and, as they are axially compressed in the housing they align in fixed concentric and coaxial alignment. This arrangement provides for accurate alignment of orifices, apertures and openings for maximum efficiency and predictability of flow and spray characteristics. Concentricity is achieved by providing tapered surfaces, such as angular, radiused, curved, chamfered or bevelled surfaces, over short axial or longitudinal distances.

[0031] It is noted that prior art arrangements provided large longitudinal sections to locate parts axially. Concentricity in the present invention may be achieved via angular type interfaces over a short distance of, preferably 0.2 - 2.0mm, and still more preferably, 0.4 to 1.0 mm. These concentric features may taper concentrically and act as a guide to centre the wear part. By the use of short angular or bevelled leading edges, rather than the longer longitudinally radial location of the prior art steps, this reduces adhesion and the size of wear surfaces, particularly advantageous at points of concentricity. Such angular and concentric surface features facilitate and determine concentricity of the wear parts. One could provide shorter longitudinally aligned radial walls, but still need gaps to prevent adhesion. Full concentricity may be achieved only once the housing is compressed by an axial load in the cap to achieve full alignment. The tapered surfaces may be identical in angle. Or the tapered surfaces may be different, for example, concentricity may be provided thus:

- Radius to radius
- Radius into taper engagement about a radius
- Parallel taper to taper engagement
- Varying taper angular point engagement

[0032] This provides a multiple step alignment - the clasp first aligns, followed by axial compression via an O-ring concentrically arranged in the top surface of an

orifice disk which forces the lower tapered surfaces into alignment. Concentricity is therefore achieved via an angular type interface over a short distance, rather than the longer longitudinally aligned radial location of the steps, thus reducing adhesion surface at points which determine concentricity of the wear parts.

[0033] Another aspect of the invention is that the nozzle component parts are screw fitted for axial engagement. This provides a particular functional advantage over other wear part installations that are not screw fitted, because in prior versions, a certain amount of longitudinal radial gap is required to enable removal and replacement of wear parts to be facilitated. In the present arrangement, the wear parts enclosed in the housing are compressed into a tightly fitting axial alignment. Prior art arrangements require an arbor press, such as a manually levered mandrel press, to disengage thickly bound parts glued together by sticky, viscous or dried materials. The axial screw engagement of the housing to the nozzle component such as the nozzle cap assists concentricity of the component parts, achieves a tight fitting arrangement for better flow and predictability of spray properties, and provides an in-built arbor press or means to apply high torque to the component parts to break the adhesion caused by the dried material and enable replacement of the parts. The internal wall of the nozzle cap includes an annular guide to keep the housing wall and the post radially inwardly supported against flexing until the housing is partially removed from the nozzle cap. The internal wall of the nozzle cap includes an annular stress relieving radiused recess. The bottom edge of the recess forms a radially inward clasp or grip retention diameter or annular guide to stop the post, arms or claws from releasing grip of the wear parts until the "glue" is broken and the housing has been removed at least partially from the nozzle cap.

[0034] Moreover, the protective housing extends the life of the wear parts considerably. Excessive eccentricity affects a spray nozzles performance. If the geometry is off center, it makes a nozzle less efficient and requires greater pressure of the flow material to deliver adequate flow of the product through the nozzle vortex, including the swirl chamber and the cavities defined by the nozzle.

[0035] Because concentricity of the component parts is achieved, the nozzle barrel components, such as the nozzle cap, may be engineered differently to avoid the sharp angles required in the prior art to achieve concentricity and the nozzle cap structures are not required to achieve alignment of the housing or wear parts. The nozzle head internal structures close to the orifice may be radiused in profile to minimise the concentration of stress areas or points associated with sharp edges by distributing the stress load over a wider surface area of the radiused or curved annular concave structure.

[0036] The wear part may include an orifice disc and/or a swirl chamber. The wear parts may be seated, trapped, fixed or otherwise located in the downstream chamber. The swirl chamber may be adjacent the orifice disc which is preferably aligned axially therewith. The orifice disc

may be sized to be trapped immediately under the retaining edge or protuberance.

[0037] The post is preferably resiliently deflectable to permit the wear part to enter or be removed from the downstream chamber upon application of sufficient force, but be retained against axial displacement at rest. The base of the post may be located intermediate the height of the chamber wall or may extend down to the base.

[0038] A longitudinally aligned key may extend along part or all of the length of the chamber wall. The key preferably cooperates with a complementary feature on the side wall of the wear part to prevent the wear part, particularly the swirl chamber, from rotating about its axis in the downstream chamber. The key advantageously provides structural reinforcement of the post and may extend beyond the post along the inside chamber wall down to or towards the base. However, the key or longitudinally aligned and extending ridge, rib or protuberance, may be an external feature located other than on the post.

[0039] The complementary feature may be a longitudinally aligned groove. The key may be one or more protrusions raised relative to the inner surface of the post towards the axial centre of the downstream chamber and aligned longitudinally and parallel to the chamber axis. The key is preferably a ridge. The ridge may extend the full length of the post and down to a base of the downstream chamber.

[0040] The downstream chamber base may be an annular ledge. The base may comprise circumferentially spaced radially inwardly extending protrusions. The base may comprise any other seat device that prevents axial displacement of the wear part away from the retaining edge or protuberance to below the seat device within the housing. The top surface of the outer surface of the top of the post and the inner chamber wall may be a radius to radius engagement or abutment relationship.

[0041] The chamber wall may include a side opening. The side opening may define one side of the post. However, to protect the post, the post may be defined by a slot either side of the post. The chamber wall may extend further to the opening from a slot adjacent the arm or post. The side opening may register with a mouth of a cavity of the swirl chamber. The side opening may provide flow communication between an intermediate chamber of the housing and the swirl chamber via the cavity of the nozzle encompassing the housing.

[0042] The housing may include a wall having at least one opening, such as a slot, providing access to the intermediate chamber below the downstream chamber. The slot may be accessed by a cam tool. The cam tool may have a disc cam intermediate a shaft to enable the disc cam to be rotated and to bear against the one or more wear parts. The cam may overcome a retaining force of the protuberance by urging the wear part to bear against the retaining edge thereby deflecting the post to allow the at least one wear part to be removed. The slot

preferably provides flow communication between a lower chamber and the intermediate chamber.

[0043] It is further preferred that the orifice disc and the swirl chamber be retained in one or more housings by means of a peened or machined retaining edge about its periphery thus making these parts and respective housing a unitary assembly. The retaining edge preferably extends radially inwardly.

[0044] The invention in a second aspect provides a clasp device used to locate and secure the swirl chamber and orifice disc components within the spray nozzle retainer cap.

[0045] The arrangement is such that the wear parts and housings clip in to the clasp device in which they are retained by means of the arm members. The precise means whereby this is effected is not restricted in the invention. A preferred means, however, is the engagement of the terminal ends of the arms with corresponding lugs on the engaging flats of the wear parts.

[0046] The invention in a third aspect is the provision within a spray nozzle assembly of a first O ring which seats within a lance adapter and is held compressively by the retainer cap when assembled and a second O ring within the retainer cap which compressively seals under the load applied by a clasp used to locate the swirl chamber and orifice disc components.

[0047] The arrangement is such that each O ring is compressed independently of the other.

[0048] Previously such sealing had been effected by means of flat washers or axial gland seals, both of these being less effective at high pressures. This could be partially addressed with support backup rings however are difficult to install on a regular basis and expensive to replace and have limitations at elevated pressures. The use of the O rings as described here addresses these problems and is highly effective in such a static arrangement at much higher pressure levels than previously possible.

[0049] In a further aspect of the invention wear parts in a spray nozzle are provided with durable housings into which they are located.

[0050] It is preferred that these housings be applied to parts such as swirl chambers and orifice discs.

[0051] In a further embodiment of the invention a swirl chamber or orifice plate can be provided which is smaller in diameter than that which would be conventionally used such that, when a housing is applied about their peripheries, the resulting diameter of each is then that of conventional such devices.

[0052] It is therefore preferred that these be able to be retro fitted to existing spray nozzle assemblies.

[0053] In an embodiment of the invention in which a check valve is included the perforated sleeve covering the valve is provided with locating pins positioned at the end of the sleeve most remote from the nozzle in order to minimise the length of the spray nozzle assembly.

[0054] The invention in a fourth aspect provides a threaded end on the retainer cap which engages with an

internal thread in the lance adapter such that no exterior threads are provided on the assembled spray nozzle assembly and as such damage to external threads cannot occur.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

[0055] Possible and preferred features of the present features of the present invention will now be described with particular reference to the accompanying drawings. However, it is to be understood that the features illustrated in and described with reference to the drawings are not to be construed as limiting on the scope of the invention. In the drawings:

FIG. 1 shows an exploded diagram of the components of a prior art spray nozzle assembly;

FIG. 2 shows an assembled section view of the prior art nozzle assembly shown in Fig. 1;

FIG. 3 is a perspective view of a component of the prior art clasp device shown in Fig. 1 with an arm member shown from additional partial side and top plan perspectives;

FIG. 4a is an exploded perspective view of part of the prior art assembly shown in Fig. 1 with an orifice disc made according to an aspect of the present invention shown from top plan and side perspectives;

FIG. 4b is a top plan view of an orifice disc shown in Fig. 4a in a prior art armour housing;

FIG. 5a is a side view of a cylindrical housing according to a preferred embodiment of the invention;

FIG. 5b is another side view of the cylindrical housing shown in Fig. 5a rotated about 90 degrees;

FIG. 6a is a top plan view of a swirl chamber according to the preferred embodiment;

FIG. 6b is a side view of the swirl chamber shown in Fig. 6a;

FIG. 6c is a top plan view of an orifice disc according to the preferred embodiment;

FIG. 6d is a side view of the orifice disc shown in Fig. 6c;

FIG. 7 is an exploded view of a spray nozzle assembly according to the preferred embodiment;

FIG. 8a is a front elevation of a cam tool according to the preferred embodiment;

FIG. 8b is a side elevation of the cam tool shown in Fig. 8a;

Figures 9a and 9b are section views of a spray nozzle assembly made according to a second embodiment of the invention similar to the preferred embodiment;

Figure 10 is an exploded perspective view of the spray nozzle made according to the second embodiment; and

Figure 11 is a sectional view of a spray nozzle assembly according to a third embodiment of the invention.

DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0056] A prior art example of a spray nozzle 10 is shown in Figs. 1 - 4 including a lance adapter 20 and retainer cap 30 components, with a spring valve 101, a clasp device 40 and swirl chamber 50. The prior art clasp 40 requires that the wear parts 70,150 be inserted into the housing sideways, so that lateral insertion makes axial alignment of the component parts is not automatically achieved by the dimensional and structural constraints of the component parts. The prior art clasp 40 requires that the wear parts 70,150 be housed in individual armour housings 55,75, rather than providing a unitary armour housing that can be fitted with the wear parts 70,150.

[0057] The clasp device 40 has a first end, corresponding to a clasp base 41, seats compressively against an O ring 60 located against an annular shoulder 25 in sealing arrangement within the generally cylindrical lance adapter 20.

[0058] The clasp device 40 comprises a generally cylindrical body 45, extending rearward to the concentric base 41 that is generally concentric therewith and narrower in diameter, having an annular step down to the base 41. An opposing end of the cylinder 45 has a seat 43 for a swirl chamber 50 and orifice disc 70 assembly. The swirl chamber 50 and orifice disc 70 are very similar to the corresponding wear parts 50,70 utilised in the spray nozzle assembly of the present invention described with reference to Figs. 5a - 11.

[0059] The seat 43 comprises a pair of opposed raised co-planar partial discs 46 that define therebetween a broad aperture 42 with parallel straight sides and radiused ends following the contours of the radiused forward end walls of the cylinder body 45. The clasp 40 further includes arm members 44 which each comprise an elongate arm 47 that have a radiused or arced outer surface in cross section following the contour of the cylinder body 45 and an internal planar surface that cooperates with a corresponding pair of opposed flats 51 extending the full length of the housing 55 outer body. The arms 47 of the arm members 44 each terminate in a shallow radially inwardly extending hook 48 that is adapted to clamp or

pass over the upper edge 52 of the opposed flats 51 of the housing 55, thereby preventing rotation of the housing 55, and therefore importantly the swirl chamber 50, with in the cylindrical body 45. Limitation of rotation of the wear parts 50,70 minimises wear and enables the design of a predictable flow path and consistency of flow. Prior art swirl chambers have traditionally being cylindrical and permitted rotation within the cap.

[0060] The swirl chamber 50 characteristically has an entrance 53 defining a converging pathway into the cavity 56 of the swirl chamber 50. A flat wall 54 of the housing 55 immediately below the entrance 53 allows a sufficient gap between it and the upper wall of the cylindrical body 45 to allow good flow communication between the central bore 33 of the cylindrical body 45 and cavity 56 via a gap 32 defined by the cylindrical body 45 and the lower edge of the flat wall 54. The housings 55,75 are loosely fitted within the clasp arms 44 to permit some slack, allow high tolerances and primarily to facilitate the removal of the wear parts after use has gummed them up with the viscous, proteinous, cementitious or gluey flow material.

[0061] The orifice disc 70 compressively abuts an O ring 80 against and with the retainer cap 30. This provides an excellent seal between the orifice disc 70 and the retainer cap 30 because the O-ring 80 is captured in an upwardly facing circular groove 71 concentrically set in the upper face of the orifice disc 70. The compression of the O-ring 80, trapped in a concentric, upwardly facing seal groove, significantly improves seal performance, longevity and wear resistance, and improves the tightness of the fit of the relative components, rather than using a traditional annular seal. In this high-wear application, the compressive seal arrangement is advantageous.

[0062] In Figs 3a, b the profiles of the clasp arms 44 are shown. In Fig. 3a, the clasp arms are shown to have a flat internal wall 44b which cooperates with the pair of flat walls 51 of the housing 55 to prevent rotation of the housing 55 about the longitudinal axis of the clasp device 40.

[0063] During use of such a spray nozzle 10, it is common for the material being sprayed to adhere to the contacting components. Wear parts that are exposed to the high abrasion and pressure of the flowable material are ideally made from costly, extremely hard and abrasion-resistant materials, preferable Tungsten-carbide or the more rudimentary iron-carbon steels. However because of their hardness, such materials are generally brittle, lacking in strength. Therefore, advantageously, the wear parts 50,70 of the present invention are separately formed using extremely hard materials, and then encased or pressed into tightly fitting cases, shrouds or housings 55,75 made of stronger and more workable materials, such as 300 series stainless steel. Moreover, with the device 10, the provision of the clasp 40 permits wear parts 50,70 to be simply removed. The clasp device 40 has a threaded outer surface 41a on its base 41 above a pair of opposed flats 49 which facilitate its removal by

rotation using a suitable spanner, the threads 41a of the clasp base 41. Upon rotation of the clasp 40 relative to the retainer cap 30 damage to the wear parts is avoided that is caused by the conventional pressing out of the wear parts by an arbor press or other such means.

[0064] The swirl chamber 50 is located within the housing 55 made of stainless steel to provide a strong swirl chamber assembly with a strong outer casing but hard internal wear surfaces. Similarly, the orifice disc 70 is surrounded by the stainless steel housing 75 which protects it from any damage that might otherwise result from dropping or handling during assembly and disassembly.

[0065] The swirl chamber and the orifice disc are retained in their housings as unitary devices by the peening or machining of a peripheral edge of each housing over these devices. Of course other means of providing an annular inwardly radially extending flange or lip known to the skilled person can achieve satisfactory trapping or encasing of the wear part item 50,70 in the respective housing casing 55,75.

[0066] These wear items 50,70 are manufactured typically from tungsten carbide which is relatively expensive and brittle. However, they permit the production of narrower more accurate orifice 72 and greater precision in machining and other working of the material. By providing smaller diameter orifice discs 70 and swirl chambers 55 expense is spared because less material is used in their manufacture, as well as the devices 50,70 being protected from damage by their stainless steel housings 55,75. Pressing the wear part items 50,70 into their housings 55,75 by peening or machining has proved efficacious and has overcome problems of relative movement of these components 50,70,55,75. In the prior art, this has been considered problematic in this high pressure, high wear application where components out of alignment adversely affect performance and the duration between forced replacement of consumable products 50,70,55,75. This may be distinguished with the relative looseness of the fit of the consumables 50,70,55,75 in the clasp device 40 which permits some axial movement to facilitate removal and replacement.

[0067] It is also envisaged that these wear items 50,70 be provided *in situ* in their housings 55,75 at the same size as conventional such items which also permits them to be retro fitted to existing spray nozzle assemblies and used as wear part consumables therein.

[0068] With reference to Figs. 4a - 4c, there is shown the orifice disc 70 and housing 75 in greater detail. The orifice disc 70 is, in itself, very similar to that used in the present invention, except that it has slight flattened sides 69. The orifice disc 70 is a substantially circular thin disc shape that is 1 - 2mm in height and about 14 - 20mm in diameter, but noting that these dimensions are merely suggestive and the invention is not limited to orifices having particular dimensions. On the sides of the housing 75 corresponding to the position where the clasp hook 48 overhangs the housing 75, the housing 75 has opposed flat sides with a recessed section 74 having a nar-

row and shallow ledge inclining upwardly towards the orifice 72. The recess 74 provides a resting positions in which the hook 48 is adapted to nest and includes a pair of spaced knobs or small ramps 77, one at each end of the recess 74, that laterally retain the hook, overhang or catch 48 and provides a ramp over which the ends of the hook 48 may ride on insertion or removal, noting that there is some play purposely incorporated in the fit of the component parts 40,44,55,75.

[0069] The orifice 72 is centrally located in the orifice disc 70. Concentrically placed around the periphery of the disc 70 on its upper surface is a circular groove 71 adapted to receive an O-ring 80 as previously described. The groove is sufficiently deep to retain the O-ring 80, but sufficiently shallow to allow the O-ring 80 to sit partially proud of the upper disc 70 surface. The orifice 72 is finely machined or otherwise formed to low tolerance which is made possible by the use of hard and workable alloys. The orifice 72 has a flare mouth or inlet 72a located centrally on the orifice's 70 underside surface to facilitate pressurised flow into and through the orifice 72. Different applications will require different sized apertures for the orifice 72.

[0070] The orifice disc upper surface 78 includes an annular peripheral bevelled or cammed edge 79 over which the upper inner walls of the housing 75 are peened or worked to provide a smooth transitional surface from the housing upper peripheral surface to that of the orifice disc 70 and ensure a good mating relationship. The lower side walls are similarly bevelled or radiused to facilitate peening or working of an inward extending radial flange of the housings 55,75 to extend over the upper and lower peripheries of the orifice disc 70.

[0071] Although the materials described are preferred they are not restricted in the invention.

[0072] In a second aspect of the prior art shown in Fig. 2 which helps to understand the present invention, a check valve is provided within the spray nozzle assembly. In this embodiment the first end 41 of the clasp passes generally over the perforated sleeve 90 covering the valve spring 100. This first end of the clasp in turn seats compressively against an O ring 60 located against a shoulder 25 within the lance adapter 20 to form a seal.

[0073] The lance adapter 20 and end cap 30 engage by means of a screw thread 31 located within one end of the lance adapter and the exterior of one end of the end cap the arrangement being such that when screw connection of these components has been effected no external thread is present which could be damaged by contact.

[0074] Another embodiment of the inventive clasp arrangement is shown in Figures 5a - 6d. A smaller (so-called "mini") spray nozzle arrangement is presented as compared to the "maxi" prior art clasp that is shown in Figures 1 and 3 - 4c.

[0075] In Figs. 5a - 5b there is shown a substantially cylindrical protective shell or casing in the form of a housing 110 having a central bore 112 that is axially continu-

ous through lower, intermediate and upper chambers 114, 116,118. The lower most chamber 114 is the inlet for the clasp arrangement and receives incoming flow material into the nozzle. The lower outer surface of the housing 110 includes a threaded portion 120 that is adapted to engage the internal thread in a nozzle cap 30. Similar to the valve arrangement 101 shown in Fig. 2, the lower chamber 114 receives the perforated sleeve 90 of valve 101 and telescopically the other valve 101 components, including the spring 100.

[0076] The arrangement includes a swirl chamber 150 that may be identical to that shown in Figs. 1 - 2, or may be dimensioned differently to give the chamber 150 different characteristics of atomisation and spray pattern, velocity of spray and density of application, etc. The swirl cavity 156 in this case is very shallow and the broad wall 154 immediately below the mouth 153 is high relative to the broad wall 54 of the housing 55 in Fig. 1.

[0077] However, the swirl chamber 150 further includes a longitudinal groove key 157 machined or otherwise formed the full height of the predominantly cylindrical wall 158 of the swirl chamber 150. The groove key 157 provides a lock on axial rotation of the swirl chamber 150 when housed in the cylindrical housing 110. The orifice disc 70 may be identical to that shown in Fig. 1 or may be varied with respect to the orifice size 72. There is bulk economy in providing swirl chambers 150 and orifice discs 70 of identical outer dimensions so that one size fits all arrangements. The orifice disc 70 is shown in Fig. 6c with the O-ring 80 seated in the circular groove 71.

[0078] The invention enables the same sized swirl chambers 150 and orifice discs 70 to be used in spray nozzles 10 of different sizes and capacities, such as mini and maxi spray nozzles, whilst advantageously protecting wear parts 50,70,150 made from hard and correspondingly brittle materials with housings 55,75,110 made from strong and resilient materials, irrespective of the spray nozzle bore sizes in the cap 30 and lance adapter 20.

[0079] The cylindrical housing 110 is adapted to house both the swirl chambers 150 and orifice discs 70 in axial relationship in the chamber 118 in a snug fit but allowing a small amount of play to facilitate removal and replacement of the consumable wear parts 70,150 when gummed up by dried flowed material, such as proteinous milk.

[0080] The flow path from the lance adaptor 20 through to the central bore 112 occurs through a pair of opposed large slots 132 formed in the cylindrical wall 134 which provide the entrance for the flow material into the intermediate chamber 116.

[0081] Immediately above the intermediate chamber 116 is an annular ledge 136 providing a seat on which the swirl chamber 150 may rest when inserted into the upper chamber 118. The cylindrical wall 134 includes the large generally rectangular opening 135 that is adapted to be in registration with the cavity mouth 153 of the swirl chamber 150.

[0082] Circumferential registration of the swirl chamber 150 is achieved by providing a registration arm or post 137 defined by two spaced longitudinal slots 138 in the wall 134, the post 137 having a key ridge 139 extending down a substantial portion of its length on the post's 137 inside surface.

[0083] The ridge may be two or more longitudinally aligned protrusions, but is preferably a continuous ridge starting immediately underneath the position that the orifice disc 70 takes up above the swirl chamber 150 in the upper chamber 118 to ensure that a standard circular disc 70 may be used, and depending down to the ledge 136. The cylindrical housing 110 includes an open top 140 through which the swirl chamber 150 is first axially inserted by an operator, its bevelled peripheral lower edge 159 assisting the lower edge's 159 passage past the upper end of the post which includes a shallow detent, clasp, catch or stop 145 comprising a protrusion extending radially inwardly to trap the orifice disc 70 in place once inserted after the swirl chamber 150. The post 137 is resiliently deflectable radially outwardly due to its narrow width despite the strengthening properties of the ridge 137 so that the orifice disc 70 may ride passed the catch 145 and nest in the very top of the upper chamber 118. The catch 145 forms part of a radially inwardly extending lip 146 that continues along the inner upper surface of the cylindrical wall 134 and gradually tapers off. The cylindrical shape of the orifice disc 70, albeit shallow as it is and its tight axial fit in the downstream or upper chamber 118, means that it is difficult to tilt out of axial alignment and is so held by the non-symmetrical detent 145 on one side of the upper chamber 118.

[0084] Turning to Figs. 6c and 6d, the orifice disc 70a made according to an embodiment of the present invention is shown. The upper peripheral edge of the orifice disc 70a comprises a radial step 73a with an either stepped transition in diameter between the top surface 74a and the side wall 75b, or the axial step 73a comprises a radial concave curve in profile. Preferably, the radial step is stepped and provides a horizontal upper surface immediately above the side wall 75b on which the protrusions 145, 146 may engage, so that the protrusions 145, 146 engage under radial inward tension imposed by the tendency of the post 137 to press inward to urge the protrusion 146 into the annular radial step 73a. The radial step 73a is uniform annularly about the upper edge of the orifice disc 70a, so that circumferential alignment of the orifice disc 70a is not required. The lower peripheral edge of the orifice disc 70a may be chamfered or bevelled uniform circumferentially to facilitate the insertion of the orifice disc 70a into the housing chamber 118. The radial step may be between 0.2 - and 1.0mm in size. The radial step 73a may be 0.4 to 0.8mm in size. The radial step is preferably about 0.5 - 0.7mm, and most preferably about 0.6mm in size.

[0085] The post protrusion 145 may extend radially inwardly to a greater extent than the retaining wall protrusion 146. The retaining wall protrusion 146 may be a

shallow radial protrusion that extends partially or fully circumferentially around the upper region of the retaining wall 134a.

[0086] Once the spray nozzle has been used and the wear parts 70, 150 need replacing, the nozzle cap 30 and housing 110 are unthreaded from the lance adapter 20 and cap 30, respectively. A special cam tool 160, shown in Figs. 8a and 8b, may be used to lever the wear parts 70, 150 out of the housing 110 when required. The cam tool includes a central shaft and a crucifix handle 162 for manipulating the tool 160. The remote end of the shaft 161 terminates in a cam device comprising a cam disc 164 intermediate a spindle 165. In use, the cam device 163 is inserted into one of the large slots 132 and through to the opposed slot 132, so that the cam disc 134 is located immediately underneath the swirl chamber 150 with the cam disc substantially in alignment with the slots 132. On rotation of the tool 160, the cam disc 163, supported by the spindle 165 bearing against the lower edges of the slots 132, rides up against the underside 166 of the swirl chamber 150 whereby to apply upward force against the swirl chamber 150 so that the orifice disc 70 is forced passed the catch 145 and out of the upper chamber 118.

[0087] Turning to Figures 9a to 10b, there is shown an assembled nozzle 210 similar to the second embodiment shown in Figs. 5a - 8b. The nozzle 210 includes a nozzle cap 230 threadably engaged to a lance adapter 220. The nozzle 210 includes a wear parts housing 240 threadably engaged to the nozzle cap 230 by an outer threaded surface 241a of the housing 240 engaging an internally threaded bore 241b in the nozzle cap 230. The housing 240 traps the wear parts, a swirl chamber 250 and an orifice disc 270, in concentric relationship by providing a self-aligning combination of bevelled or tapered edges 259 and 273 that cooperate with similarly tapered annular surfaces within the housing 240 to ensure that as the orifice disc 270 is pressed passed the claw 245 at the top of the arm 237, the respective tapered surfaces of the wear parts 250, 270 and the internal surfaces of the housing 240, cooperate to concentrically align part in the housing 240 in a fixed arrangement with minimal play between the wear parts 250, 270 and the housing 240.

[0088] The provision of an axially compressed seal 280 in the upper surface 278 of the orifice disc 270 enhances the axial alignment and compression of the various parts 250, 270, 240 in the cavity defined between the nozzle cap 230 and the lance adapter 220. Whereas a radial O-ring might fail and be forced through the orifice 285, the compression seal 280 is much less likely to fail and its effectiveness is improved by the axial compression of the overall arrangement. The components 250, 270, 240 can be secured in a tight fit with negligible play because the axial engagement of the nozzle cap 230 and the housing 240 means that a large amount of torque can be applied to each component requiring disassembly to overcome the adhesive forces of the dried spray material. This also means that standard spanners can be used for

disassembly of the threadably engaged parts 220,230,240 rather than an arbor press or other specialist disassembly device. Lands or flats 249a-c are provided for engagement by a spanner.

[0089] The upper end of the housing wall 234 slopes downwardly towards an opening 235 in the housing wall 234, the opening 235 being for the purpose of registration with the mouth 253 of the swirl chamber 250. The inclination downwards of the upper edges 287 of the wall 234 protect the edges from damage and wear to which the upper opening 286 of the housing is exposed with the entry and removal of the wear parts 250, 270. The retaining edge 245 extends substantially around the upper edge 287 for about 180 -270 degrees. The arm 237 is sufficiently resiliently deflectable to permit the entry of the wear parts into the housing by manual force, although a special tool 160 is required to remove the wear parts 250,270 from the housing as described with reference to Figs. 8a and 8b.

[0090] In Fig. 11 there is shown a spray nozzle assembly similar to that shown in Figs. 9a - 9b, but showing the respective taper lower periphery 359 of a swirl chamber 350 that cooperates with a corresponding and parallel internal annular angled corner forming a seat 360 in the internal wall surface of the housing 340. This enables a multi-stage procedure for achieving concentricity and axial alignment of the wear parts 350,370 in which the wear parts may be eccentrically aligned once initially inserted into the housing 340, the housing 340 comprising claws 345 that grip the upper chamfered edge 373 of an orifice disc 370. However, on application of axial compressive force occasioned by the threaded engagement of the housing 340 in a nozzle cap 330, an O-ring 380 in the orifice disc 370 symmetrically bears down of the orifice disc 370 and forces the self-alignment of the wear part 350 by the operation of the cooperation of the angled annular surfaces 359,360.

Use of the Word "Comprising"

[0091] Throughout the specification and claims the word "comprise" and its derivatives are intended to have an inclusive rather than exclusive meaning unless the contrary is expressly stated or the context requires otherwise. That is, the word "comprise" and its derivatives will be taken to indicate the inclusion of not only the listed components, steps or features that it directly references, but also other components, steps or features not specifically listed, unless the contrary is expressly stated or the context requires otherwise.

Orientational Terms:

[0092] Orientational terms used in the specification and claims such as vertical, horizontal, top, bottom, upper and lower are to be interpreted as relational and are based on the premise that the component, item, article, apparatus, device or instrument will usually be consid-

ered in a particular orientation, typically with the nozzle cap downstream and the lance adapter upstream.

5 Claims

1. A clasp (110,240) for a spray nozzle assembly, wherein the spray nozzle assembly includes a spray nozzle (210) and a wear part (50,70,150,250,270) releasably trapped in a protective housing (110,240), comprising the protective housing (110, 240) with a housing chamber (118) having a lower base (136) on which the wear part (50,70,150,250,270) may be seated,
characterised in that the clasp has an upper opening (140) through which the wear part may axially enter the housing chamber or be removed therefrom, and a chamber wall (134) comprising a substantially rigid, part-cylindrical retaining wall (134a) having a first upper radially inwardly extending protrusion (146) and at least one resiliently deflectable wall section (137) having a further upper radially inwardly extending protrusion (145).
2. A clasp for a spray nozzle assembly according to claim 1, wherein the first (146) and further (145) protrusions are adapted to radially and axially releasably retain the wear part (50,70,150,250,270) in the housing chamber (118) in substantially concentric relationship to the housing chamber (118).
3. A clasp for a spray nozzle assembly according to claim 1 or 2, wherein the radial extent of the first protrusion (146) is substantially smaller than the radial extent of the further protrusion (145).
4. A clasp for a spray nozzle assembly according to any one of the previous claims, wherein the wear part (50,70,150,250,270) is made from a hard and abrasion resistant material and the protective housing (55,75,110,250,270) is made from a strong and resilient material
5. A clasp for a spray nozzle assembly according to any one of the previous claims, wherein the part-cylindrical retaining wall (134a) extends circumferentially to form an arc that extends greater than half-way around the upper chamber (118).
6. A clasp for a spray nozzle assembly according to any one of the previous claims, wherein the protective housing (110,240) is generally cylindrical and the deflectable wall section is in the form of a post (137) defined by a slot (138) in the housing chamber wall (134) either side of the post (137), the inwardly extending further protuberance (145) being located at or near its upper or downstream end and adapted to prevent the wear part

- (50,70,150,250,270) from inadvertently axially escaping from the housing chamber (118).
7. A clasp for a spray nozzle assembly according to any one of the previous claims, the wear part comprising an orifice disc (70,270) and the spray nozzle assembly additionally including a swirl chamber (50,250), wherein the housing chamber (118) inner wall includes a longitudinally aligned projection (139) that provides an axial key for the swirl chamber, so that a swirl chamber entrance or cavity mouth (53,153,253) is in registry with an opening (135) in the protective housing.
 8. A clasp for a spray nozzle assembly according to claim 7, wherein the axial key (139) extends along the deflectable wall (137) as a reinforcing rib (139) that resists permanent deformation of the deflectable wall and the axial key cooperates with a complementary feature on an outer side wall (154) of the wear part (50,150,250) to prevent the wear part from rotating in the housing chamber (118).
 9. A clasp for a spray nozzle assembly according to claim 7 or 8, wherein, in the housing chamber (118), the swirl chamber (50,150,250) supports the orifice disc (70,270) that is aligned axially with the housing chamber and the swirl chamber, the orifice disc being sized to be trapped immediately under the first (146) and further (145) protrusions, the swirl chamber being sized slightly radially smaller than the orifice disc to clear the first and further protrusions.
 10. A clasp for a spray nozzle assembly according to any one of claims 7 to 9, wherein the base of the post (137) is located intermediate the height of the housing chamber wall (134) and the axial key (139) extends upstream to the base (136) of the housing chamber (118).
 11. A clasp for a spray nozzle assembly according to any one of the previous claims, wherein an upper peripheral region of the wear part (70,270) has a radial step (73a) such that the top of the wear part (74a) is radially smaller than the outer step portion (75b) of the wear part, the radial step engaging with the first (146) and further (145) protrusions.
 12. A clasp for a spray nozzle assembly according to any one of claims 7 to 11, wherein the protective housing (110,240) is axially screwed into a complementarily threaded spray nozzle (210) to achieve concentricity, the extent of axial engagement of the protective housing in the spray nozzle not affecting the registration of the swirl chamber (50,150,250) relative to the protective housing so that fluid flow is not affected.
 13. A clasp for a spray nozzle assembly according to any one of claims 7 to 12, wherein the protective housing wall (134) extends upstream of the base (136) of the housing chamber (118) and has an opening (132) that provides access to an intermediate chamber (116) upstream of the housing chamber (118) that permits the insertion of a wear part removing tool (160).
 14. A clasp for a spray nozzle assembly according to claim 13, wherein the housing opening (132), registered with the swirl chamber mouth, provides flow communication between the intermediate chamber (116) and the housing chamber (118) and the opening is accessible by the wear part removing tool (160) having a disc cam (163) intermediate a shaft (161) to enable the disc cam to be rotated and to bear against the wear part (50,150,250) to overcome a retaining force of the protuberance (145) by deflecting the deflectable wall section (137) to allow the wear part to be removed from the protective housing (110,240).
 15. A clasp for a spray nozzle assembly according to any one of the claims 11 to 14, wherein the wear part (50,70,150,250,270) is adapted to be concentrically located within the housing chamber (118) without long longitudinally aligned surfaces by providing the housing base (136) with a chamfered inner wall that cooperates with a bevelled lower circumferential edge (73b,159,259) of the wear part.

Patentansprüche

1. Verschluss (110, 240) für eine Sprühdüsenbaugruppe, wobei die Sprühdüsenbaugruppe eine Sprühdüse (210) und ein Verschleißteil (50, 70, 150, 250, 270) enthält, das lösbar in einem Schutzgehäuse (110, 240) eingefasst ist, umfassend das Schutzgehäuse (110, 240) mit einer Gehäusekammer (118), die eine untere Basis (136) aufweist, auf der das Verschleißteil (50, 70, 150, 250, 270) aufsitzen kann, **dadurch gekennzeichnet, dass** der Verschluss eine obere Öffnung (140), durch die das Verschleißteil axial in die Gehäusekammer eintreten oder daraus entfernt werden kann, und eine Kammerwand (134) aufweist, die eine im Wesentlichen starre, teilweise zylindrische Haltewand (134a) mit einem ersten oberen, radial nach innen verlaufenden Vorsprung (146) und zumindest einen elastisch ablenkbaren Wandteilabschnitt (137) mit einem weiteren oberen, radial nach innen verlaufenden Vorsprung (145) umfasst.
2. Verschluss für eine Sprühdüsenbaugruppe nach Anspruch 1, wobei der erste (146) und weitere (145) Vorsprung zum radial und axial lösbaren Halten des Verschleißteils (50, 70, 150, 250, 270) in der Gehäus-

- sekammer (118) in im Wesentlichen konzentrischer Beziehung zur Gehäusekammer (118) geeignet sind.
3. Verschluss für eine Sprühdüsenbaugruppe nach Anspruch 1 oder 2, wobei das radiale Ausmaß des ersten Vorsprungs (146) im Wesentlichen kleiner als das radiale Ausmaß des weiteren Vorsprungs (145) ist. 5
 4. Verschluss für eine Sprühdüsenbaugruppe nach einem der vorhergehenden Ansprüche, wobei das Verschleißteil (50, 70, 150, 250, 270) aus einem harten und abriebfesten Material hergestellt ist und das Schutzgehäuse (55, 75, 110, 250, 270) aus einem kräftigen und elastischen Material hergestellt ist. 10
 5. Verschluss für eine Sprühdüsenbaugruppe nach einem der vorhergehenden Ansprüche, wobei die teilweise zylindrische Haltewand (134a) umfänglich zum Ausbilden eines Bogens verläuft, der mehr als über die Hälfte um die obere Kammer (118) verläuft. 20
 6. Verschluss für eine Sprühdüsenbaugruppe nach einem der vorhergehenden Ansprüche, wobei das Schutzgehäuse (110, 240) im Allgemeinen zylindrisch ist und der ablenkbare Wandteilabschnitt in der Form eines Pfostens (137) ist, der durch einen Schlitz (138) in der Gehäusekammerwand (134) auf beiden Seiten des Pfostens (137) definiert ist, wobei sich der nach innen verlaufende, weitere Vorsprung (145) am oder nahe seines oberen oder stromabwärtigen Endes befindet und zum Verhindern, dass das Verschleißteil (50, 70, 150, 250, 270) versehentlich axial aus der Gehäusekammer (118) entweicht, geeignet ist. 25
 7. Verschluss für eine Sprühdüsenbaugruppe nach einem der vorhergehenden Ansprüche, wobei das Verschleißteil eine Lochscheibe (70, 270) umfasst und die Sprühdüsenbaugruppe zusätzlich eine Wirbelkammer (50, 250) enthält, wobei die Innenwand der Gehäusekammer (118) einen längs ausgerichteten Vorsprung (139) enthält, der einen axialen Keil für die Wirbelkammer vorsieht, sodass sich ein Wirbelkammereingang oder eine Hohlraumöffnung (53, 153, 253) in Deckung mit einer Öffnung (135) im Schutzgehäuse befindet. 30
 8. Verschluss für eine Sprühdüsenbaugruppe nach Anspruch 7, wobei der axiale Keil (139) die ablenkbare Wand (137) entlang als Verstärkungsrippe (139) verläuft, die permanenter Verformung der ablenkbaren Wand Widerstand entgegensetzt, und der axiale Keil mit einem komplementären Merkmal an einer Außenseitenwand (154) des Verschleißteils (50, 150, 250) zusammenwirkt, um zu verhindern, dass das Verschleißteil in der Gehäusekammer (118) dreht. 35
 9. Verschluss für eine Sprühdüsenbaugruppe nach Anspruch 7 oder 8, wobei, in der Gehäusekammer (118), die Wirbelkammer (50, 150, 250) die Lochscheibe (70, 270) stützt, die axial am Gehäuse und der Wirbelkammer ausgerichtet ist, wobei die Lochscheibe derart bemessen ist, dass sie unmittelbar unter dem ersten (146) und weiteren (145) Vorsprung eingefasst ist, wobei die Wirbelkammer radial geringfügig kleiner als die Lochscheibe bemessen ist, um den ersten und weiteren Vorsprung freizumachen. 40
 10. Verschluss für eine Sprühdüsenbaugruppe nach einem der Ansprüche 7 bis 9, wobei die Basis des Pfostens (137) zwischenliegend in der Höhe der Gehäusekammerwand (134) angeordnet ist und der axiale Keil (139) stromaufwärts zur Basis (136) der Gehäusekammer (118) verläuft. 45
 11. Verschluss für eine Sprühdüsenbaugruppe nach einem der vorhergehenden Ansprüche, wobei ein oberer umfänglicher Bereich des Verschleißteils (70, 270) eine radiale Stufe (73a) aufweist, sodass die Oberseite des Verschleißteils (74a) radial kleiner als der äußere Stufenabschnitt (75b) des Verschleißteils ist, wobei die radiale Stufe mit der ersten (146) und weiteren (145) Vorsprung in Eingriff steht. 50
 12. Verschluss für eine Sprühdüsenbaugruppe nach einem der Ansprüche 7 bis 11, wobei das Schutzgehäuse (110, 240) zum Erzielen von Konzentrität axial in eine komplementär gewindete Sprühdüse (210) eingeschraubt ist, wobei das Ausmaß von axialem Eingriff des Schutzgehäuses in die Sprühdüse die Deckung der Wirbelkammer (50, 150, 250) bezüglich des Schutzgehäuses nicht beeinträchtigt, sodass Fluidströmung nicht beeinträchtigt ist. 55
 13. Verschluss für eine Sprühdüsenbaugruppe nach einem der Ansprüche 7 bis 12, wobei die Schutzgehäusewand (134) stromaufwärts von der Basis (136) der Gehäusekammer (118) verläuft und eine Öffnung (132) aufweist, die Zugang zu einer zwischenliegenden Kammer (116) stromaufwärts von der Gehäusekammer (118) vorsieht, welche die Einführung eines Verschleißteilentfernungswerkzeugs (160) ermöglicht.
 14. Verschluss für eine Sprühdüsenbaugruppe nach Anspruch 13, wobei die Gehäuseöffnung (132), die sich in Deckung mit der Wirbelkammermündung befindet, Strömungsverbindung zwischen der zwischenliegenden Kammer (116) und der Gehäusekammer (118) vorsieht und die Öffnung durch das Verschleißteilentfernungswerkzeug (160) zugänglich ist, das einen Scheibennocken (163) zwischenliegend an einem Schaft (161) aufweist, um zu er-

möglichen, dass der Scheibennocken gedreht wird und gegen das Verschleißteil (50, 150, 250) drückt, um eine Haltekraft des Vorsprungs (145) durch Ablenken des ablenkbaren Wandteilabschnitts (137) zu überwinden, um zu ermöglichen, dass das Verschleißteil aus dem Schutzgehäuse (110, 240) entfernt wird.

15. Verschluss für eine Sprühdüsenbaugruppe nach einem der Ansprüche 11 bis 14, wobei das Verschleißteil (50, 70, 150, 250, 270) dazu geeignet ist, konzentrisch innerhalb der Gehäusekammer (118) ohne lange, längs ausgerichtete Oberflächen angeordnet zu sein, durch Versehen der Gehäusebasis (136) mit einer abgefasten Innenwand, die mit einer abgeschrägten unteren Umfangskante (73b, 159, 259) des Verschleißteils zusammenwirkt.

Revendications

1. Agrafe (110,240) pour un ensemble formant buse de pulvérisation, dans lequel l'ensemble formant buse de pulvérisation inclut une buse de pulvérisation (210) et une partie d'usure (50, 70, 150, 250, 270) prise au piège de façon amovible dans un logement protecteur (110, 240), comprenant le logement protecteur (110, 240) avec une chambre de logement (118) ayant une base inférieure (136) sur laquelle la partie d'usure (50, 70, 150, 250, 270) peut être assise, caractérisée en ce que l'agrafe a une ouverture supérieure (140) à travers laquelle la partie d'usure peut entrer de façon axiale dans la chambre de logement ou être enlevée de cette dernière, et une paroi de chambre (134) comprenant une paroi de retenue sensiblement rigide, à partie cylindrique (134a) ayant une première protubérance s'étendant vers l'intérieur, supérieure de façon radiale, (146) et au moins une section de paroi (137) pouvant être déviée de façon élastique ayant une protubérance supplémentaire s'étendant vers l'intérieur, supérieure de façon radiale (145).
2. Agrafe pour un ensemble formant buse de pulvérisation selon la revendication 1, dans laquelle la première protubérance (146) et la protubérance supplémentaire (145) sont conçues pour retenir, de manière amovible, de façon radiale et de façon axiale, la partie d'usure (50, 70, 150, 250, 270) dans la chambre de logement (118) dans une relation sensiblement concentrique avec la chambre de logement (118).
3. Agrafe pour un ensemble formant buse de pulvérisation selon la revendication 1 ou 2, dans lequel l'étendue radiale de la première protubérance (146) est sensiblement plus petite que l'étendue radiale

de la protubérance supplémentaire (145).

4. Agrafe pour un ensemble formant buse de pulvérisation selon l'une quelconque des revendications précédentes, dans laquelle la partie d'usure (50, 70, 150, 250, 270) est faite d'une matière dure et résistante à l'abrasion et le logement protecteur (55, 75, 110, 250, 270) est fait d'une matière à haute résistance et élastique.
5. Agrafe pour un ensemble formant buse de pulvérisation selon l'une quelconque des revendications précédentes, dans laquelle la paroi de retenue à partie cylindrique (134a) s'étend de façon circonferentielle pour former un arc qui s'étend plus loin que la moitié autour de la chambre supérieure (118).
6. Agrafe pour un ensemble formant buse de pulvérisation selon l'une quelconque des revendications précédentes, dans laquelle le logement protecteur (110, 240) est globalement cylindrique et la section de paroi pouvant être déviée est sous la forme d'un montant (137) défini par une fente (138) dans la paroi de chambre de logement (134) de part et d'autre du montant (137), la protubérance supplémentaire s'étendant vers l'intérieur (145) étant située au niveau ou proche de son extrémité supérieure ou aval et conçue pour empêcher la partie d'usure (50, 70, 150, 250, 270) de s'échapper de façon axiale par mégarde depuis la chambre de logement (118).
7. Agrafe pour un ensemble formant buse de pulvérisation selon l'une quelconque des revendications précédentes, la partie d'usure comprenant un disque d'orifice (70, 270) et l'ensemble formant buse de pulvérisation incluant de plus une chambre à remous (50, 250), dans laquelle la paroi intérieure de chambre de logement (118) inclut une partie en saillie (139) alignée de façon longitudinale qui fournit une clé axiale pour la chambre à remous, de sorte qu'une entrée de chambre à remous ou une embouchure de cavité (53, 153, 253) est en correspondance avec une ouverture (135) dans le logement protecteur.
8. Agrafe pour un ensemble formant buse de pulvérisation selon la revendication 7, dans laquelle la clé axiale (139) s'étend le long de la paroi pouvant être déviée (137) comme une nervure de renforcement (139) qui résiste à une déformation permanente de la paroi pouvant être déviée et la clé axiale coopère avec une particularité complémentaire sur une paroi latérale extérieure (154) de la partie d'usure (50, 150, 250) pour empêcher la partie d'usure de tourner dans la chambre de logement (118).
9. Agrafe pour un ensemble formant buse de pulvérisation selon la revendication 7 ou 8, dans laquelle, dans la chambre de logement (118), la chambre à

remous (50, 150, 250) supporte le disque d'orifice (70, 270) qui est aligné de façon axiale avec la chambre de logement et la chambre à remous, le disque d'orifice étant dimensionné pour être pris au piège immédiatement sous la première protubérance (146) et la protubérance supplémentaire (145), la chambre à remous étant dimensionnée légèrement plus petite de façon radiale que le disque d'orifice pour effacer la première protubérance et la protubérance supplémentaire.

10. Agrafe pour un ensemble formant buse de pulvérisation selon l'une quelconque des revendications 7 à 9, dans laquelle la base du montant (137) est située de façon intermédiaire sur la hauteur de la paroi de chambre de logement (134) et la clé axiale (139) s'étend en amont jusqu'à la base (136) de la chambre de logement (118).
11. Agrafe pour un ensemble formant buse de pulvérisation selon l'une quelconque des revendications précédentes, dans laquelle une région périphérique supérieure de la partie d'usure (70, 270) a un échelon radial (73a) de sorte que le dessus de la partie d'usure (74a) est plus petit de façon radiale que la portion d'échelon extérieure (75b) de la partie d'usure, l'échelon radial mettant en prise la première protubérance (146) et la protubérance supplémentaire (145).
12. Agrafe pour un ensemble formant buse de pulvérisation selon l'une quelconque des revendications 7 à 11, dans lequel le logement protecteur (110, 240) est vissé de façon axiale dans une buse de pulvérisation fileté de manière complémentaire (210) pour parvenir à une certaine concentricité, l'étendue de mise en prise axiale du logement protecteur dans la buse de pulvérisation n'affectant pas le positionnement de la chambre à remous (50, 150, 250) par rapport au logement protecteur de sorte qu'un flux de fluide n'est pas affecté.
13. Agrafe pour un ensemble formant buse de pulvérisation selon l'une quelconque des revendications 7 à 12, dans lequel la paroi de logement protecteur (134) s'étend en amont de la base (136) de la chambre de logement (118) et a une ouverture (132) qui fournit un accès à une chambre intermédiaire (116) en amont de la chambre de logement (118) qui permet l'insertion d'un outil d'enlèvement de partie d'usure (160).
14. Agrafe pour un ensemble formant buse de pulvérisation selon la revendication 13, dans laquelle l'ouverture de logement (132), en correspondance avec l'embouchure de chambre à remous, fournit une communication de flux entre la chambre intermédiaire (116) et la chambre de logement (118), et

l'ouverture est accessible par l'outil d'enlèvement de partie d'usure (160) ayant une came de disque (163) intermédiaire à un arbre (161) pour permettre à la came de disque d'être tournée et de porter contre la partie d'usure (50, 150, 250) pour surmonter une force de retenue de la protubérance (145) en faisant dévier la section de paroi pouvant être déviée (137) pour permettre à la partie d'usure d'être enlevée du logement protecteur (110, 240).

15. Agrafe pour un ensemble formant buse de pulvérisation selon l'une quelconque des revendications 11 à 14, dans laquelle la partie d'usure (50, 70, 150, 250, 270) est conçue pour être située de façon concentrique à l'intérieur de la chambre de logement (118) sans longues surfaces alignées de façon longitudinale en munissant la base de logement (136) d'une paroi intérieure chanfreinée qui coopère avec un bord circconférentiel inférieur chanfreiné (73b, 159, 259) de la partie d'usure.

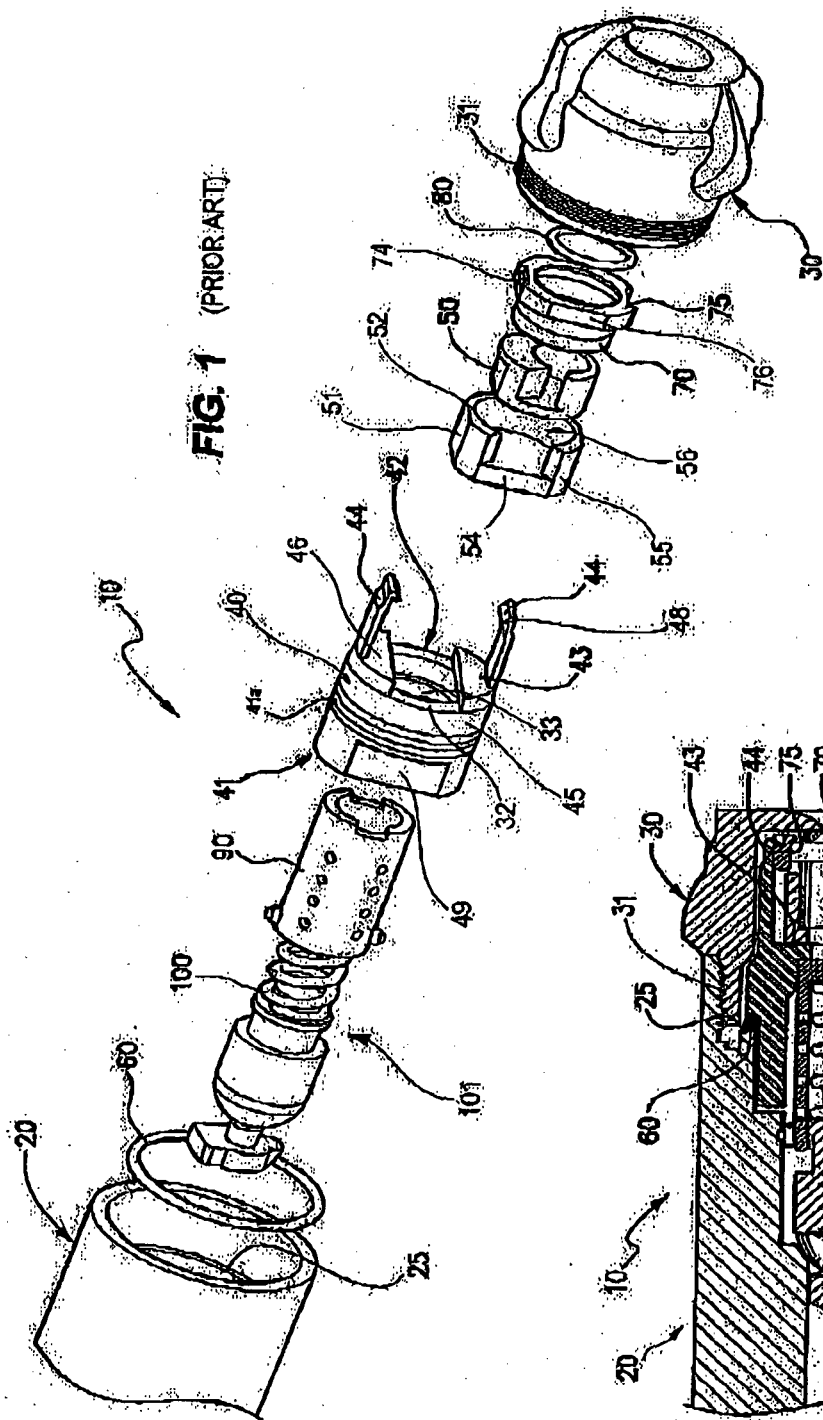


FIG. 1

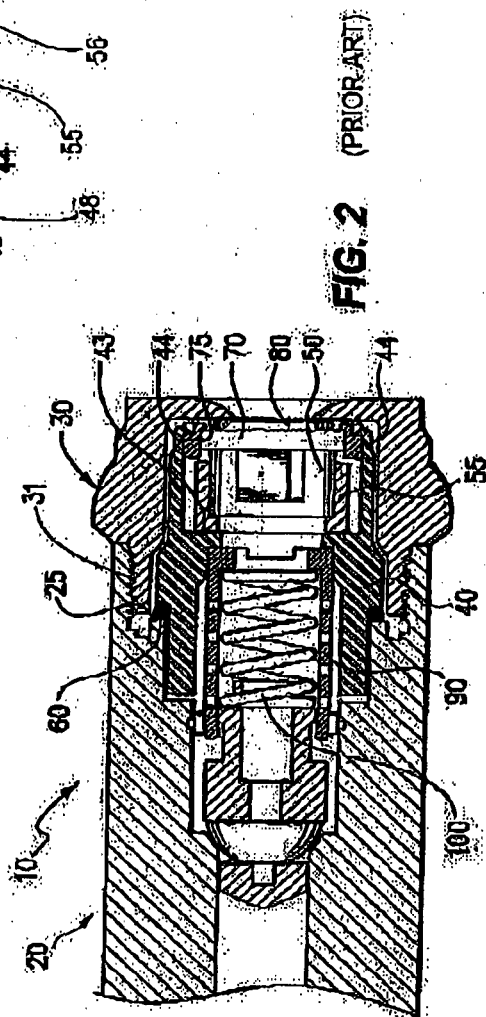


FIG. 2
(PRIOR ART)

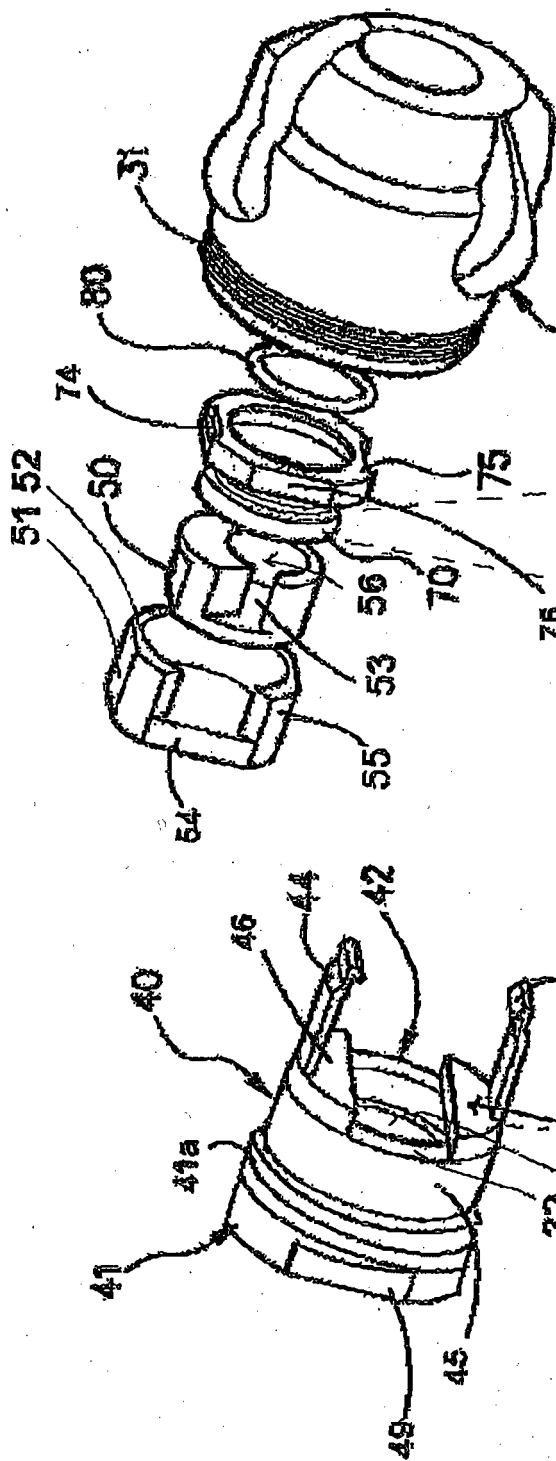


FIG. 3
(PRIOR ART)

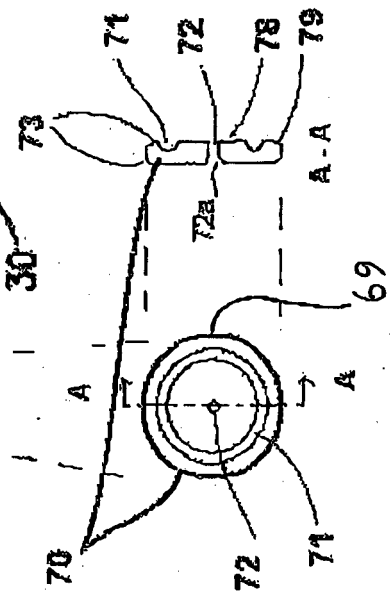


FIG. 4a
(PARTIAL PRIOR ART)

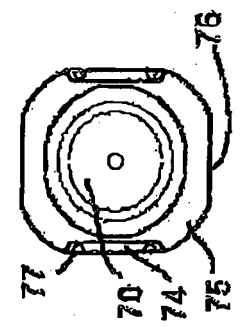
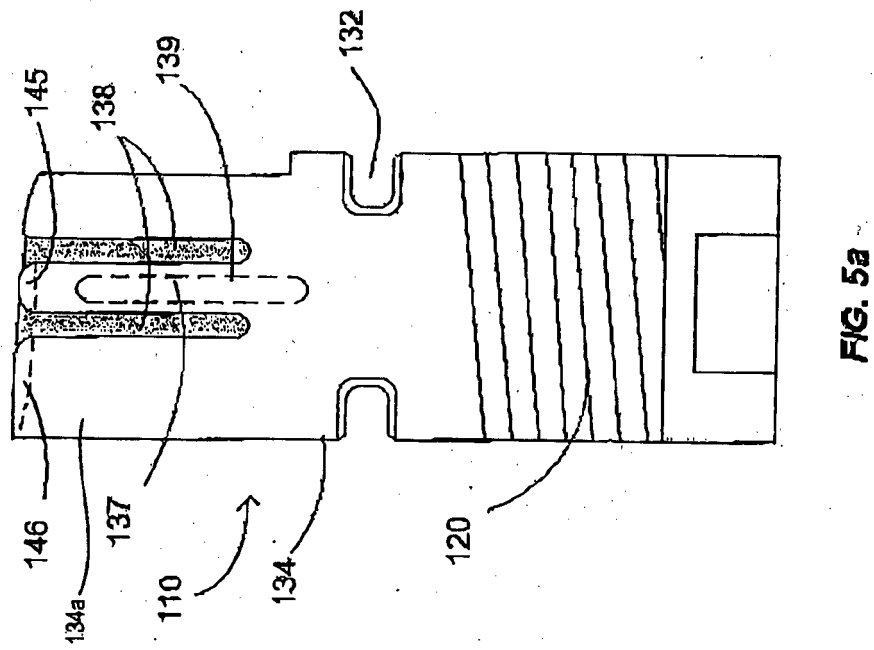
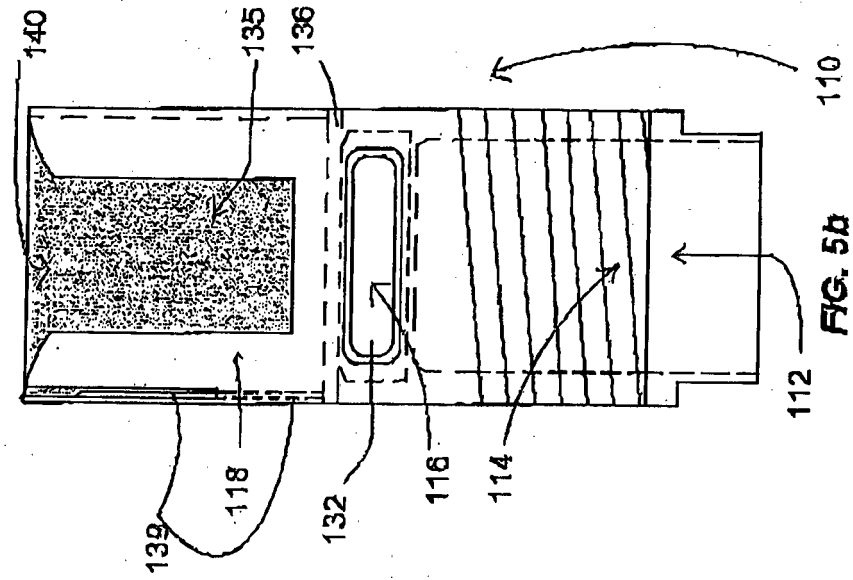
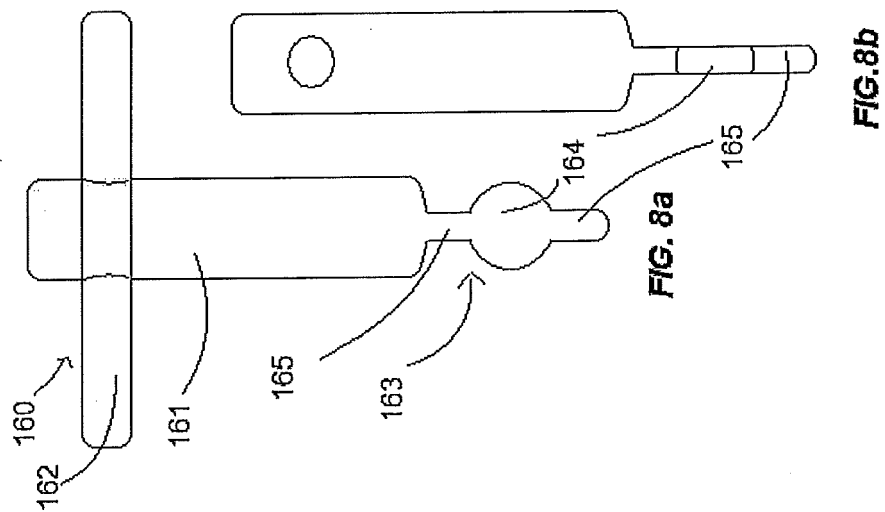
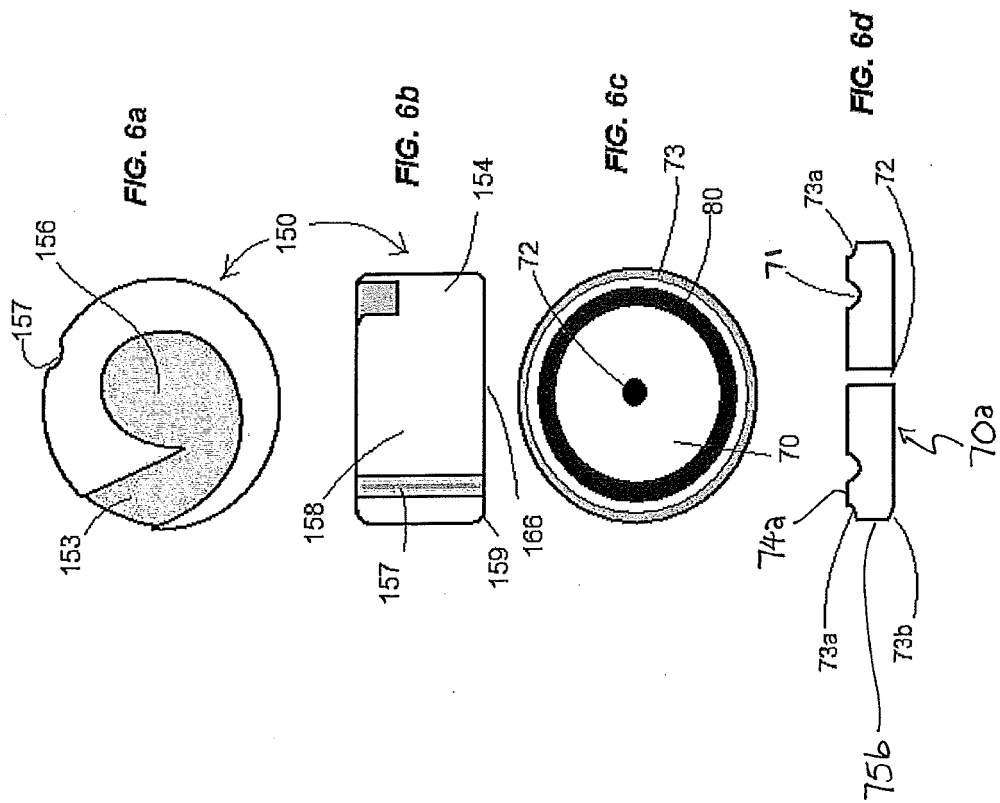


FIG. 4b
(PRIOR ART)





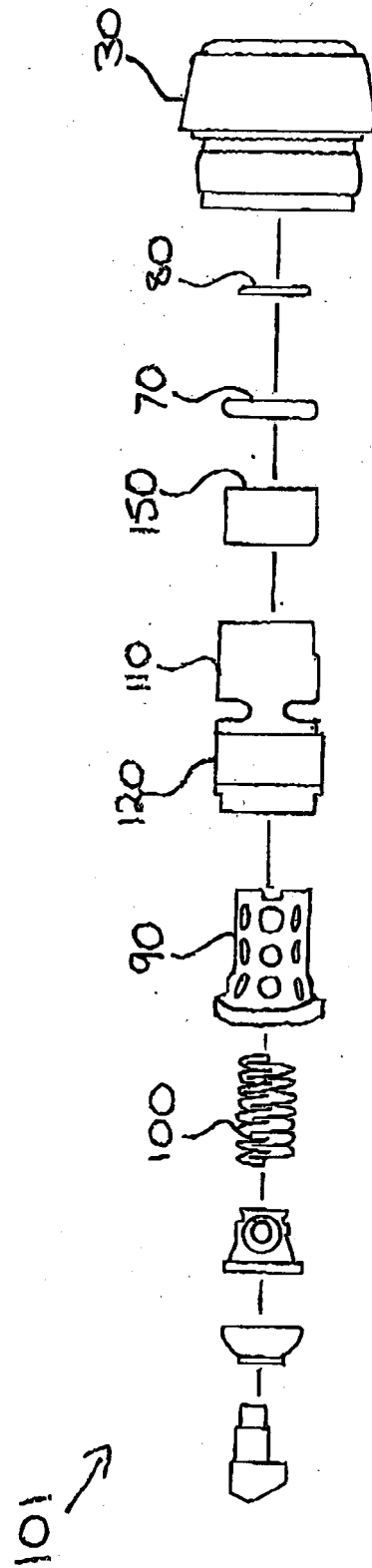
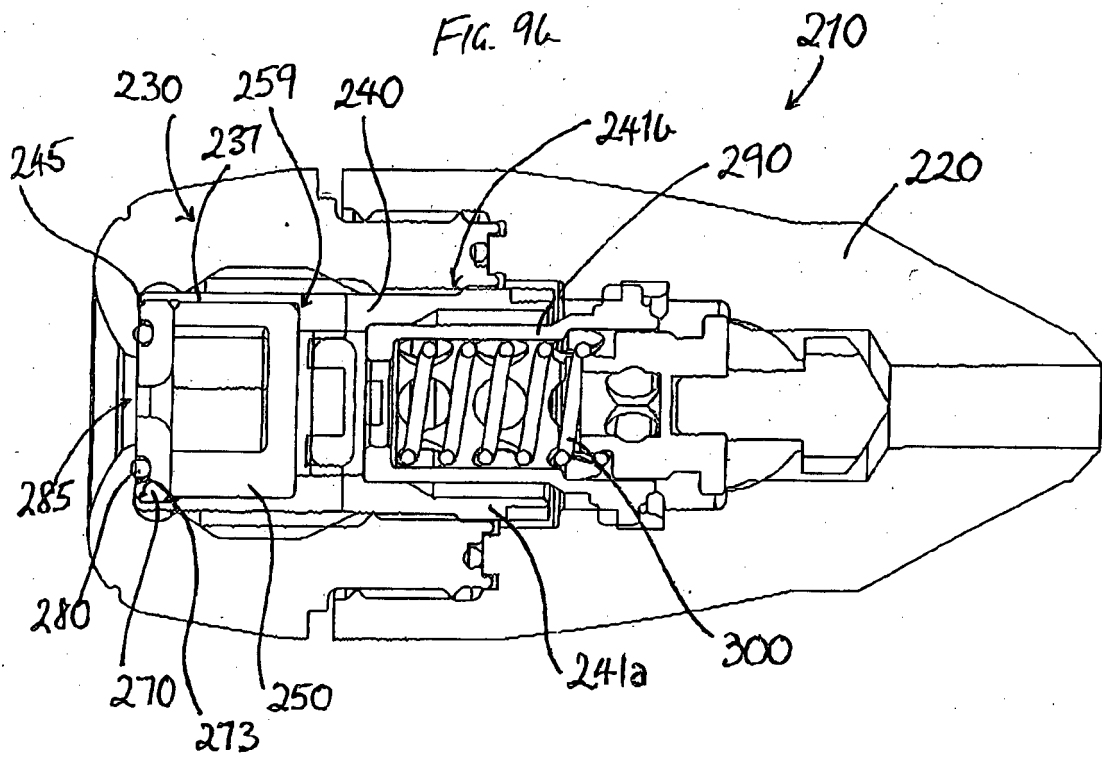
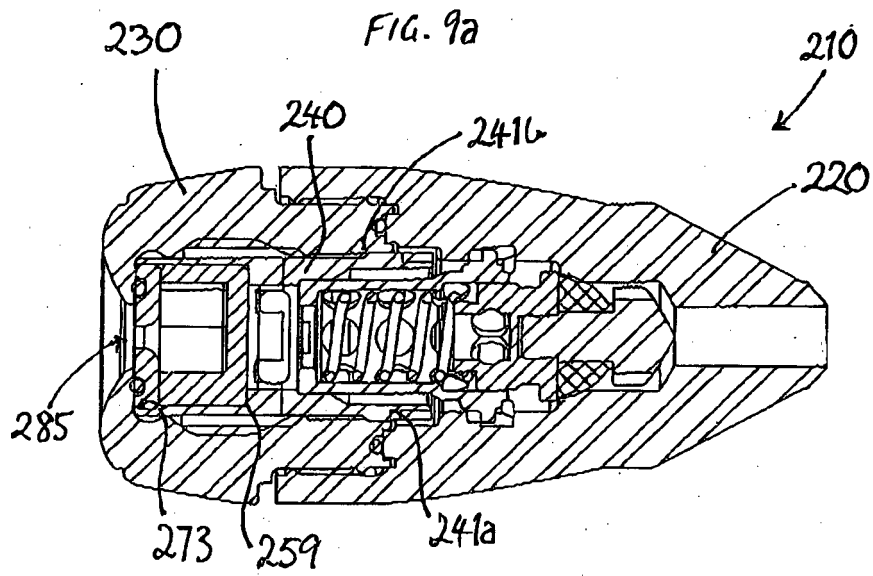


FIG. 7



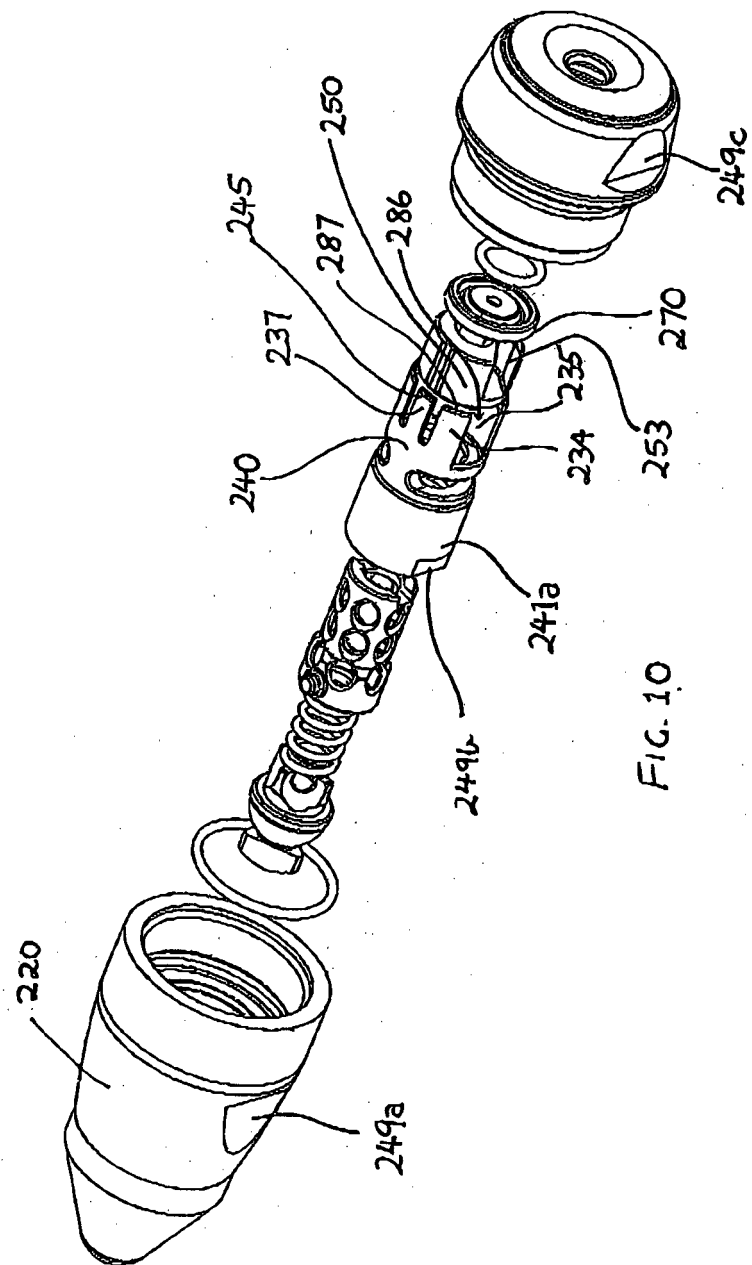


FIG. 10

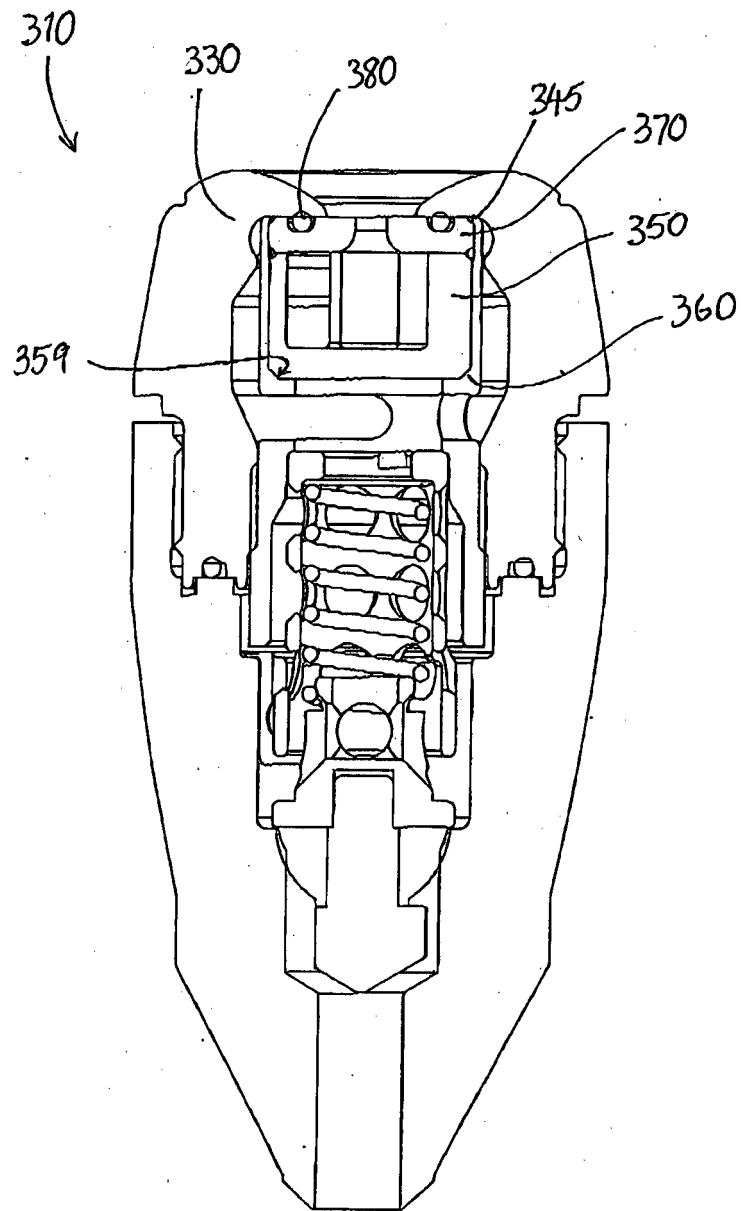


FIG. 11

REFERENCES CITED IN THE DESCRIPTION

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