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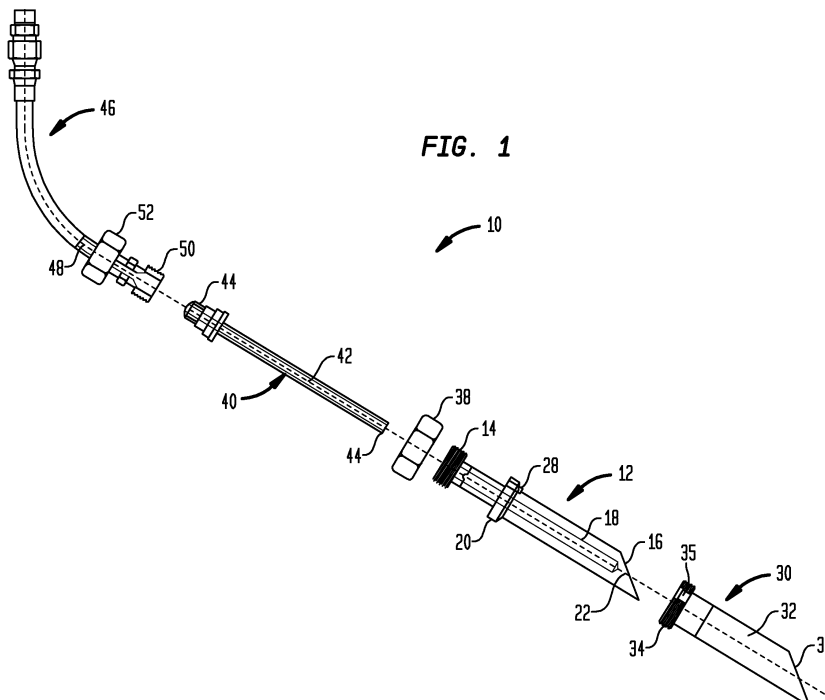
(54) **Injection nozzle**

(57) In order to overcome the problems that earlier apparatus have experienced, an injection nozzle (10) is proposed, comprising:

- a plastic body portion (12) having a first end (16) and a second end (14) opposed to the first end (16);
- a bore or passageway (18) extending through the plastic

body portion (12) and having a first opening proximate the first end (16) and a second opening at the second end (14); and

- a plurality of channels (22) in communication with the first opening, each one of the plurality of channels (22) terminating in a corresponding aperture (24) at the first end (16).



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Description

Technical field of the present invention

[0001] The present invention relates to an apparatus used to introduce cryogenic substances into chillers, blenders, kettles or mixers (mixing tanks) in which a product such as a food product is being processed.

Background of the present invention; prior art

[0002] Known chillers, blenders, kettles or mixers (collectively "chillers") consist of a large vessel, container or drum in which a plurality of metallic nozzles are used to introduce a cryogenic substance, such as liquid carbon dioxide or liquid nitrogen, from a remote source of said cryogen into the chiller.

[0003] The nozzles are attached to conduits or piping, some of which is flexible, from the source, but which are usually exposed to the plant or facility atmosphere being at ambient temperature and certainly a temperature higher than the cryogenic substance being introduced into the chiller.

[0004] Accordingly, the extreme cold of the cryogen is conducted through the wall of the nozzle and the conduit to be in contact with the atmosphere of the plant which results in frosting and large amounts of ice build-up at the nozzles, conduit and exterior wall of the chiller where the metallic nozzle(s) penetrate the chiller wall.

[0005] This excessive amount of ice and snow build-up can, over time, compromise the structural integrity of the equipment, clog the nozzles, lead to food product excessively sticking to nozzles and the chiller wall, and lead to an unusually long warm-up period after the cryogenic substance is no longer being introduced into the chiller.

[0006] That is, upon cessation of chilling operations, an unacceptable period of time is required for known nozzles to become warm enough for the ice and snow build-up to be removed should maintenance and repair have to occur for the nozzles, conduits or chiller.

[0007] In addition, an inner metallic surface of the chiller or the chiller wall which has been cooled by known metallic nozzles will cause product to freeze to the wall surface and create interference between the product frozen to the wall and paddles or blades of the mixer, thereby damaging the paddles and also damaging the product by pulverization.

[0008] Scraped surface type mixers are also susceptible to damage if a large layer of ice is formed at the nozzle in the interior of the mixer such that agitators for the mixer contact the ice layers.

Disclosure of the present invention: object, solution, advantages

[0009] Starting from the disadvantages and shortcomings as described above and taking the prior art as dis-

cussed into account, an object of the present invention is to overcome the problems that earlier apparatus have experienced.

[0010] This object is accomplished by an apparatus comprising the features of claim 1. Advantageous embodiments and expedient improvements of the present invention are disclosed in the dependent claims.

[0011] Basically, the present invention relates to an injection nozzle apparatus or injection nozzle, in particular plastic injection nozzle, for bottom injection chilling.

[0012] More particularly, an injection nozzle includes

- a plastic body portion having a first end and a second end opposed to the first end;
- a bore or passageway extending through the plastic body portion and having a first opening proximate the first end and a second opening at the second end; and
- a plurality of channels in communication with the first opening, each one of the plurality of channels terminating in a corresponding aperture at the first end.

[0013] According to an advantageous embodiment of the present invention, the apertures are arranged at an, in particular angled and/or plastic, facial portion of the first end in a dispersing pattern, for example to subscribe an arc of about sixty degrees. In combination therewith or independently thereof, a central one of the apertures which is in communication with the bore or passageway is aligned essentially with a longitudinal axis of the plastic body portion.

[0014] According to an expedient embodiment of the present invention, the second end of the plastic body portion is provided with an, in particular metallic, threaded portion for being releasably engaged with another component, in particular with a, for example mechanical, fastener.

[0015] According to a favoured embodiment of the present invention, a finger or tongue, preferably constructed of the same material as the plastic body portion or of stainless steel, extends from the second end.

[0016] In order to align the facial portion of the first end to be in registration with an, in particular angularly cut and/or an angled metallic, facial portion of an, in particular metallic, housing, the finger or tongue may advantageously be received in a groove of the housing when the plastic body portion is slid into an interior space of the housing.

[0017] Such housing, for example of stainless steel, may expediently be provided to function as a sheath for the plastic body portion. Such tongue-in-groove arrangement insures that the facial portion of the plastic body portion and the facial portion of the housing or sheath are in registration for mounting the injection nozzle (apparatus).

[0018] The housing or sheath can favourably include an interior space sized and shaped to receive the plastic body portion. One end of the housing or sheath can pref-

erably be provided with an exterior threaded portion to be releasably engagable with another component, in particular with a, for example mechanical, fastener.

[0019] The other end of the housing or sheath can advantageously be provided with the, in particular angularly cut and/or an angled metallic, facial portion which can expediently be open-ended such that the facial portion of the plastic body portion can favourably be exposed at the facial portion of the housing or sheath and, if advisable, slightly extend therefrom. A groove or receptacle can preferably be formed in the threaded portion of the housing or sheath.

[0020] When the plastic body portion is disposed in the interior space of the housing or sheath, a nut can advantageously be used to be threadably engaged with the threaded portion of the housing or sheath to thereby releasably mount the plastic body portion in the interior space of the housing or sheath. The threaded portion of the plastic body portion can expediently extend beyond the nut for releasable engagement.

[0021] When the plastic body portion is seated in the interior space of the housing or sheath, the nut can favourably be threaded down to the threaded portion until such time as a flange or washer, with which a section of the plastic body portion can preferably be provided, is seated securely within the nut.

[0022] The present invention further relates to the use of at least one injection nozzle apparatus or injection nozzle, in particular plastic injection nozzle, as described above for bottom injection chilling.

Brief description of the drawings

[0023] For a more complete understanding of the present inventive embodiment disclosures and as already discussed above, there are several options to embody as well as to improve the teaching of the present invention in an advantageous manner. To this aim, reference may be made to the claims dependent on claim 1; further improvements, features and advantages of the present invention are explained below in more detail with reference to preferred embodiments by way of non-limiting example and to the appended drawing figures taken in conjunction with the description of the embodiments, of which:

- FIG. 1 shows a side plan exploded view partially in cross-section of the injection nozzle according to the present invention;
- FIG. 2 shows a top plan exploded view of the injection nozzle of FIG. 1;
- FIG. 3 shows a top plan view of a plastic portion of the embodiment of FIG. 2; and
- FIG. 4 shows the injection nozzle of FIG. 1 mounted to a side wall of a chiller for operation.

[0024] In the appended drawing figures, like equipment is labelled with the same reference numerals throughout the description of FIG. 1 to FIG. 4.

Detailed description of the drawings; best way of embodying the present invention

[0025] Referring to FIG. 1 to FIG. 4, a plastic injection nozzle apparatus according to the present invention is shown generally at 10 to deliver liquid nitrogen or liquid carbon dioxide.

[0026] The injection nozzle apparatus 10 includes a plastic nozzle or plastic body portion 12 having by way of example a substantially cylinder shape, or circular cross-section. Plastic nozzle 12 can be formed from teflon, ultra high molecular weight (UHMW) plastic or other type of plastic material. One end of the nozzle is provided with a metallic threaded portion 14 for being releasably engaged with another component as described hereinafter.

[0027] An opposite end of the nozzle 12 has a facial portion 16 cut at an angle as shown more clearly in FIG. 2 and in FIG. 3. The plastic nozzle 12 is formed with a central bore 18 extending therethrough from the metallic threaded portion 14 to proximate the facial portion 16. A section of the plastic nozzle 12 is provided with a flange 20 or alternatively a metallic or plastic washer instead of the flange for a purpose to be described hereinafter.

[0028] The central bore 18 terminates within the plastic nozzle 12 at a plurality of channels 22 shown more clearly in FIG. 2 and in FIG. 3. The channels 22 terminate in a corresponding number of apertures 24 or holes at the facial portion 16 of the plastic nozzle 12.

[0029] The apertures 24 are arranged at the facial portion 16 in a dispersing pattern to subscribe an arc of, by way of example, about sixty degrees. That is, a central one of the apertures 24 which is in communication with the central bore 18 is aligned essentially with a central longitudinal axis 26 of the nozzle 12.

[0030] The apertures 24 at either side of the central aperture are correspondingly angled outward as shown in particular in FIG. 3 so that the cryogenic substance is dispersed over a field which, during dispersion, represents a fan-shaped swath for contacting the food product in the chiller.

[0031] A finger 28 or tongue constructed of the same materials as the plastic nozzle 12 or of stainless steel extends from the washer 20, for a purpose to be described hereinafter.

[0032] A housing 30 of stainless steel is provided to function as a sheath for the plastic nozzle 12. The sheath 30 includes an interior space 32 sized and shaped to receive the plastic nozzle 12. One end of the sheath 30 is provided with an exterior threaded portion 34 to be releasably engagable with another component of the apparatus as described hereinafter.

[0033] Another end of the sheath 30 is provided with an angularly cut facial portion 36 which is open-ended

such that the facial portion 16 of the plastic nozzle 12 can be exposed at the facial portion 36 and if necessary slightly extend therefrom. A groove 35 or receptacle is formed in the threaded portion 34 of the sheath 30, for a purpose to be described hereinafter.

[0034] When the plastic nozzle 12 is disposed in the space 32 of the sheath 30, a nut 38 is used to be threadably engaged with the threaded portion 34 of the sheath 30 to thereby releasably mount the plastic nozzle 12 in the interior space 32 of the sheath 30. The threaded portion 14 of the plastic nozzle 12 will extend beyond the nut 38 for releasable engagement as described hereinafter.

[0035] In order to align the facial portion 16 of the plastic nozzle 12 to be in registration with the facial portion 36 of the sheath 30, the finger 28 is received in the groove 35 when the plastic nozzle 12 is slid into the interior space 32 of the sheath 30. This tongue-in-groove arrangement insures that the facial portions 16, 36 are in registration for mounting the injection nozzle apparatus 10 as shown in FIG. 4.

[0036] Even if one were to insert the plastic nozzle 12 into the interior space 32 such that the facial portions 16, 36 were not in alignment, then merely rotating the plastic nozzle 12 while it is in the interior space 32 and applying pressure to the nozzle 12 so that upon registration of the finger 28 with the groove 35 the nozzle 12 will slip into position and be seated so that the facial portions 16, 36 are in registration.

[0037] Once the plastic nozzle 12 is seated in the interior space 32 of the sheath 30, the nut 38 can be threaded down to the threaded portion 34 until such time as the flange 20 is seated securely within the nut 38.

[0038] A delivery tube 40 constructed of stainless steel has a bore 42 or passageway extending therethrough. Both ends of the bore 42 are open-ended with a length of the delivery tube 40 sized and shaped to be received within the central bore 18 of the plastic nozzle 12. When such occurs, the bore 42 is in registration with the central bore 18. One end of the delivery tube 40 is provided with a nipple 44 to be received by and seated into a flexible conduit from which the liquid cryogen is provided.

[0039] A flexible hose 46 or conduit has a passageway 48 extending therethrough and through which liquid cryogen is provided from a remote source (not shown). One end of the flexible hose 46 is provided with a stainless steel receptacle 50 in communication with the passageway 48 and sized and shaped to receive the nipple 44 of the delivery tube 40.

[0040] A stainless steel nut 52 is used to be threadably engaged with the metallic threaded portion 14 of the plastic nozzle. Accordingly, liquid cryogen can flow through the passageway 48 into the bore 42 and through the channels 22 to be exhausted from the apertures 24 into a mixer 60 as shown in FIG. 4.

[0041] Referring to FIG. 4, the plastic nozzle apparatus 10 is shown assembled and mounted for use with the mixer 60. The flange 20 provides a surface for the nut 38

to bear against when it is threadably engaged to the threaded portion 34 of the sheath 30. The plastic flange 20 provides a plastic thermobreak surface between the metallic nut 38 and metallic threaded portion 34. The liquid cryogen may be introduced into the flexible hose 46 from a stand pipe 54 or manifold constructed and arranged external to the mixer 60.

[0042] As shown in FIG. 4, the liquid cryogen transiting through the passageway 42 of the delivery tube 40 and then through the channels 22 becomes exposed to the warmer contents in a chamber 62 of the mixer 60 so that some of the liquid cryogen flashes resulting in liquid, solid and gaseous phases of the cryogen being disbursed in a spray pattern 70 within the chamber 62. The facial portion 16 having the plurality of apertures 24 is exposed to the chamber 62 of the mixer 60.

[0043] The sheath 30 being constructed of stainless steel is disposed through a hole 64 or port formed in a side wall 66 of the mixer 60. The side wall 66 defines the chamber 62 and includes an outer surface 61 and an inner surface 63. The sheath 30 is accordingly welded to the outer and inner surfaces 61, 63 of the side wall 66 where it is introduced therethrough to form a seal at the side wall 66.

[0044] A perimeter 68 or edge of the facial portion 36 of the sheath 30 can be formed, such as by grinding, to conform substantially to the inner surface 63 of the side wall 66. Such construction substantially reduces if not eliminates areas where product in the chamber 62 can become trapped and accumulate.

[0045] The plastic nozzle 12 substantially functions as a thermobreak and reduces if not eliminates the conduction of the extreme cold of the liquid cryogenic substance from causing ice and snow build-up at an exterior of the sheath 30, the facial portion 16 of the nozzle 12, and the side wall 66 of the chiller.

[0046] The plastic nozzle 10 of the present embodiments will substantially reduce if not eliminate extreme cold from the liquid nitrogen or liquid carbon dioxide being conducted from the pipeline or conduit to the chiller wall and reduce if not substantially eliminate food products in the chiller from sticking or adhering to the nozzle 12 and the blender wall. This results in a more uniform temperature distribution through the food products in the mixer 60.

[0047] In addition, the plastic nozzle 12 will substantially reduce the chances of the chiller wall from being distorted or deflecting from the extreme cold temperatures of the cryogenic substance. Liquids in the mixer 60 will be prevented from freezing to the nozzle 12 due to the plastic composition of same, and in that regard, food product in the mixer will not stick to the apertures 24 of the nozzle 12 due to the plastic construction.

[0048] The absence of ice build-up will prevent damage to the chiller agitators, whether some are paddle-type, ribbon-type or plastic scraped surface-type. This also results in improved hygiene with respect to the nozzle 12 and as mentioned above, permits the nozzles 12

to thaw faster upon cessation of chilling operations and to be removed from the sheath 30 for cleaning, maintenance and repair.

[0049] It will be understood that the embodiments described herein are merely exemplary, and that one skilled in the art may make variations and modifications without departing from the spirit and scope of the present invention. All such variations and modifications are intended to be included within the scope of the present invention as described and claimed herein. Further, all embodiments disclosed are not necessarily in the alternative, as various embodiments of the present invention may be combined to provide the desired result.

List of reference numerals

[0050]

10	injection nozzle or injection nozzle apparatus, in particular plastic injection nozzle apparatus	20
12	nozzle, in particular plastic nozzle, for example plastic body portion	
14	second end, in particular threaded portion, for example metallic threaded portion, of nozzle 12	
16	first end, in particular facial portion, for example angled and/or plastic facial portion, of nozzle 12	25
18	bore or passageway, in particular central bore or central passageway	
20	flange or washer, in particular metallic washer or plastic washer	30
22	channel	
24	aperture or hole	
26	longitudinal axis, in particular central longitudinal axis	
28	finger or tongue	35
30	housing or sheath	
32	space, in particular interior space	
34	threaded portion, in particular exterior threaded portion	
35	groove or receptacle	40
36	facial portion, in particular angularly cut facial portion and/or an angled metallic facial portion, of housing or sheath 30	
38	nut, in particular metallic nut	
40	delivery tube	45
42	bore or passageway	
44	nipple	
46	hose or conduit, in particular flexible hose or flexible conduit	
48	passageway	50
50	receptacle, in particular stainless steel receptacle	
52	nut, in particular stainless steel nut	
54	stand pipe or manifold	
60	mixer	
61	outer surface of side wall 66	55
62	chamber	
63	inner surface of side wall 66	
64	hole or port	

66	side wall
68	perimeter or edge
70	spray pattern

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Claims

1. An injection nozzle (10), comprising:

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- a plastic body portion (12) having a first end (16) and a second end (14) opposed to the first end (16);
- a bore or passageway (18) extending through the plastic body portion (12) and having a first opening proximate the first end (16) and a second opening at the second end (14); and
- a plurality of channels (22) in communication with the first opening, each one of the plurality of channels (22) terminating in a corresponding aperture (24) at the first end (16).

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2. The injection nozzle according to claim 1, wherein the plurality of channels (22) are arranged in a dispersing pattern from the first opening, in particular to subscribe an arc of about sixty degrees.

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3. The injection nozzle according to claim 1 or 2, wherein a central one of the apertures (24) which is in communication with the bore or passageway (18) is aligned essentially with a longitudinal axis (26) of the plastic body portion (12).

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4. The injection nozzle according to at least one of claims 1 to 3, wherein the first end (16) comprises a facial portion in which the apertures (24) are disposed.

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5. The injection nozzle according to claim 4, wherein the facial portion of the first end (16) is an angled and/or plastic facial portion.

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6. The injection nozzle according to at least one of claims 1 to 5, wherein the plastic body portion (12) comprises an, in particular metallic, threaded portion at the second end (14) for being releasably engaged to an, in particular mechanical, fastener.

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7. The injection nozzle according to at least one of claims 1 to 6, further comprising a finger or tongue (28) disposed and protruding from the second end (14).

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8. The injection nozzle according to claim 7, wherein the finger or tongue (28)

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- is constructed

-- of the same material as the plastic body

- portion (12) or
-- of stainless steel, and/or
- extends from a flange or washer (20), with which a section of the plastic body portion (12) is provided. 5
9. The injection nozzle according to at least one of claims 1 to 8, further comprising a housing or sheath (30) having a sidewall defining an open ended space therein sized and shaped to receive the plastic body portion (12). 10
10. The injection nozzle according to claim 9, wherein the housing or sheath (30) is a metallic housing or metallic sheath. 15
11. The injection nozzle according to claim 4 or 5 and to claim 9 or 10, wherein the housing or sheath (30), in particular the sidewall, comprises a facial portion (36) in registration with the facial portion of the first end (16). 20
12. The injection nozzle according to claim 11, wherein the facial portion (36) of the housing or sheath (30) is an angularly cut facial portion and/or an angled metallic facial portion. 25
13. The injection nozzle according to at least one of claims 9 to 12, wherein the housing or sheath (30) comprises a threaded portion (34) at the sidewall for being releasably engaged to an, in particular mechanical, fastener. 30
14. The injection nozzle according to claim 13, wherein a nut (38) is threadably engaged with the threaded portion (34) of the housing or sheath (30), in particular in order to removably mount the plastic body portion (12) in an interior space (32) of the housing or sheath (30). 35 40
15. The injection nozzle according to claim 7 or 8 and to at least one of claims 9 to 14, wherein the housing or sheath (30), in particular the threaded portion (34), comprises a groove or receptacle (35) disposed to be in registration with and receive the finger or tongue (28), in particular in order to removably mount the plastic body portion (12) in an interior space (32) of the housing or sheath (30). 45 50

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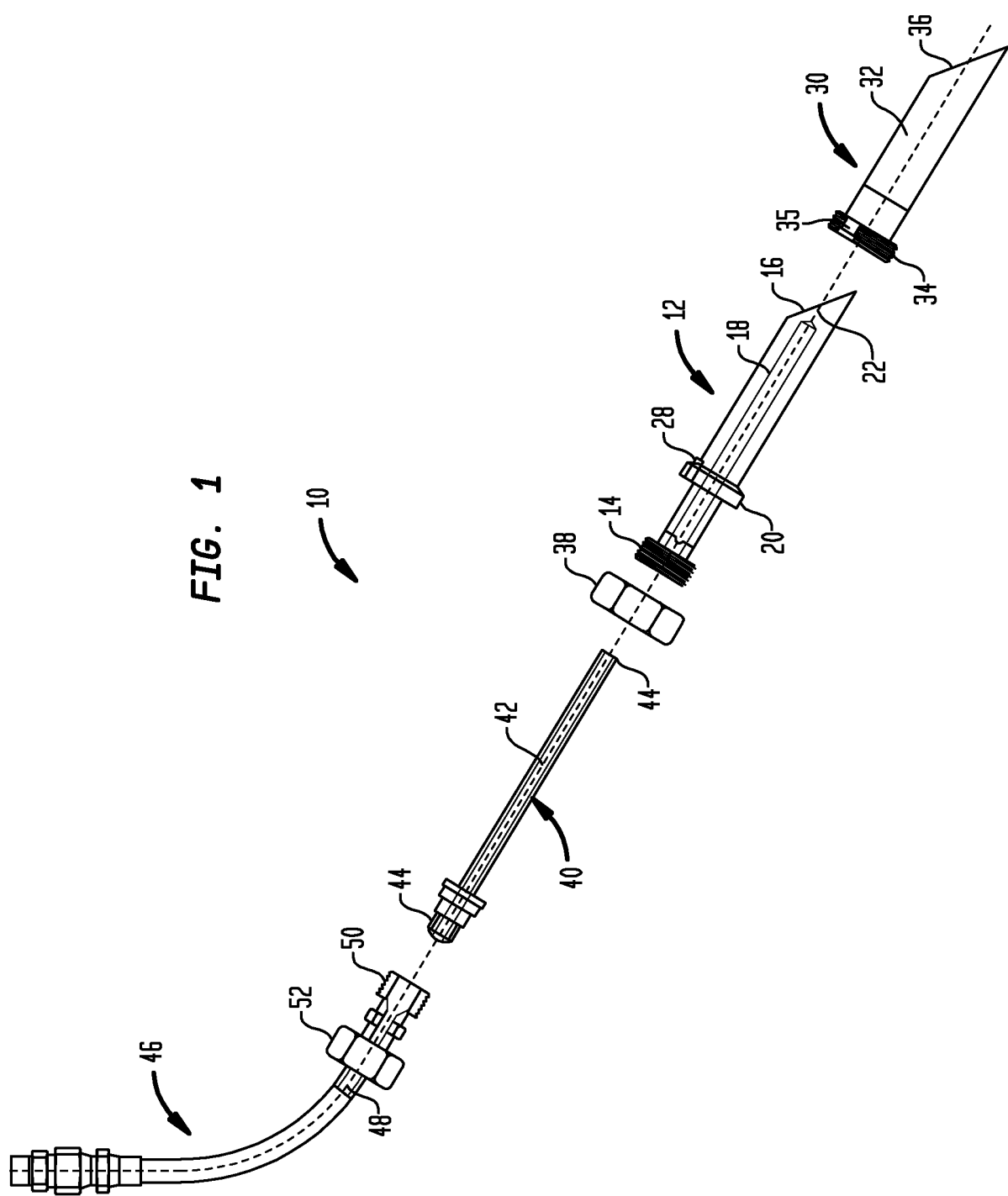


FIG. 2

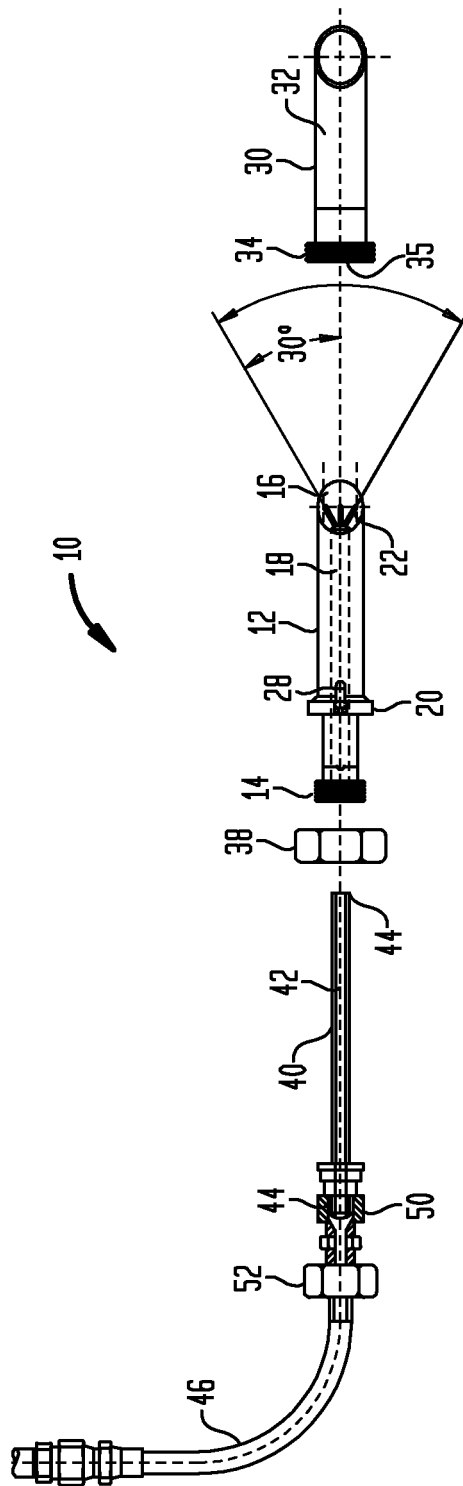


FIG. 3

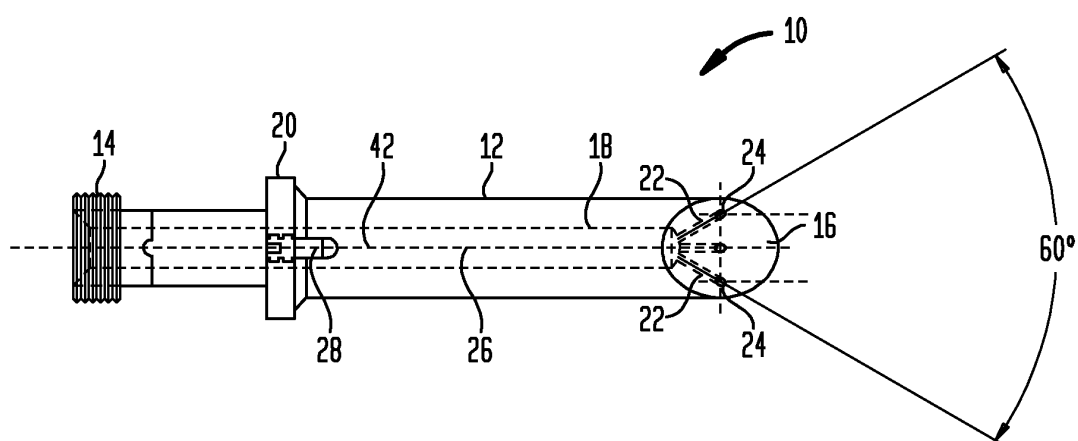
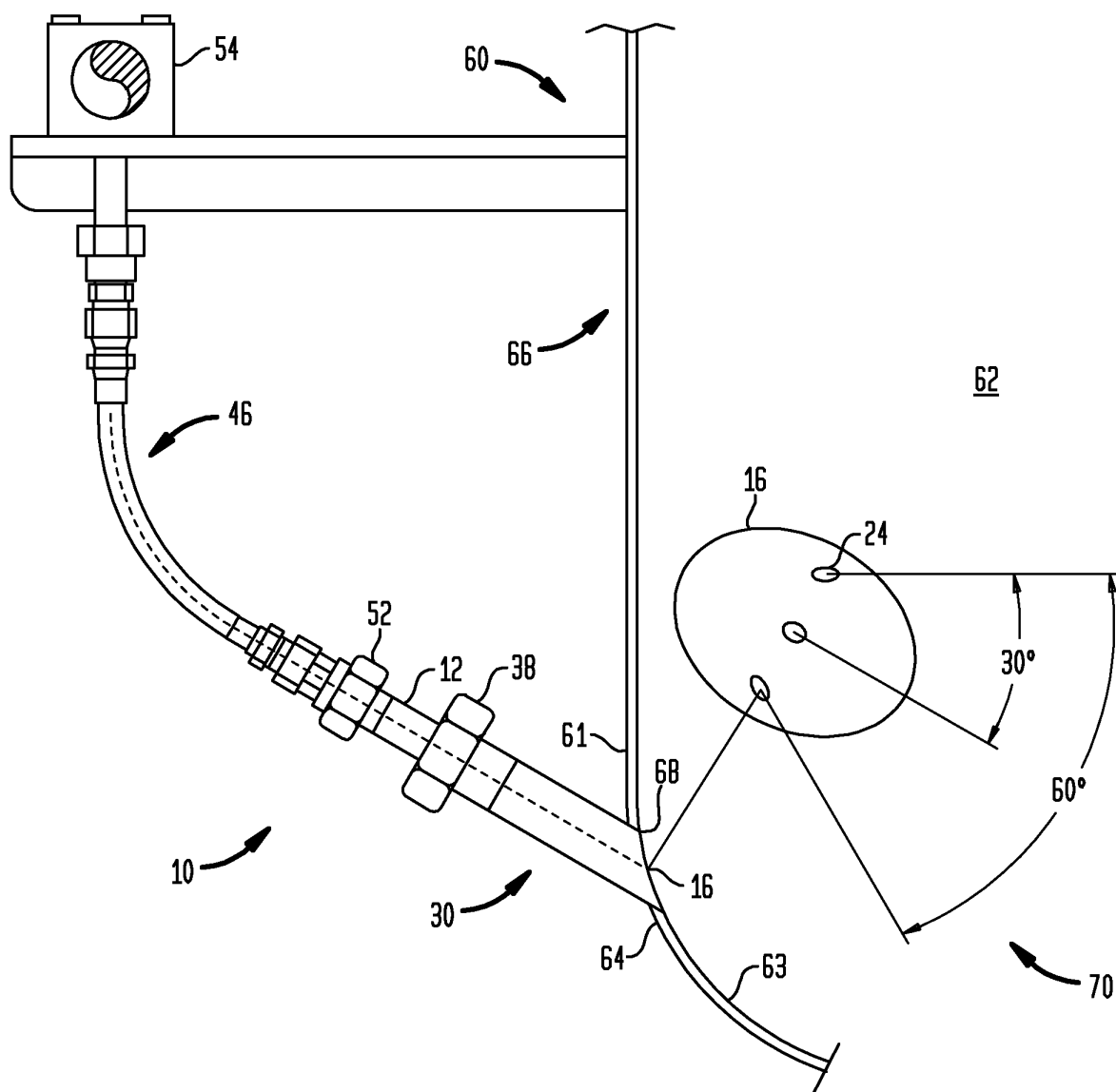


FIG. 4





EUROPEAN SEARCH REPORT

Application Number
EP 13 15 0894

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 27 June 2013	Examiner Barré, Vincent
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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