

(19) **DANMARK**

(10) **DK/EP 3965942 T3**



Patent- og
Varemærkestyrelsen

(12) Oversættelse af
europæisk patentskrift

-
- (51) Int.Cl.: **B 05 B 1/04 (2006.01)**
- (45) Oversættelsen bekendtgjort den: **2023-05-30**
- (80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2023-04-19**
- (86) Europæisk ansøgning nr.: **20728636.0**
- (86) Europæisk indleveringsdag: **2020-05-08**
- (87) Den europæiske ansøgnings publiceringsdag: **2022-03-16**
- (86) International ansøgning nr.: **US2020032195**
- (87) Internationalt publikationsnr.: **WO2020231847**
- (30) Prioritet: **2019-05-10 US 201962846055 P**
- (84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**
- (73) Patenthaver: **Spraying Systems Co., North Avenue and Schmale Road , P.O. Box 7900, Wheaton, IL 60187-7901, USA**
- (72) Opfinder: **ARENSON, Marc, 1530 Stockton Ct., Bartlett, Illinois 60103, USA**
CEDERBERG, Daniel, 1609 Deer Pointe Dr. South, Elgin, Illinois 60177, USA
- (74) Fuldmægtig i Danmark: **Novagraaf Brevets, Bâtiment O2, 2 rue Sarah Bernhardt CS90017, F-92665 Asnières-sur-Seine cedex, Frankrig**
- (54) Benævnelse: **BREDVINKLET SPRØJTEDYSE**
- (56) Fremdragne publikationer:
US-A- 5 921 472
US-A1- 2006 186 232

DESCRIPTION

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims benefit of U.S. Provisional Application Serial No. 62/846,055, filed May 10, 2019, entitled "WIDE ANGLE SPRAY NOZZLE".

BACKGROUND OF THE INVENTION

[0002] Spray devices have long been used in the agricultural industry for spraying liquids such as pesticides, herbicides and fungicides. One example of such a spray device is a backpack sprayer having a handheld wand that an operator uses to apply agrichemicals to the plants. The wand typically uses a spray nozzle that has a relatively narrow spray angle with a tapered distribution pattern. While inexpensive, this kind of backpack spray device has a number of drawbacks. For example, the nozzle configuration can lead to inconsistent spray coverage of the plants leading to poor efficacy of the treatment. The narrow spray angle can also require an operator to make numerous passes in order to apply the chemicals to a given area. As a result, the chemical application operation can be time consuming and thus more costly. See for example US2006/186232.

OBJECTS OF THE INVENTION

[0003] In view of the foregoing, a general object of the present invention is to provide a spray nozzle for a spray device that has improved spray coverage leading to a more efficacious application of liquids than achieved with existing sprayers used in agricultural applications.

[0004] A related object of the present invention is to provide a spray nozzle for a spray device that produces a relatively wide distribution pattern such that liquids may be applied in a more efficient and less time consuming manner than with existing sprayers used in a agricultural applications.

[0005] A further object of the present invention is to provide a spray nozzle for a spray device that produces an even spray distribution.

[0006] Another object of the present invention is to provide a spray nozzle for a spray device that can be manufactured at a relatively low cost.

[0007] Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings. The identified objects are not intended to limit the present invention.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS**[0008]**

FIG. 1 is a perspective view of an operator using an exemplary backpack spray device having a wand with a spray nozzle according to the teachings of the present invention.

FIG. 2 is a partial perspective view of the wand of the spray device of FIG. 1 showing the spray nozzle.

FIG. 3 is a perspective view of the spray nozzle of FIG. 2.

FIG. 4 is a cross-sectional, perspective view of the spray nozzle of FIG. 2.

FIG. 5 is an end view of the spray nozzle of FIG. 2 showing the discharge end of the nozzle.

FIG. 6 is an end view of the spray nozzle of FIG. 2 showing the inlet end of the nozzle.

FIG. 7 is a side elevation view of the spray nozzle of FIG. 2.

FIG. 8 is a side elevation view of the spray nozzle of FIG. 2 showing the side of the nozzle opposite the side shown in FIG. 7.

FIG. 9 is another side elevation view of the spray nozzle of FIG. 2 showing the side rotated 90° from the side shown in FIG. 7.

FIG. 10 is another side elevation view of the spray nozzle of FIG. 2 showing the side of the nozzle opposite the side shown in FIG. 9.

FIG. 11 is a perspective view of a further embodiment of a spray nozzle according to the present invention.

FIG. 12 is an end view of the spray nozzle of FIG. 11 showing the discharge end of the nozzle.

DETAILED DESCRIPTION OF THE INVENTION

[0009] Referring to FIGS. 1 and 2 of the drawings, there is shown an exemplary embodiment of a spray device 10 having a spray nozzle 12 (best seen in FIG. 2) configured in accordance with the present invention. The illustrated spray device 10 is a backpack sprayer that is particularly suited for discharging chemicals such as pesticides, herbicides and fungicides in agricultural and lawn and garden care environments. However, the present invention is not limited to the spraying of such liquids or use in such environments. Rather, the spray nozzle 12 of the present invention is intended for spraying any suitable liquid in which a wide angle and

even distribution pattern may be advantageous. Moreover, the spray nozzle 12 of the present invention is not limited to use with backpack sprayers. To the contrary, the spray nozzle 12 of the present invention may, for example, be used with a wheeled spray device which may or may not be self-propelled or may be one of a plurality of spaced apart nozzles on, for example, a boom of such a sprayer.

[0010] In the embodiment illustrated in FIG. 1, the backpack spray device 10 generally includes a reservoir 14 for storing the liquid that will be sprayed. The reservoir 14 in this case has attached shoulder straps 16 (one of which can be seen in FIG. 1) configured for supporting the reservoir 14 on the back of a user. The fluid reservoir 14 may have other configurations depending on the application including, for example, handheld and wheeled configurations. A spray wand 18 which the operator may use to direct the liquid being sprayed is attached to the reservoir 14 via a flexible conduit 20 which is in fluid communication with the reservoir 14. The wand 18 may be equipped with an actuating device (not shown) configured to trigger discharge of the fluid in the reservoir 14. The wand 18 may also have different configurations depending on the application including, for example, being configured as a spray gun.

[0011] For discharging the liquid, a distal end of the wand 18 is equipped with a spray nozzle 12 as shown in FIG. 2. In the illustrated embodiment, the spray nozzle 12 is attached to the end of the wand 18 by a mounting nut 22 that can be received on a threaded end (not shown) of the wand 18. As shown in FIG. 3, a flange 24 may be provided at an upstream (with reference to the direction of fluid flow), inlet end 26 of the spray nozzle 12. This flange 24 may be captured at the distal end of the wand 18 by the mounting nut 22 to secure the spray nozzle 12 to the wand 18 with a body 28 of the spray nozzle 12 protruding through the central opening of the mounting nut 22.

[0012] For metering the rate of flow of fluid into the spray nozzle 12, a flow control element 30 is provided at the inlet end 26 of the spray nozzle 12 as shown in FIGS. 4 and 6. In the illustrated embodiment, the flow control element 30 consists of a disc-shaped member that is received in the inlet end 26 of the spray nozzle 12. The illustrated flow control element 30 is configured as an insert that is a separate piece from the remainder of the nozzle body 28. However, in an alternative embodiment, the flow control element 30 may be integrally formed with the nozzle body 28. The flow control element 30 includes a centrally disposed pre-orifice 32 through which fluid enters the nozzle body 28. In operation, this pre-orifice 32 produces a first pressure drop of the fluid supplied from the reservoir as it enters the nozzle body 28. The size of the central pre-orifice 32 may be varied in order to provide a desired flow capacity for the spray nozzle 12.

[0013] As best shown in FIGS. 3, 4, 7 and 8, the body 28 of the spray nozzle 12 includes an upstream cylindrical portion 34 and a downstream convex portion 36. The cylindrical portion 34 and the convex portion 36 together define an internal fluid passage 38 extending from the inlet end 26 to a discharge end 40 of the spray nozzle 12 as shown in FIG. 4. The pre-orifice 32 in the flow control element 30 communicates with the internal fluid passage 38 at a downstream

end thereof. The cylindrical portion 34 of the internal fluid passage 38 is configured to allow fluid to build up in the nozzle body 12. As it builds up, the fluid in the cylindrical portion 34 of the internal fluid passage 38 loses velocity. The length of the cylindrical portion 34 may be varied based on the desired flow rate for the spray nozzle with longer lengths of the cylindrical portion 34 corresponding to greater flow rates. According to one embodiment, the cylindrical portion 34 may have a length of approximately 0.35 inches. In turn, the convex portion 36, which is arranged downstream of the cylindrical portion 34 and terminates in a dome-shaped end wall 42, provides a second pressure drop for the fluid being sprayed. The convex portion 36 is also configured to provide atomization of the fluid in the spray nozzle 12. In one embodiment, the spray nozzle 12 is configured to have an operating pressure of approximately 0.75 to approximately 2.0 bar.

[0014] For producing a wide angle and even distribution pattern, two discharge orifices 44, 46 are provided in the dome-shaped end wall 42 of the convex portion 36 of the nozzle body 28. The two discharge orifices 44, 46 are offset from each other on opposite sides of the apex 48 of the dome shaped end wall 42 as shown in the end view of FIG. 5. In particular one discharge orifice 44 is arranged on a first side 50 of the end wall 42 shown in FIG. 7 while the other discharge orifice 46 is arranged on a second side 52 of the end wall 42 shown in FIG. 8. The two discharge orifices 44, 46 are identically configured, but extend in opposite, substantially parallel, directions.

[0015] Each discharge orifice 44, 46 has an elongated slit-like configuration that widens as it extends from a first end 54, 55 to a second end 56, 57 with the edges of each orifice 44, 46 extending in an arc over the dome-shaped end wall 42. In this case, each discharge orifice 44, 46 widens continuously as it extends from the first end 54, 55 to the second end 56, 57. In the illustrated embodiment, the second end 56, 57 of each discharge orifice 44, 46 (representing the relatively wider end of the discharge orifice 44, 46) is near the transition 60 between the cylindrical portion 34 and the convex portion 36 of the nozzle body 28 (i.e., the upstream end of the convex portion). The opposing first end 54, 55 of each discharge orifice 44, 46 (representing the relatively narrower end of the discharge orifice 44, 46) is at a further downstream portion of the end wall 42 that is relative closer to the apex 48 of the end wall 42. The two discharge orifices 44, 46 each extend to a sufficient length that a substantial portion of the orifices 44, 46 overlap with one another when viewed in the first and second directions 50, 52 (represented by FIGS. 7 and 8). However, the two discharge orifices 44, 46 do not overlap along their entire length as shown in FIG. 5. Additionally, as shown in FIGS. 9 and 10, the discharge orifices 44, 46 are configured such that the centerline 62, 63 of each orifice 44, 46 is at an acute angle with respect to the longitudinal axis 64 of the nozzle body.

[0016] In one embodiment, the center of each discharge orifice 44, 46 at its respective base is spaced less than approximately 0.1 inches from the longitudinal axis 64 of the nozzle body 28 and more specifically approximately 0.08 inches from the longitudinal axis 64 of the nozzle body 28. In another embodiment, the centerline of each discharge orifice 44, 46 is at an angle of less than approximately 10° relative to the longitudinal axis 64 of the nozzle body 28 and more particular at an angle of approximately 7.5° relative to the longitudinal axis 64 of the

nozzle body 28. In one embodiment, each discharge orifice 44, 46 is approximately 0.23 inches long when measured in a horizontal plane that extends perpendicular to the longitudinal axis 64 of the nozzle body 28. In yet another embodiment, the width of each discharge orifice 44, 46 may be approximately three times greater at the second end 56, 57 than the width at the first end 54, 55. According to one exemplary embodiment, the discharge orifices 44, 46 are approximately .01 inches at the first end 54, 55 and approximately .03 inches at the second end 56, 57. The widths of the two discharge orifices 44, 46 may be adjusted to provide a desired flow rate capacity with relatively wider orifices providing a relatively higher flow rate capacity. It should be understood that all of these dimensions are with reference to exemplary embodiments of the spray nozzle.

[0017] In operation, the two discharge orifices 44, 46 together produce an even fan-shaped spray pattern with the overlapping, relatively narrower portions of the discharge orifices producing the center of the spray pattern while the relatively wider ends of the discharge orifices produce the opposing ends of the spray pattern. The disclosed discharge orifice configuration produces a spray pattern with a relatively wide angle and an even distribution. Such a pattern can allow an operator to discharge liquid evenly over a relatively wide area simply by traversing the area in straight paths with each traverse of the area starting at the edge of spray pattern produced by the previous path.

[0018] A further embodiment of a spray nozzle 112 according to the present invention is shown in FIGS. 11 and 12. To assist an operator in orienting the spray nozzle 112 during spraying operations, the spray nozzle 112 of FIGS. 11 and 12 is configured with an orientation feature, which in this case comprises an orientation rib 170 that extends outward from the exterior surface of the dome-shaped end wall 142 of the nozzle body 128. In the illustrated embodiment, the orientation rib 170 extends across the exterior surface of the dome-shaped end wall 142 through the apex and midway between the two discharge orifices 144 and 146. The orientation rib 170 further includes two side portions 172 each of which extends down the length of the cylindrical portion 134 of the nozzle body 128 to the flange 124. One of the side portions 172 is visible in FIG. 11 and an identical second side portion (a portion of which can be seen in FIG. 12) is spaced 180 degrees opposite the first side portion on the cylindrical portion 134 of the nozzle body 128. In this case, the side portions 172 of the orientation rib 170 each have a height that tapers as the respective side portion 172 extends down the cylindrical portion 134 from the end wall 142 towards the flange 124, although side portions 172 that do not taper in height also could be used.

[0019] In use, an operator can use the orientation rib 170 to better see how the spray nozzle 112 is oriented in the spraying device with which it is being used, such as the spray wand 18 shown in FIG. 1. The orientation rib 170 also can help inform an operator the orientation of the pattern that liquid discharging from the spray nozzle 112 will take during operation. For example, with the illustrated orientation rib 170, the long edges of the fan-shaped pattern produced by the spray nozzle 112 will be parallel to the rib 170. The orientation feature can have a configuration other than the rib 170 shown in FIGS. 11 and 12 so long as it provides an operator with a visual indication of the orientation of the spray nozzle 112 and, in particular, the

orientation of the discharge orifices 144, 146 of the spray nozzle 112.

[0020] Preferred embodiments of this invention are described herein, including the best mode known to the inventors for carrying out the invention.

REFERENCES CITED IN THE DESCRIPTION

Cited references

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US62846055 [0001]
- US2006186232A [0002]

Patentkrav

1. Sprøjtedyse (12, 112), der omfatter:

5 et dyselegeme, der har en første del (34) og en anden del (36), den første del har en cylindrisk konfiguration, den anden del inkluderer en kuppelformet endevæg (42), den første og anden del af dyselegemet definerer en intern væskepassage (38), der har en indløbsende (26) og en nedstrømsende (40), som er defineret af den kuppelformede endevæg;

10 et strømningsstyringselement (30), der er arrangeret ved indløbsenheden af den interne væskepassage, strømningsstyringselement, der inkluderer en foråbning (32), hvorigennem væske kan trænge ind i den interne væskepassage af dyselegemet; og

15 første og anden udledningsåbning (44, 46, 144, 146) i den kuppelformede endevæg (42, 142), hvor hver af den første og anden udledningsåbning er arrangeret på en respektiv én af modstående første og anden side af et apeks (48) af den kuppelformede endevæg, den første og anden udledningsåbning hver har en forlænget spaltelignende konfiguration, der er relativt smallere i bredde ved en første ende (54, 55) deraf end ved en anden ende (56, 57) deraf,

20 hvor den første ende er arrangeret relativt tættere på apekset (48) end den anden ende, en del af den første og anden udledningsåbning i nærheden af den første ende (54, 55) af hver udledningsåbning, der overlapper hinanden, når de ses fra den første side mod den anden side, og første og anden udledningsåbning er i parallel relation til hinanden, og hver udvides kontinuerligt

25 som den respektive udledningsåbning strækker sig fra den første ende (54, 55) til den anden ende (56, 57) til frembringelse af en vifteformet væskeudledningsmønster fra sprøjtedysen med jævn fordeling.

30 2. Sprøjtedysen ifølge krav 1, hvor den første og anden udledningsåbning (44, 46, 144, 146) strækker sig i modsatte retninger.

3. Sprøjtedysen ifølge krav 1, hvor hver af den første og anden udledningsåbning (44, 46, 144, 146) har en respektiv midterlinje, der danner en spids vinkel med en langsgående akse af dyselegemet.
- 5 4. Sprøjtedysen ifølge krav 3, hvor midterlinjen (62, 63) af hver af den første og anden udledningsåbning danner en vinkel på mindre end 10 grader med den langsgående akse (64) af dyselegemet.
- 10 5. Sprøjtedysen ifølge krav 1, hvor hver af den første og anden udledningsåbning (44, 46, 144, 146) er cirka tre gange bredere ved den anden ende (56, 57) end ved den første ende (54, 55).
6. Sprøjtedysen ifølge krav 1, hvor strømningsstyringselementet (30) omfatter et skiveformet element, der er modtaget i indløbsenheden (26) af dyselegemet.
- 15 7. Sprøjtedysen ifølge krav 1 hvor foråbningen (32) er placeret centralt i strømningsstyringselementet (30).
8. Sprøjtedysen ifølge krav 1, hvor en orienteringsribbe (170) er tilvejebragt på en udvendig overflade af den kuppelformede endevæg (142), orienteringsribben strækker sig hen over apeks af den kuppelformede endevæg halvvejs mellem den første og anden udledningsåbning (144, 146).
- 20 9. Sprøjteanordning, der omfatter:- 25 en væskebeholder (14);
en væg (18), der er fastgjort til beholderen med en fleksibel ledning (20), der er i væskedommunikation med væskebeholderen; og
30 en sprøjtedyse (12, 112) ifølge krav 1, der er fastgjort til væggen (18) til udledning af væske fra væskebeholderen.
10. Sprøjteanordningen ifølge krav 9, som desuden omfatter skulderremme (16), der er konfigureret til at støtte beholderen (14) på en brugers ryg.

11. Sprøjteanordningen ifølge krav 9, hvor hver af den første og anden udledningsåbning (44, 46, 144, 146) har en respektiv midterlinje (62, 63), der danner en spids vinkel med en langsgående akse (64) af dyselegemet.

5

12. Sprøjteanordningen ifølge krav 11, hvor midterlinjen (62, 63) af hver af den første og anden udledningsåbning (44, 46, 144, 146) danner en vinkel på mindre end cirka 10 grader med den langsgående akse (64) af dyselegemet.

10 **13.** Sprøjteanordningen ifølge krav 9, hvor hver af den første og anden udledningsåbning (44, 46, 144, 146) er tre gange bredere ved den anden ende (56, 57) end ved den første ende (54, 55).

15 **14.** Sprøjteanordningen ifølge krav 10, hvor foråbningen (32) er placeret centralt i strømningssstyringselementet (30).

20 **15.** Sprøjteanordningen ifølge krav 9, hvor en orienteringsribbe (170) er tilvejebragt på en udvendig overflade af den kuppelformede endevæg (142), orienteringsribben strækker sig hen over apeks af den kuppelformede endevæg halvvejs mellem den første og anden udledningsåbning (144, 146), og den første og anden udledningsåbning er orienteret til at rette vifteformede sprøjtemønstre parallelt med orienteringsribben.

DRAWINGS

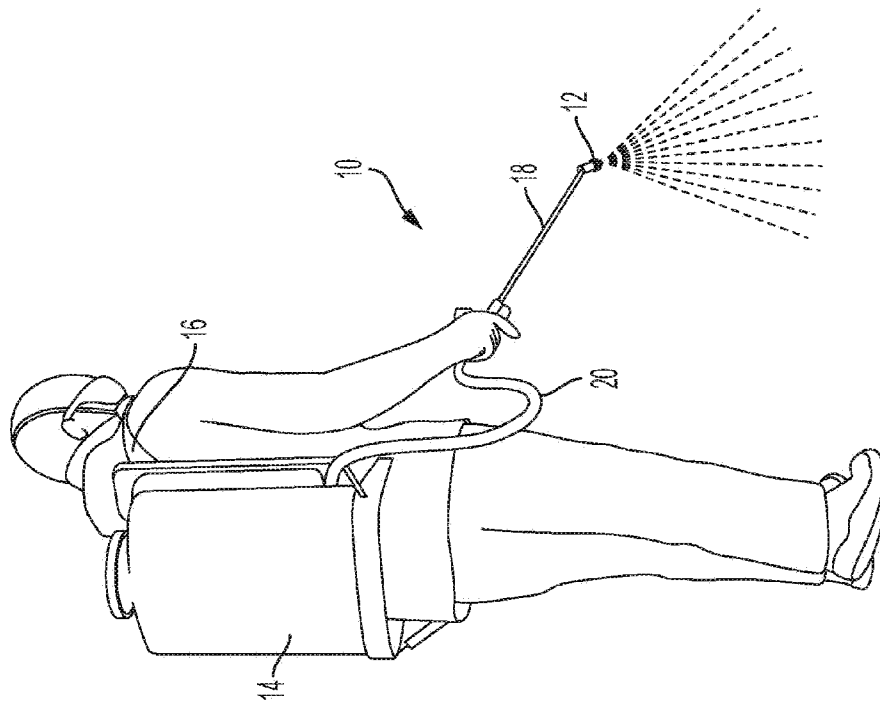


FIG. 1

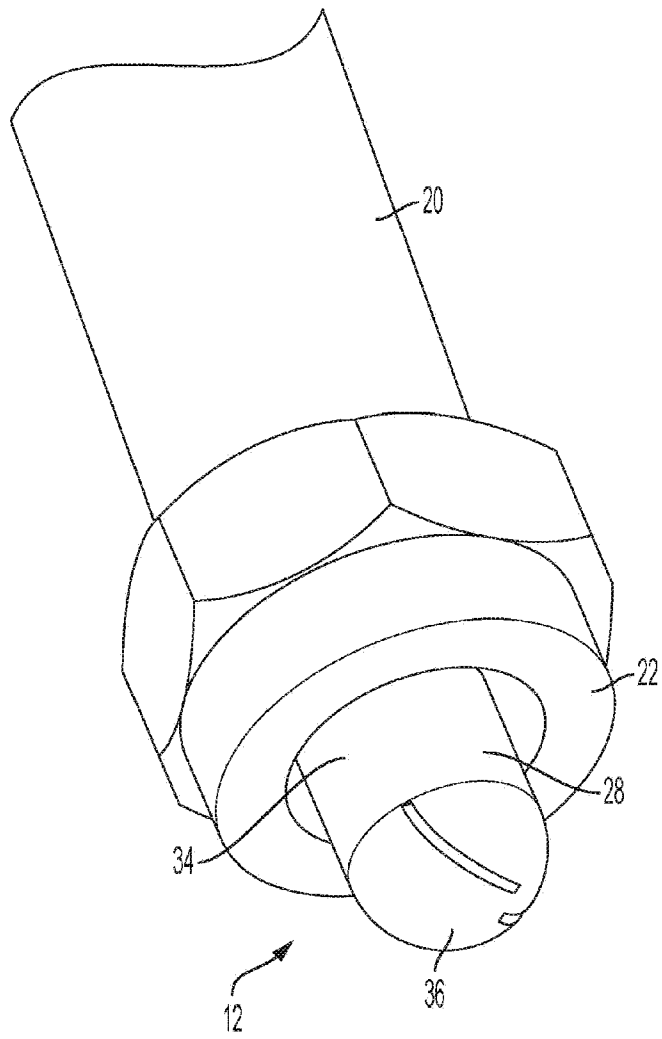


FIG. 2

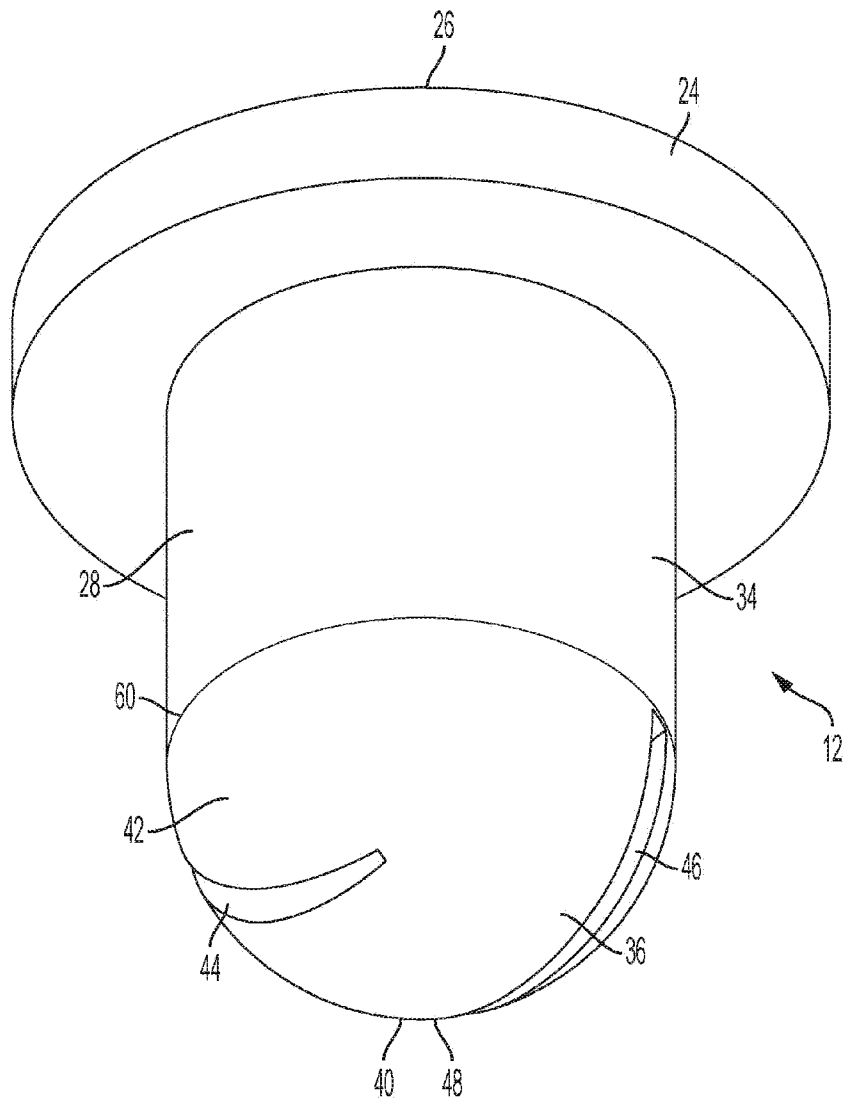


FIG. 3

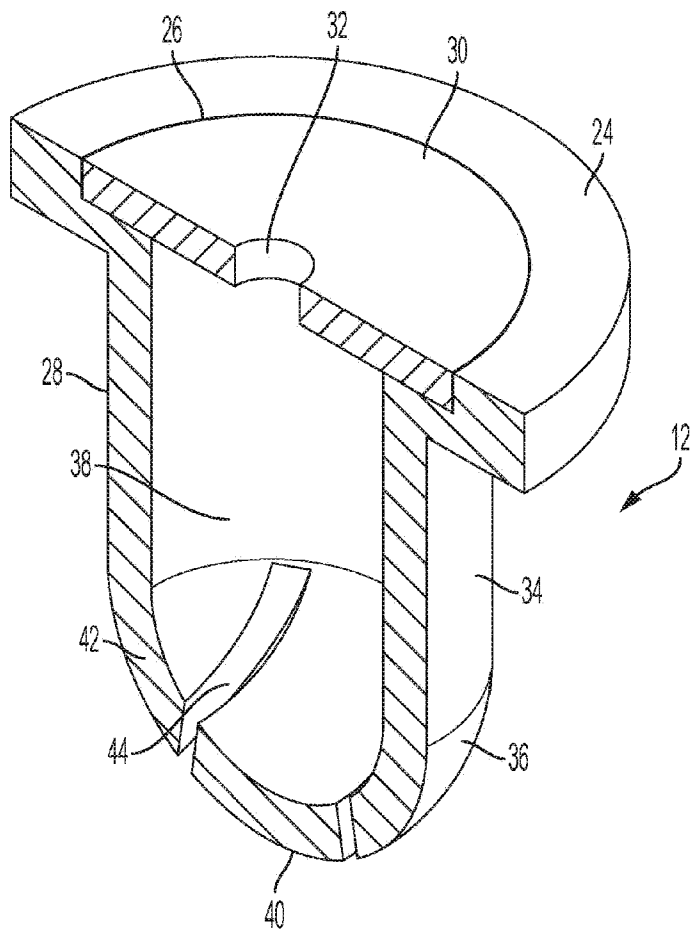


FIG. 4

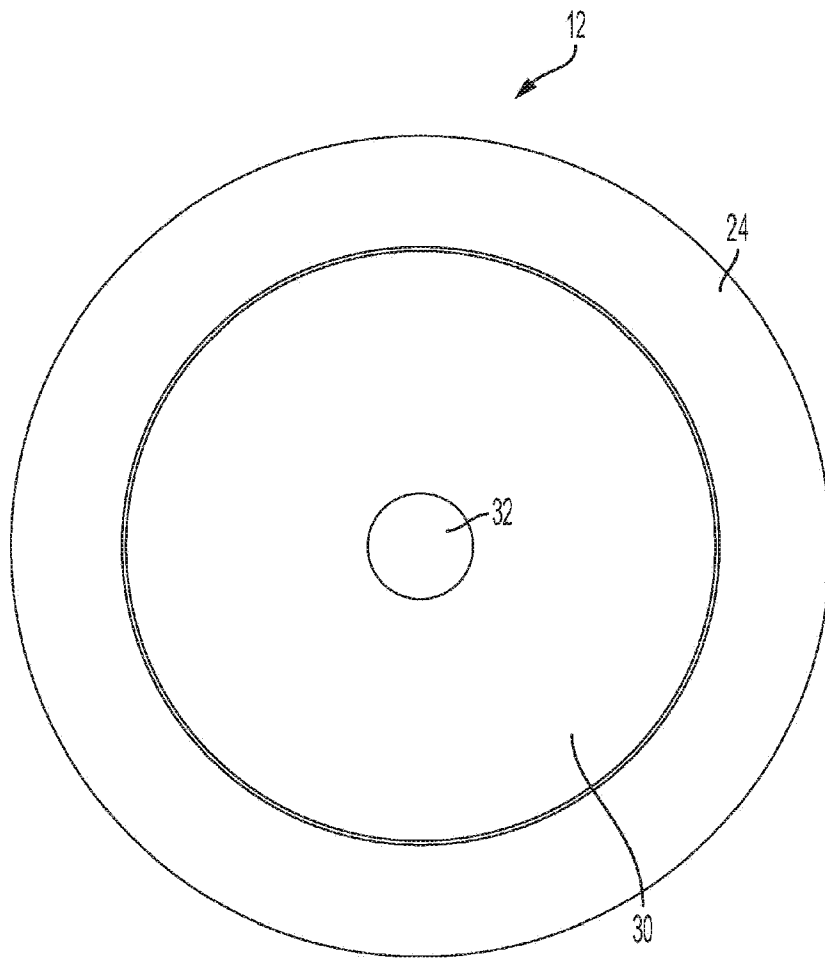


FIG. 6

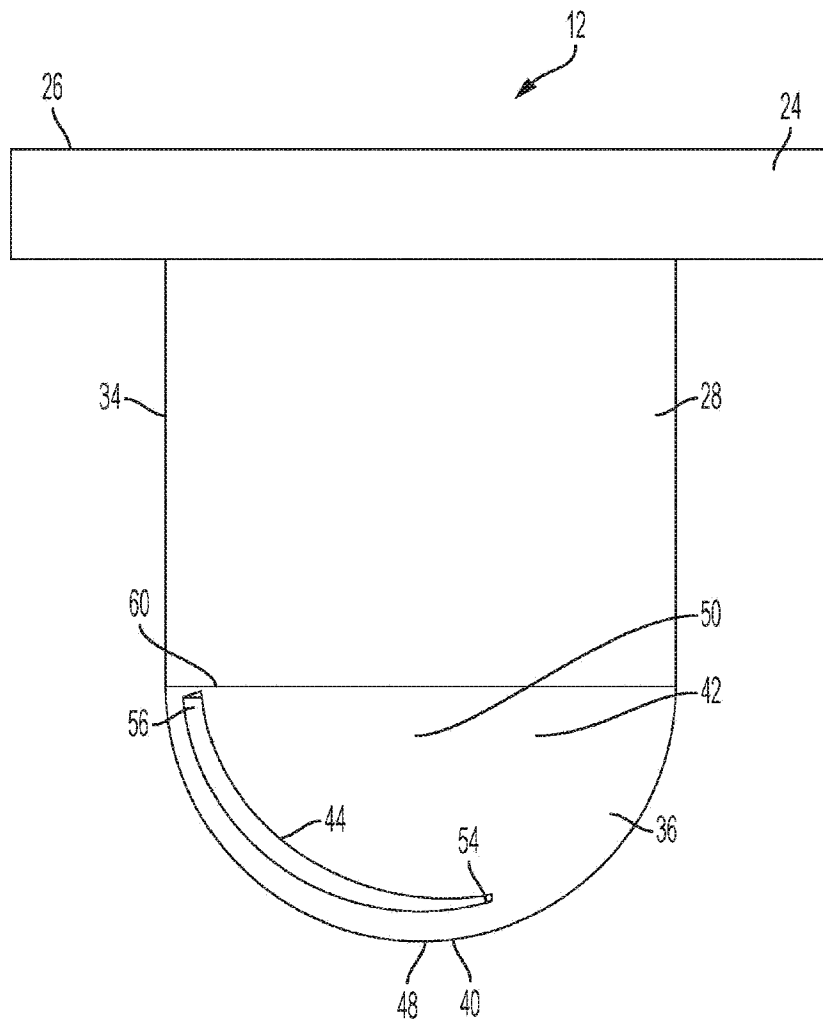


FIG. 7

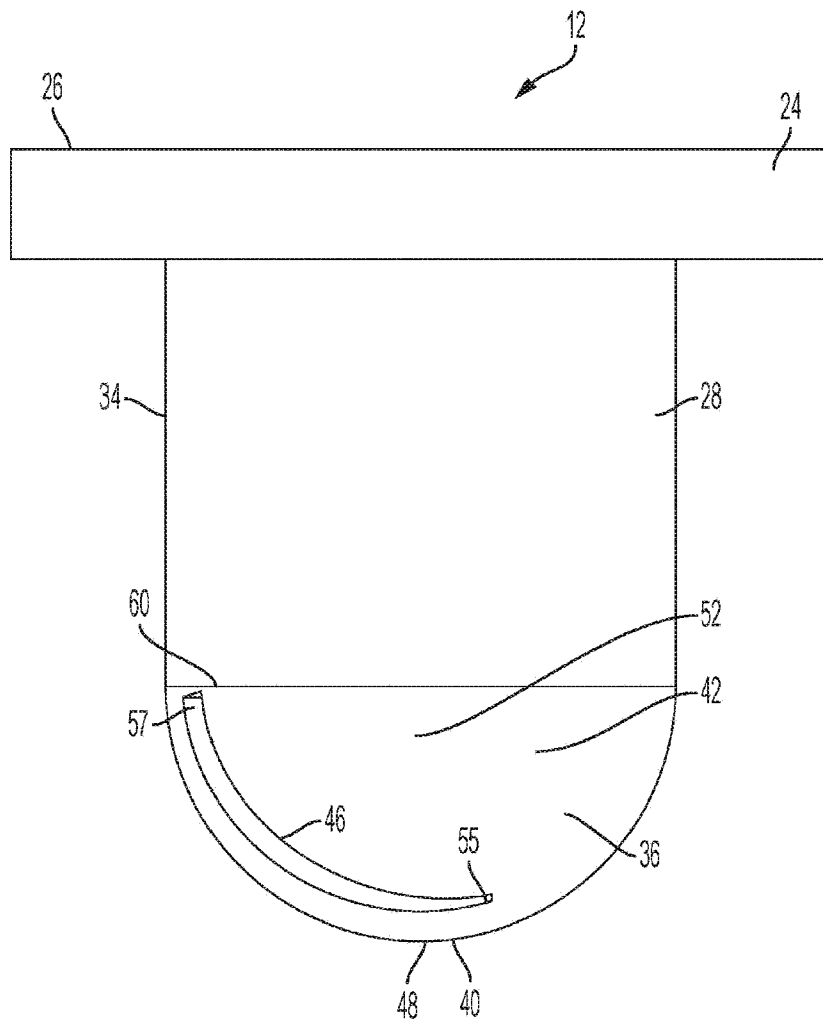


FIG. 8

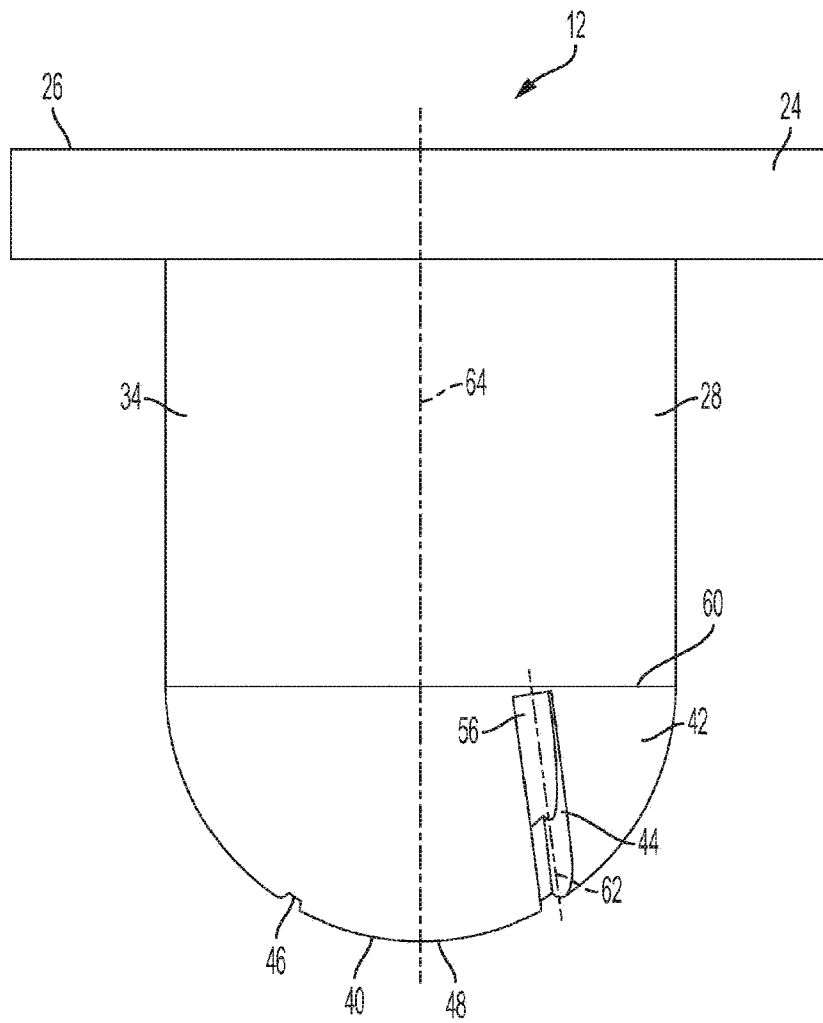


FIG. 9

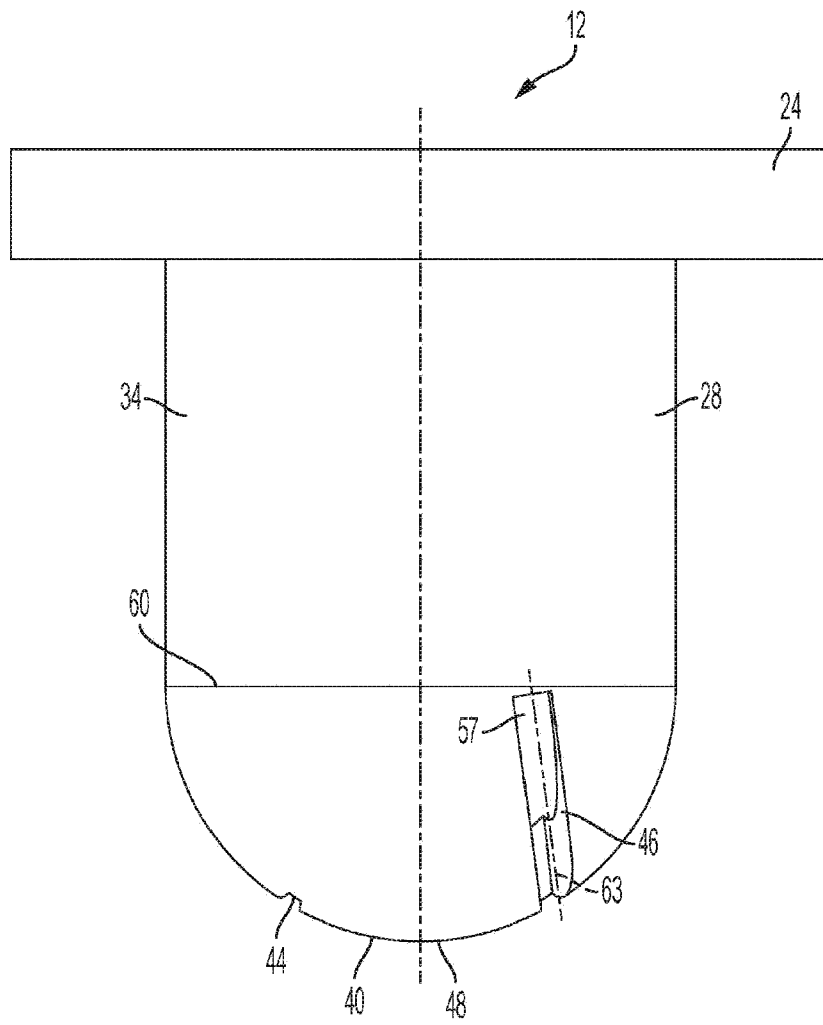


FIG. 10

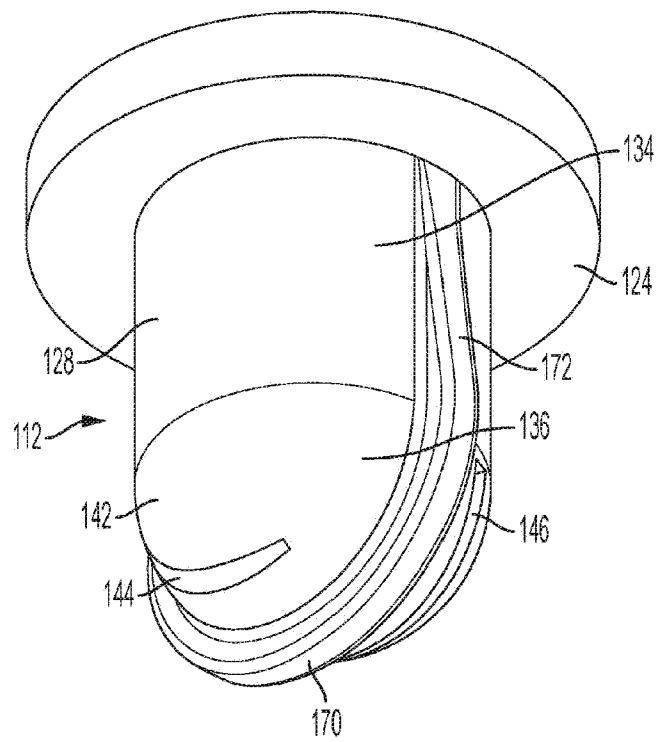


FIG. 11

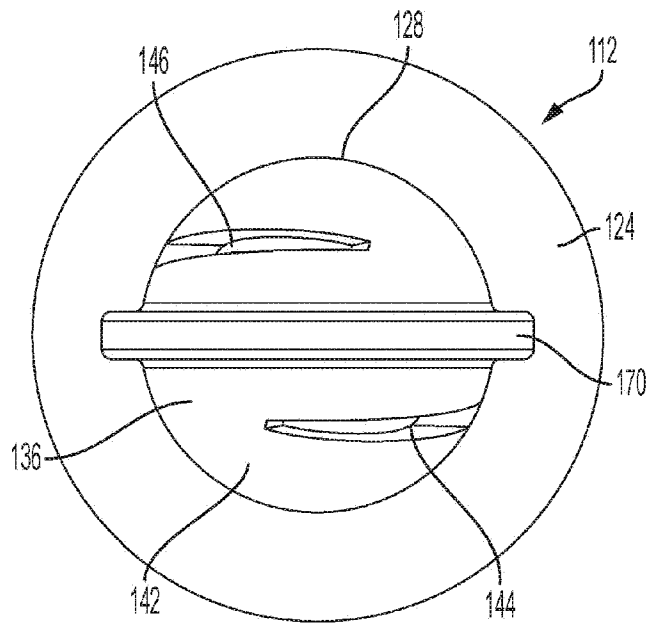


FIG. 12