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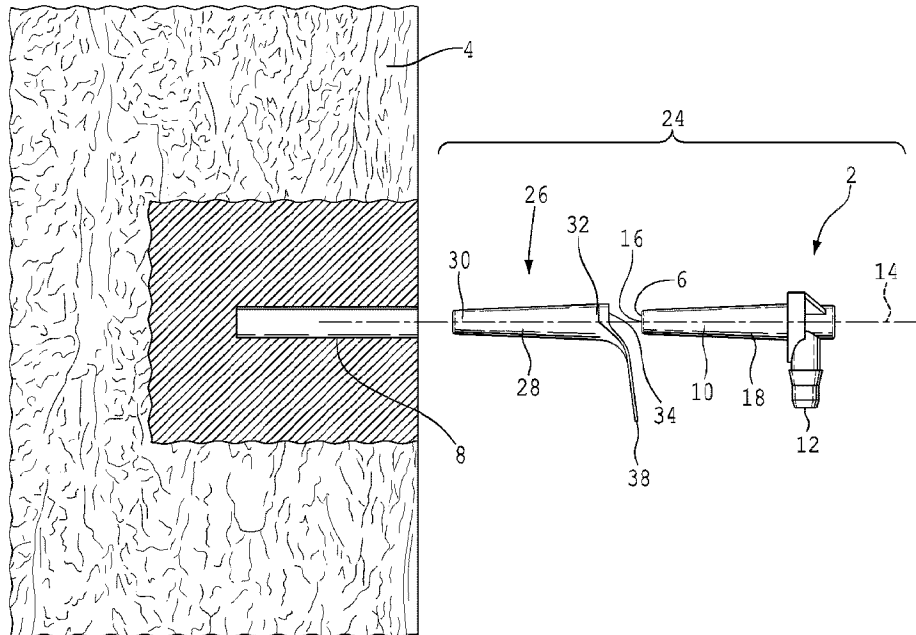
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(54) Title: SPOUT ASSEMBLY FOR TREE SAP COLLECTION AND ASSOCIATED METHOD OF USE



(57) Abrégé/Abstract:

A spout assembly including a spout and a sleeve, the sleeve of a resilient material capable of being engaged into a tap hole with the spout for collecting tree sap. The sleeve compressively deforming between the spout nose and the tap hole surface, sealing engaging the spout with the tap hole. The sleeve acting as an intermediate surface, reducing the occurrence of spout seizing and protecting the harder material of the spout, reducing wear and the occurrence of breakage of the spout. The sleeve can be designed to be removable from the spout, to contain a tongue, to be biodegradable, or a combination thereof.



Abstract

A spout assembly including a spout and a sleeve, the sleeve of a resilient material capable of being engaged into a tap hole with the spout for collecting tree sap. The sleeve compressively deforming between the spout nose and the tap hole surface, sealing engaging the spout with the tap hole. The sleeve acting as an intermediate surface, reducing the occurrence of spout seizing and protecting the harder material of the spout, reducing wear and the occurrence of breakage of the spout. The sleeve can be designed to be removable from the spout, to contain a tongue, to be biodegradable, or a combination thereof.

SPOUT ASSEMBLY FOR TREE SAP COLLECTION AND ASSOCIATED METHOD OF USE

FIELD

The improvements generally relate to tree sap collection, such as maple tree harvesting in the production of maple syrup, and more specifically to the equipment therefore.

BACKGROUND

Tree sap is generally collected from maple trees through the use of a device alternatively referred to as a spout 2, a spile, a spigot, or a tap, examples of which are presented in Figs. 1A and 1B. The expression spout will be used herein to refer to this type of device for simplicity. A tap hole 8 is drilled into a tree 4 trunk, an action commonly referred to as tapping, and the spout 2 has a hollow channel with an inlet 6 fitted into this hole 8 and from which the tree's 4 sap is collected. The portion which is fitted into the tap hole 8 can be referred to as a nose 10 or collecting portion for instance, and bears the inlet 6. The hollow channel fluidly connects the inlet 6 to an outlet 12. Depending on the shape of the spout's body, the channel can be straight or crooked, e.g. have an L-shape. In the case of bucket collection, the outlet 12 is open to the environment and the sap drips into a bucket. In vacuum collection (e.g. Fig. 1A and 1B) the sap is conveyed via hollow tubes under a partial vacuum, and under the effect of gravity. In this latter context, the outlet 12 is connected to one of these tubes, which can be referred to as a downstream tube. Some spouts 2 can have one or more additional inlets, which can be used, for instance, to connect to an upstream tube from which sap from upstream trees 4 is received and combines into the downstream flow.

Some spouts 2 are made of metal, but it is becoming more and more common nowadays to use spouts 2 which are made of plastic. Such plastic spouts 2 can have relatively low cost and be quite efficient, and for ecological and/or economic reasons many maple harvesters remove the spouts 2 from the trees 4 at the end of the season, sanitize them and re-use them the next season. Although they were satisfactory to a certain extent, existing spouts 2 have been known to suffer from some limitations.

For instance, sometimes the spout 2 seizes in the tree 4, possibly due to the action of dried sugary sap, or due to having been introduced too tightly into the tree 4, or otherwise becomes difficult to remove, causing some maple harvesters to abandon some of their spouts 2 in the trees 4 at the end of the season. Upon being forcefully removed, some
5 spouts 2 may become damaged, and/or damage the tree 4. In the case of a plastic in particular, and especially when the spout 2 has been re-used for more than one season and the plastic has aged, the interference seal made between the tree 4 and the spout 2 can become somewhat permeable, which can lead to leakage. In the case of vacuum collection for instance, such leakage, especially if it occurs at a number of tap holes 8 in the tube
10 network, may reduce the efficiency of the vacuum and may increase microbial exposure. It is difficult, once the spouts 2 have been installed, to detect which one contains an improper seal, and therefore some harvesters will prefer replacing their entire spout 2 inventory to avoid this type of scenario, thereby depriving themselves of the economic and ecological advantages associated with sanitizing and reusing the discarded spouts 2.

15 SUMMARY

It was found that providing a spout assembly 24 with a sleeve 26 of a resilient/supple material on the nose 10 of the spout 2 could alleviate at least one, or more, of the aforementioned limitations.

Accordingly, in accordance with one aspect, there is provided a spout assembly 24 for
20 collecting tree sap, the spout assembly 24 comprising a spout 2 having a tree sap path 16 extending from an inlet 6 to an outlet 12 and a straight nose 10 having the inlet 6 and an outer surface 18 extending around an axis 14 of the nose 10, and a sleeve 26 made of an elastomeric, supple material, the sleeve 26 having a body 28 portion covering and surrounding at least a portion of the outer surface 18, from a distal end 30 to a proximal end
25 32, in alignment with the axis 14, and a tongue 38 extending radially away from the axis 14 at the proximal end 32 of the body 28, wherein the body 28 of the sleeve 26 is configured for being press-fitted into a tap hole 8 of the tree 4, between the outer surface 18 of the spout 2 and the tap hole 8, when the spout 2 is engaged with the tap hole 8, the sleeve 26 being removable from the nose 10 when the spout 2 is removed from the tap hole 8.

In accordance with another aspect, there is provided a method of harvesting sap from a tree 4, the method comprising forming a tap hole 8 in a trunk of a tree 4, longitudinally engaging a sleeve 26 of resilient material onto an outer surface 18 of a nose 10 portion of a spout 2, longitudinally engaging the nose 10 portion of the spout 2, with the sleeve 26 on its outer surface 18, into the tap hole 8, harvesting sap from the tree 4 via the spout 2, and removing the spout 2 and the sleeve 26 from the tree 4, wherein said removing the sleeve 26 from the tree 4 includes gripping and pulling a transversally-extending tongue 38 of the sleeve 26.

In accordance with another aspect, there is provided a method of harvesting sap from a tree 4, the method comprising forming a tap hole 8 in a trunk of a tree 4, longitudinally engaging a sleeve 26 of resilient material onto an outer surface 18 of a nose 10 portion of a spout 2, longitudinally engaging the nose 10 portion of the spout 2, with the sleeve 26 on its outer surface 18, into the tap hole 8, harvesting sap from the tree 4 via the spout 2, and removing the spout 2 from the sleeve 26, while the sleeve 26 is in the tree 4.

In accordance with yet another aspect, there is provided a sleeve 26 for a spout 2 comprising an elongated body 28, defining a distal end 30 and a proximal end 32, and a cavity 34 defined within the body 28 and fluidly connecting the distal end 30 to the proximal end 32, the cavity 34 configured to receive at least part of a nose 10 of the spout 2 via the proximal end 32, and a tongue 38 extending radially away from an axis 14 at the proximal end 32 of the body 28.

Many further features and combinations thereof concerning the present improvements will appear to those skilled in the art following a reading of the instant disclosure.

DESCRIPTION OF THE FIGURES

In the figures,

Fig. 1A and 1B are different types of spouts;

Fig. 2A is a side exploded view of an embodiment of a spout assembly with a first spout type;

Fig. 2B is a side view of the spout assembly of Fig. 2A placed in the tap hole;

Fig. 3A is a side exploded view of an embodiment of a spout assembly with a second spout type; and

Fig. 3B is an side view of the spout assembly of Fig. 3A placed in the tap hole.

DETAILED DESCRIPTION

- 5 Fig. 1A and Fig. 1B shows examples of spouts 2 adapted to be inserted into a tree 4 tap hole 8 to collect tree sap. The spouts 2 generally comprising a nose 10 on a front portion of the spout, the nose 2 generally straight and elongated along an axis 14, an outlet 12 rearwardly from the nose 10 and a tree sap path 16, the tree sap path 16 being a hollow channel within the spout 2, fluidly connecting the inlet 6 to the outlet 12. For example, Fig. 1B shows a
- 10 spout 2 containing a frustroconical nose 10 elongated along an axis 14, the nose 10 having an opening defining the inlet 6 at its front end and defining an outer surface 18 around the axis 14. The spout shown in Fig. 1B having a tree sap path 16 fluidly connecting the inlet 6 to the outlet 12, the tree sap path 16 extending straight along the axis 14 of the nose 10 from the front end of the spout 2, rearwardly from the nose 10 and then radially to the outlet 12.
- 15 Spouts are generally made of a hard material, such as metal or hard plastic such as high impact polypropylene or nylon, to name examples, which usually has a compressive modulus well over 0.5 GPa, and typically over 1 GPa. This can, for instance, allow the spout to hold by itself and via a snug interference fit when inserted into the tap hole, as well as provide sufficient structural integrity to hold associated equipment that may apply loads
- 20 during use. Such equipment can be tubing for vacuum collection connected to a tube connector, for example in the tube connectors 20 defining the outlets 12 in spouts of Fig. 1A and Fig. 1B.

As will be discussed below, providing a sleeve of a resilient and/or supple material for use on the nose of a spout, such as the spouts presented above for instance, can be useful in some

25 embodiments. A possible use of the sleeve will now be presented in relation to an embodiment of a spout 2 such as the one shown in Fig. 1B, by reference to Fig. 2A and Fig. 2B.

Fig. 2A presents an exploded view of an embodiment of a spout assembly 24 for collecting sap from a tree 4. In this example, the spout assembly 24 includes a sleeve 26 in addition to a spout 2. The sleeve has an elongated body 28 with a hollow cavity 34 defining a generally annular cross-section throughout the sleeve's length, the elongated body 28 defining a distal end 30 and a proximal end 32. The sleeve 26 being of a resilient elastomeric supple material, such as ethylene propylene diene monomer rubber (EPDM), neoprene, nitrile or silicone, to name a few.

The sleeve 26 is longitudinally engaged with at least part of the spout 2 nose 10 via the introduction of the front end of the nose 10 through the proximal end 32 of the sleeve 26 into the hollow cavity 34, the sleeve 26 circumferentially covering and surrounding a portion of the nose 10 outer surface 18. When the inner surface of the sleeve is snugly engaged with the outer surface 18 of the spout 2, the sleeve 26 is coaxial with the axis 14 defined by the nose 10 of the spout 2. The inlet 6 of the spout 2 and the cavity 34 of the sleeve 26 fluidly connected with each other so as to create a fluid passage from the portion of the cavity 34 in front of the nose 10, in this particular case aligned with the distal end 30 of the sleeve 26, through the tree sap path 16 to the outlet 12 of the spout 2.

Attention is now brought to Fig. 2B, showing the embodiment of Fig. 2A engaged into a tap hole 8. After forming the tap hole 8 in the trunk of a tree 4, the spout assembly 24, including the sleeve 26 covering the spout's 2 nose 10, is longitudinally inserted into the tap hole 8. The spout assembly 24 is forcefully pushed into the tap hole 8 of the tree 4, in a manner to form an interference fit therewith, which will thereafter retain the spout 2. The interference fit is formed partially due to the compressibility of the spout 2 and of the wood 36, but the sandwiched portion of the sleeve 26, being of a resilient, supple material, may squeeze significantly and assist in the formation of the interference fit, and can also significantly assist in providing a seal between the tap hole 8 and the spout nose 10, around the entire circumference.

In this particular example, the sleeve 26 body 28 is fully inserted into the tap hole 8 and a portion of the nose 10 uncovered by the sleeve 26 comes into contact with the tap hole 8. It can be noted that the depth at which the sleeve 26 body 28 is inserted into the tap hole 8 can vary depending on the specifics of the embodiment. In the present embodiment, the

sleeve 26 is fully inserted into the tap hole 8 purely for exemplary purposes. The embodiment can be adapted for the sleeve 26 body 28 to be partially inserted into the tap hole 8, wherein a portion of the nose 10 uncovered by the sleeve remains out of contact with the tap hole 8, for instance.

- 5 The spout assembly 24 being engaged in the tap hole 8 as illustrated in Fig. 2B, sap can be collected and one can combine the presented embodiment with any equipment to aid in the sap collection. For instance, a tube can be connected to the tube connector 20 and routed to the appropriate collection system where sap is collected, as in Fig. 1B used directly.

- 10 Once the tree sap has been harvested, the spout 2 is generally removed from the tree 4 by pulling away from the tap hole 8. In some cases, the sleeve 26, spout 2 or both may seize due to the presence of dried, sugary sap in the tap hole 8 after use.

- 15 In the illustrated embodiment, the sleeve 26 includes a tongue 38 extending outwardly, initially along a lip formed on a radial portion of the proximal end 32 of the sleeve body 28 and subsequently transversally to the longitudinal direction of the sleeve body 28. As perhaps best seen in Fig. 2B, part of the tongue 38 extends out of the tap hole 8 when the spout assembly 24 is engaged with the tap hole 8. The tongue 38 can help provide a better grip for removing the sleeve 26 from the tree 4, or removing the sleeve 26 from the spout 2, for example.

- 20 It can be useful for the tongue 38 to be radially aligned with a structural member of the spout 2 in order permit grasping the tongue 38 with and against the structural member in order to facilitate pulling of the spout assembly 24 out of the tap hole 8. The sleeve 26 and spout 2 dislodging from the tap hole 8 simultaneously when pulled.

- 25 In this particular example, the role of structural member is played by the tube connector 20, integral to the spout 2, rearwardly to the nose 10 and extending radially outwardly from the axis 14, substantially forming an L-shaped structure between the nose 10 and the tube connector 20. Nevertheless, in other types of spouts 2, such as the one shown in Fig. 1A, the structural member can be another element that may be used for a similar role; in Fig. 1A the structural member is one of the handgrips 40, seen to be extending transversally to the

longitudinal axis on both sides of the spout 2. Many spouts have a structural member integrally attached, such as the spouts 2 shown in Fig. 1A and 1B, whereas others can have a structural member removably attached.

Alternatively, the spout assembly 24 can be removed from the tap hole 8 by grasping the
5 tongue 38 and pulling the sleeve 26 from the tap hole 8, dislodging the sleeve 26 from the tap hole 8 and removing the spout 2 with it. In all cases, once the spout assembly 24 is removed from the tap hole 8, the sleeve 26 body 28 can be removed from engagement with the spout 2 nose 10 by pulling the sleeve 26 and spout 2 apart from each other, such as by grasping the sleeve 26 tongue 38 and tube connector 20 and pulling them away from each
10 other, for instance.

In another instance, the spout assembly 24 can be removed from the tap hole 8 by pulling the spout 2 away from the tap hole 8, such as by grasping the tube connector 20 for instance, the spout 2 nose 10 dislodging from the sleeve 26 body 28, leaving the sleeve 26 in the tap hole 8 as the spout 2 is removed, and subsequently grasping the tongue 38 of the
15 sleeve 26 and pulling away from the tap hole 8, dislodging the sleeve 26 from the tap hole 8.

It can be preferred for the sleeve 26 to be made of a biodegradable material, such as an engineered biodegradable polylactic acid (PLA) composite for instance. The sleeve 26 being disposable after use, such as by composting or leaving the sleeve 26 in the wilderness. In this particular instance, it can be useful for the sleeve 26 to be left in the tree 4 when the
20 spout 2 is removed from the tap hole 8 individually from the sleeve 26.

In the illustrated embodiment, the sleeve 26 body 28 is frustroconical. It can be understood that the dimensions and shape of the spout assembly 24 and/or of the sleeve 26, can vary depending on the specifics of the embodiment. However, for the purposes of providing an order of magnitude, it can be said that the sleeve 26 can be expected to engage with a spout
25 2 having an outer diameter between 1/8" to 7/16" in most practical applications. It can also be said that the thickness of the sleeve 26 in the spout assembly 24 can be expected to be between 1/64" and 1/4" in most practical applications.

As can be understood, a single sleeve 24 of resilient elastomeric supply material can be used with different types of spouts 2 such as the ones shown in Figs. 1A and Fig. 1B, for instance. When the sleeve 26 is longitudinally engaged with a spout 2 nose 10, the material property of the sleeve 26 can allow it to elastically deform and adapt to different spout 2 nose 10 outer surface 18 profiles and sizes.

More detail about another possible embodiment is shown in Figs. 3A and 3B. The embodiment of Figs. 3A and 3B differs from that of the embodiment of Figs 2A and 2B in that the spout assembly 24 in this embodiment contains a different type of spout 2, having a nose 10 formed of two frustroconical sections 42, 44 connected by a ledge 46. The front frustroconical section 42 having a smaller outer diameter than the rearward frustroconical section 44. During engaged, the sleeve 26 can deform to the outer surface 18 of the front frustroconical section 42 and the rear frustroconical section 44, circumferentially covering and surrounding the nose 10. In this embodiment and perhaps best seen in Fig. 3B, when the spout assembly 24 is engaged into the tap hole 8, the sleeve 26 is only partially introduced into the tap hole 8.

As can be understood, the examples described above and illustrated are intended to be exemplary only. For instance, in the embodiments above, the structural member was a tube connector, but the sleeve can be adapted to other embodiments of spouts. for example, in an alternate embodiment, the structural member can be a radially extending handgrip. The scope is indicated by the appended claims.

WHAT IS CLAIMED IS:

1. A spout assembly for collecting tree sap, the spout assembly comprising
 - a spout having a tree sap path extending from an inlet to an outlet and a straight nose having the inlet and an outer surface extending around an axis of the nose, and
 - a sleeve made of an elastomeric, supple material, the sleeve having a body portion covering and surrounding at least a portion of the outer surface, from a distal end to a proximal end, in alignment with the axis, and a tongue extending radially away from the axis at the proximal end of the body,
 - wherein the body of the sleeve is configured for being press-fitted into a tap hole of the tree, between the outer surface of the spout and the tap hole, when the spout is engaged with the tap hole, the sleeve being removable from the nose when the spout is removed from the tap hole.
2. The spout assembly of claim 1 wherein the nose forms a front end of the spout, further comprising a structural member extending radially from the spout, rearwardly of the nose, wherein the tongue extends parallel to the structural member, in front of the structural member.
3. The spout assembly of claim 2 wherein the structural member is a tube connector having the outlet.
4. The spout assembly of any one of claims 1 to 3 wherein the body of the sleeve is frustroconical.
5. The spout assembly of any one of claims 1 to 4 wherein the tree sap path extends straight along the axis of the nose from the front end of the spout, rearwardly from the nose, and then radially to the outlet.
6. The spout assembly of any one of claims 1 to 5 wherein the spout is made of plastic.

7. The spout assembly of claim 6 wherein the plastic is high impact polypropylene.
8. The spout assembly of claim 6 wherein the plastic is nylon.
9. The spout assembly of any one of claims 1 to 8 wherein the nose of the spout is frustroconical.
10. The spout assembly of any one of claims 1 to 9 wherein the body of the sleeve has a thickness between 0.4 mm (1/64") and 6.4 mm (1/4").
11. The spout assembly of any one of claims 1 to 10 wherein the sleeve is made of a biodegradable material.
12. A method of harvesting sap from a tree, the method comprising :
 - forming a tap hole in a trunk of a tree;
 - longitudinally engaging a sleeve of resilient material onto an outer surface of a nose portion of a spout;
 - longitudinally engaging the nose portion of the spout, with the sleeve on its outer surface, into the tap hole;
 - harvesting sap from the tree via the spout; and
 - removing the spout and the sleeve from the tree; wherein said removing the sleeve from the tree includes gripping and pulling a transversally-extending tongue of the sleeve.
13. The method of claim 12 wherein removing the spout and the sleeve from the tree includes gripping and pulling both the tongue and a transversally-extending structural member of the spout.
14. The method of claim 12 further comprising, after removing the spout and the sleeve from the tree, removing the sleeve from the spout by pulling the tongue.

15. The method of claim 14 further comprising cleaning the sleeve and the spout individually and longitudinally engaging the sleeve onto the outer surface of the nose portion of the spout for an upcoming use.

16. The method of claim 14 further comprising cleaning the spout and discarding the sleeve.

17. The method of claim 12 wherein harvesting sap from the tree via the spout includes using a vacuum collection system.

18. A method of harvesting sap from a tree, the method comprising :

forming a tap hole in a trunk of a tree;

longitudinally engaging a sleeve of resilient material onto an outer surface of a nose portion of a spout;

longitudinally engaging the nose portion of the spout, with the sleeve on its outer surface, into the tap hole;

harvesting sap from the tree via the spout;

removing the spout from the sleeve, while the sleeve is in the tree; and

after removing the spout from the sleeve, removing the sleeve from the tree, including gripping and pulling a transversally extending tongue of the sleeve.

19. The method of claim 18 further comprising cleaning the sleeve and the spout individually and longitudinally engaging the sleeve onto the outer surface of the nose portion of the spout for an upcoming use.

20. The method of claim 19 further comprising cleaning the spout and discarding the sleeve.

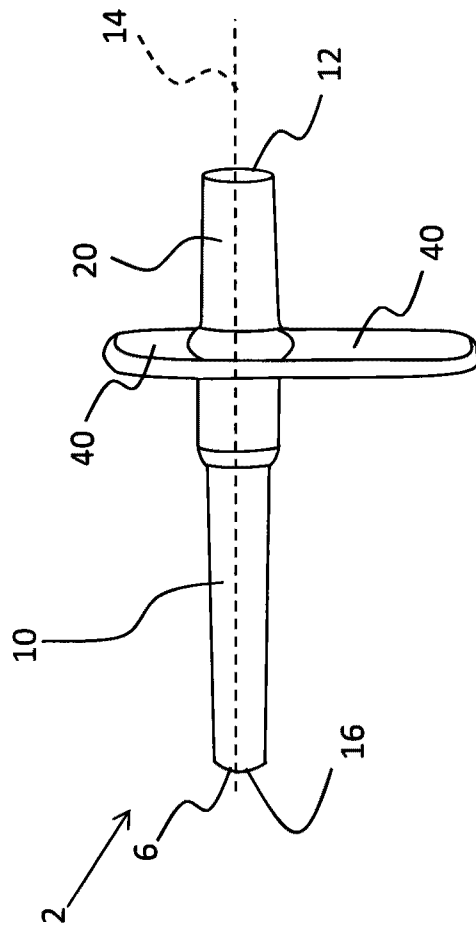


Fig. 1A

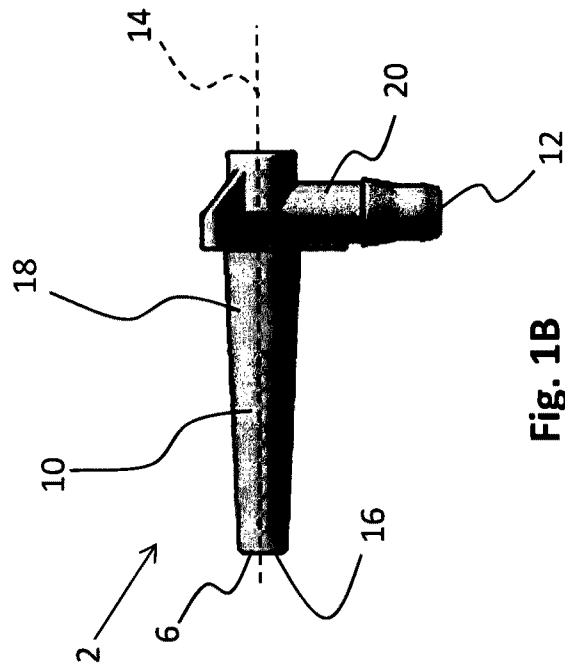


Fig. 1B

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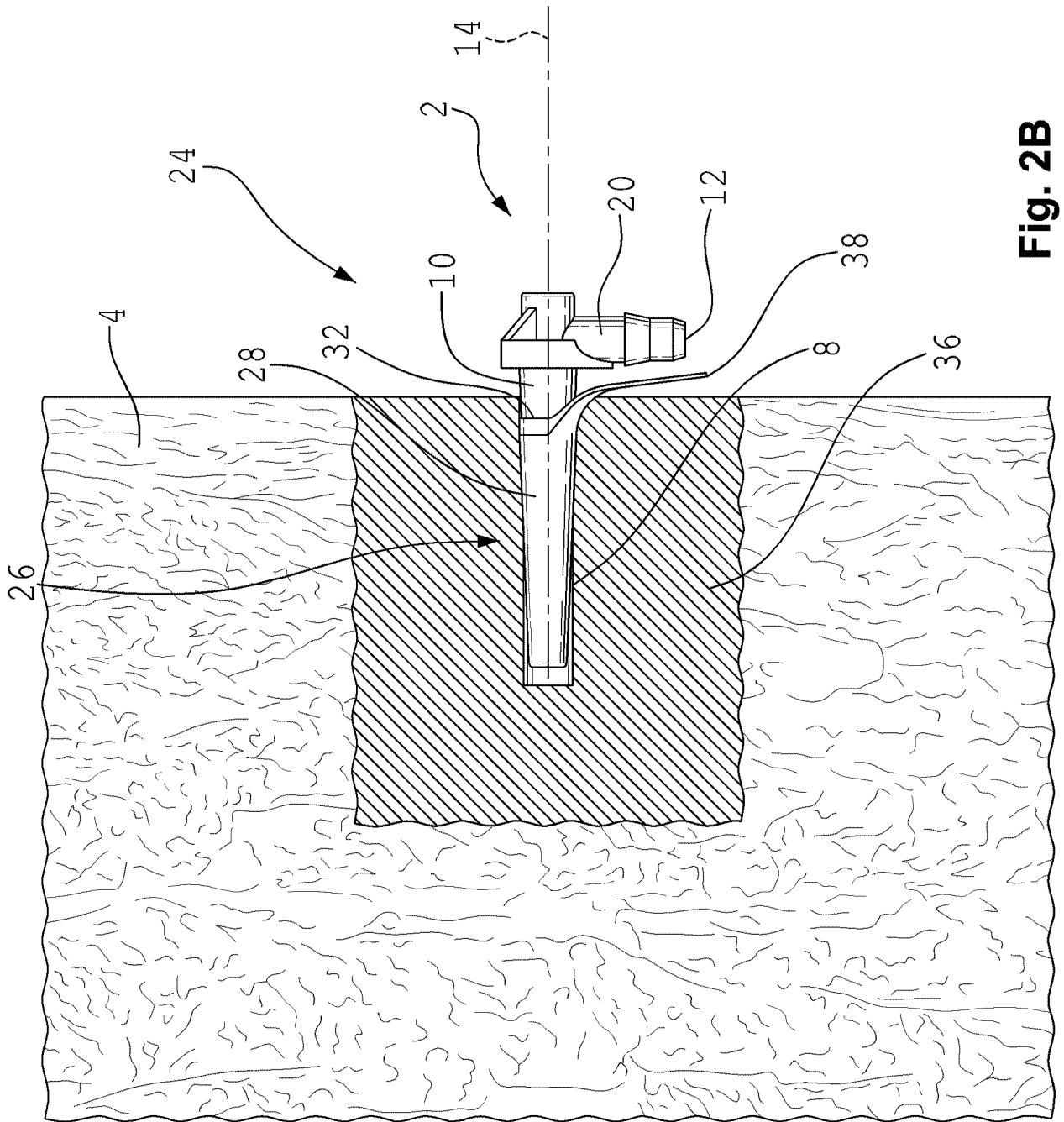


Fig. 2B

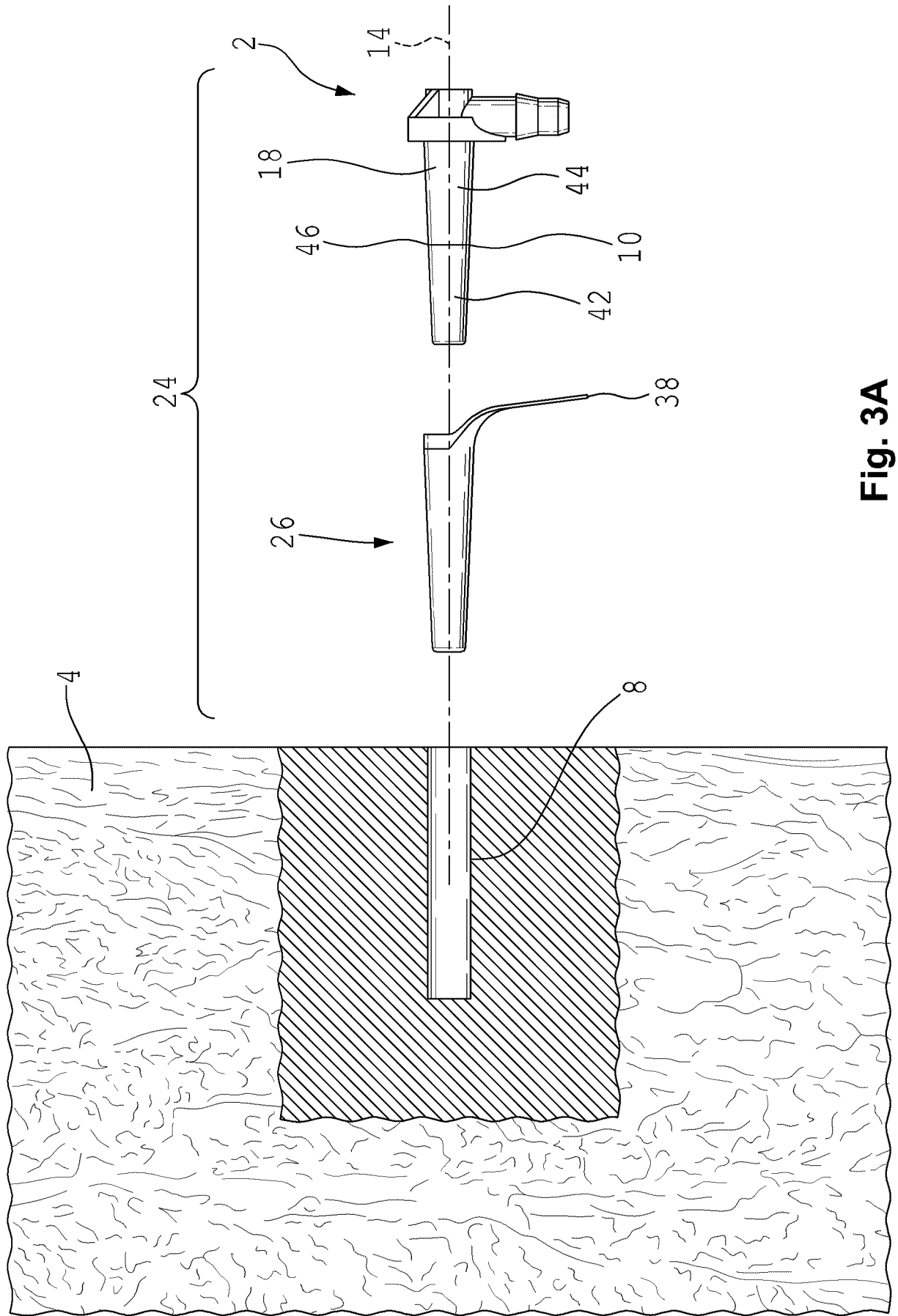


Fig. 3A

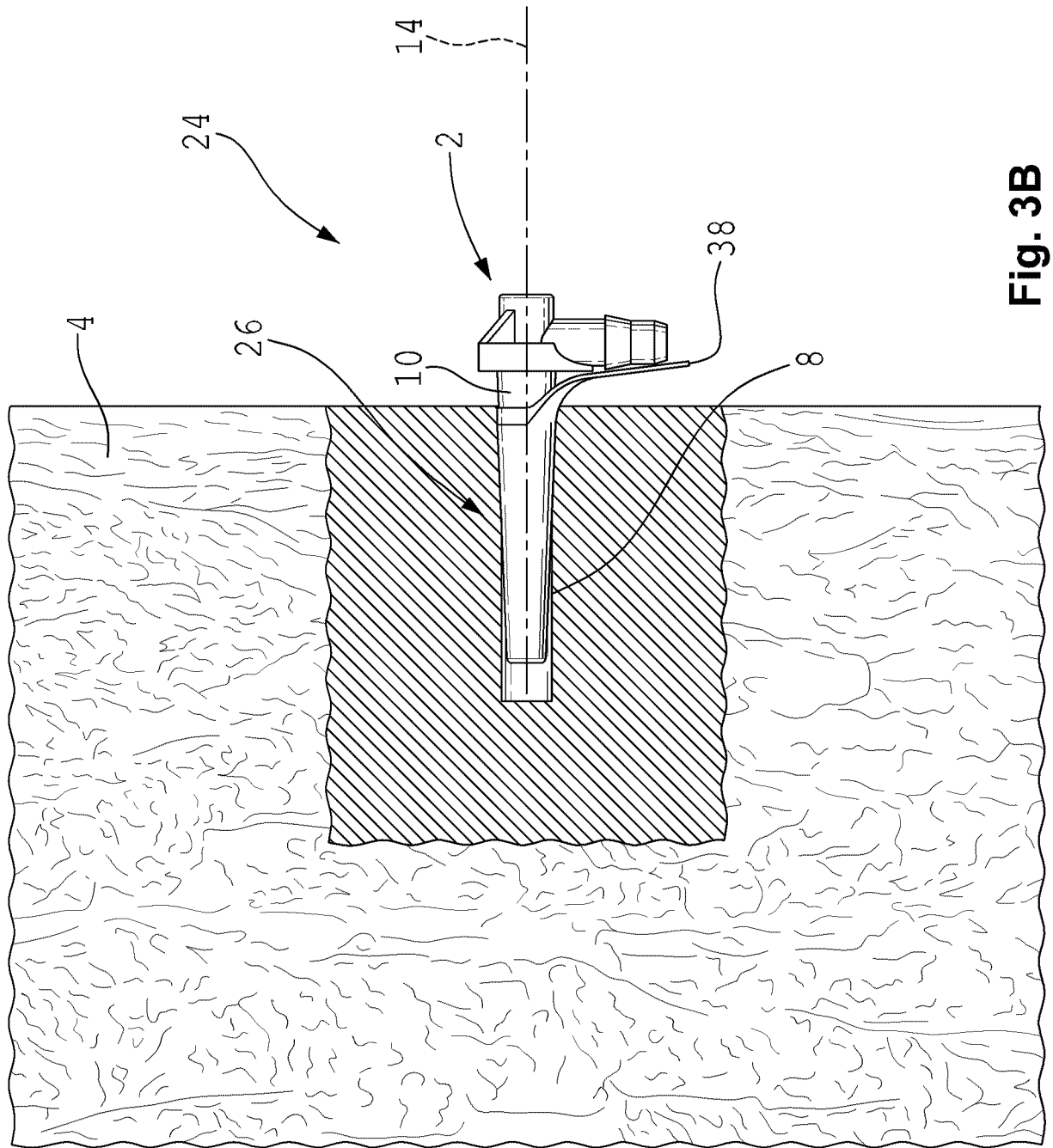


Fig. 3B

