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Australian Government

PCT/AU2018/000085

**Patent Office
Canberra**

I, EMILY LOCKE, DELEGATE OF THE COMMISSIONER, hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2017902110 for a patent by MICHAEL CHRISTOPHER STUART as filed on 2 June 2017.

WITNESS my hand this
EIGHTEENTH day of July 2018

EMILY LOCKE
DELEGATE OF THE COMMISSIONER



ANCHOR

Technical Field

[001] The present invention relates to a ground engaging anchor.

Background

[002] With the installation of a fence, it is common that a strip footing may need to be installed. A strip footing is a strip of concrete placed into a trench and reinforced with steel. The footing supports the load of the fence. Installing a strip footing can be a lengthy process.

[003] Use of strip footings for fences can be common around pools. In some instances, pavers may have already been laid meaning that the pavers may need to be initially removed to allow for the strip footing to be installed but then relaying of the strip footing is subsequently required.

[004] Whilst some of the problems highlighted above relate to the installation of pool fences, it is desirable to avoid the installation of strip footings for fences in more general applications as well as other loading bearing structures where possible.

[005] The reference in this specification to any prior publication (or information derived from it), or to any matter which is known, is not, and should not be taken as an acknowledgment or admission or any form of suggestion that that prior publication (or information derived from it) or known matter forms part of the common general knowledge in the field of endeavour to which this specification relates.

Summary

[006] In a first aspect there is provided an anchor including:

a body;

a shaft extending from the body; and

a plurality of legs pivotally connected to the body, wherein the plurality of legs are movable from a stowed position to a deployed position in response to a driving force being applied to the anchor such that at least a portion of the shaft is driven into a ground surface whilst the plurality of legs engage the ground surface and splay outwardly relative to the shaft.

- [007] In certain embodiments, the body is a collar such that the shaft extends through a hole in the collar and is connected to the collar.
- [008] In certain embodiments, the shaft is welded to the collar or separable from the collar.
- [009] In certain embodiments, the shaft includes:
a force receiving portion configured to receive the driving force applied to the anchor;
and
a ground protruding portion which is configured to be driven into the ground surface.
- [010] In certain embodiments, the force receiving portion is configured to be received within a bit of an electrically powered hammer tool.
- [011] In certain embodiments, a ground protruding portion of the shaft includes a pointed tip to protrude into the ground surface.
- [012] In certain embodiments, each leg includes a foot having planar surface to promote sliding of the foot through the ground whilst moving to the deployed position.
- [013] In certain embodiments, each foot has a pointed tip which points in a splaying direction of the respective leg.
- [014] In certain embodiments, each leg includes a leading cutting edge.
- [015] In certain embodiments, the leading cutting edge extends a length of the respective leg.
- [016] In certain embodiments, each leg is pivotally fastened to the body via a roll pin.
- [017] In certain embodiments, an end of each leg is pivotally fastened within a respective cavity of the body.

[018] In certain embodiments, each cavity is defined by a pair of opposing plates which tight fitting receive therebetween the end of the respective leg, wherein the respective roll pin extends between the respective opposing plates and through a hole in the end of the respective leg.

[019] In certain embodiments, a ring component that is threadably received over the shaft, wherein during movement of the anchor from the stowed position to the deployed position, the ring component presses downwardly against the ground surface and exerts a force against a trailing edge of each leg to promote splaying of the legs.

[020] In certain embodiments, the legs in the stowed position do not extend past a footprint of the body.

[021] In another aspect there is provided an anchor assembly including:
an anchor configured according to the first aspect; and
a mesh sleeve that is coupled to at least a portion of the anchor.

[022] In another aspect there is provided a kit for assembling an anchor assembly, including:
an anchor configured according to the first aspect; and
a mesh sleeve that is able to be coupled to at least a portion of the anchor.

[023] In another aspect there is provided a method of installing an anchor according to the first aspect, wherein the method includes:

locating the shaft of the anchor to contact the ground surface whilst the anchor is in the stowed position; and

applying the driving force to the anchor causing at least a portion of the shaft to be driven into the ground surface whilst the legs engage the ground engaging surface and splay out relative to the shaft.

[024] In certain embodiments, the method further includes creating a hole in the ground surface, wherein the step of locating the shaft of the anchor includes locating the anchor within the hole.

[025] In certain embodiments, the method further includes securing a structure to at least a portion of the anchor.

[026] In certain embodiments, the method includes pouring a connecting material into the hole in order to connect the structure to at least a portion of the anchor.

[027] In certain embodiments, the method includes locating a mesh sleeve over a portion of the anchor after deployment in the hole and prior to pouring a connecting material into the hole.

[028] In certain embodiments, the method includes coupling the mesh sleeve to the anchor.

[029] In certain embodiments, the shaft of the anchor includes a force receiving portion configured to be received within a bit of an electrically powered hammer tool, wherein the method includes applying the driving force to the force receiving portion using the electrically powered hammer tool.

Brief Description Of Figures

[030] The example embodiment of the present invention should become apparent from the following description, which is given by way of example only, of a preferred but non-limiting embodiment, described in connection with the accompanying figures.

[031] Figure 1 is an elevated side view of a first example of an anchor in a stowed position;

[032] Figure 2 is a underneath view of the anchor of Figure 1 in the stowed position;

[033] Figure 3 is a cross-sectional view of the anchor of Figure 1 starting in a stowed position and the position of the legs over time whilst the anchor is moving toward the deployed position;

[034] Figure 4 is an elevated side view of a second example of an anchor;

[035] Figure 5 is an elevated side view of the anchor of Figure 4 is an intermediate position between the stowed and deployed position;

[036] Figure 6 is an underneath view of the anchor of Figure 4;

[037] Figure 7 is an elevated side view of the anchor of Figure 4 is the deployed position;

[038] Figure 8A, 8B and 8C are side, elevated, and rear view of a leg of the anchor of Figure 4; and

[039] Figure 9 is a flowchart representing a method for installing the anchor of either Figure 1 or Figure 4; and

[040] Figure 10 is an elevated side view of another example of the anchor;

[041] Figure 11 is an underneath side view of another example of the anchor in the stowed position;

[042] Figure 12 is an elevated side view of the anchor of Figure 11 in the deployed position;

[043] Figure 13 is an underneath side view of the anchor of Figure 11 in the deployed position;

[044] Figure 14A is a cross-sectional view of an example of an anchor assembly prior to the pouring of connecting material into the hole; and

[045] Figure 14B is a cross-sectional view of another example of an anchor assembly prior to the pouring of connecting material into the hole.

Modes for Carrying Out The Invention

[046] The following modes, given by way of example only, are described in order to provide a more precise understanding of the subject matter of a preferred embodiment or embodiments.

[047] In the figures, incorporated to illustrate features of an example embodiment, like reference numerals are used to identify like parts throughout the figures.

[048] Referring to Figures 1 and 2, there is shown a first example of an anchor 10. The anchor 10 includes a body 20, a shaft 30 extending from the body 10, and a plurality of legs 40 pivotally connected to the body. The anchor 10 is movable between a stowed position, as shown in Figures 1 and 2, to a deployed position as shown in Figure 3. In particular, in response to a driving force 200 (see Figure 4) being applied to the anchor 10 such that at least a portion of the shaft 30 is driven into a ground surface 100, the plurality of legs 40 engage the ground surface 100 and splay outwardly relative to the shaft as shown in Figures 3 and 4.

[049] The splaying of the legs 40 expand the horizontal footprint of the anchor 10 within the ground such that the installation of strip footings may not be required.

[050] The body 20 can be provided in the form of a collar 22. The shaft 30 can extend through a hole in the collar 22 wherein the collar 22 is subsequently connected about the shaft 30. In one form, the shaft 30 is welded to the collar 22. It will be appreciated that in other embodiments, it may be possible for the shaft 30 and body to be a single cast unit rather than two separate pieces that are subsequently welded together.

[051] The shaft 30 can include a ground protruding portion 36 which promotes the anchor 10 being driven into the ground surface 100. Generally the ground protruding portion 36 of the shaft 30 includes a pointed tip 38 to aid the shaft 30 protruding into the ground surface 100. The ground protruding portion 36 of the shaft 30 extends downwardly from the body 10 which can be the collar 22. In particular, the ground protruding portion 36 is axially aligned with the centre of the collar 12 and extends orthogonally from the collar 22.

[052] In one form, the anchor 10 receives the driving force via a force receiving portion 32. In one form, the shaft 30 can include the force receiving portion 32. The force receiving portion 32 is configured to receive the driving force applied to the anchor 10 such that the anchor 10 is driven into the ground causing the legs 40 to splay. The force receiving portion 32 can be axially aligned with the ground protruding portion 36. In one form, the force receiving portion 32 extends upwardly from the body 10. In one form, the force receiving portion 32 and the ground protruding portion 36 are part of the shaft 30 that extends through the hole in the collar 12 and welded together.

[053] In one form, the force receiving portion 32 is configured to be receivable within a bit of an electrically powered hammer tool, such as a rotary hammer or a hammer drill. However, it is possible for the driving force to be applied to the force receiving portion 32 with manual means such as a sledge hammer, a hammer or the like.

[054] Referring to Figures 5 to 7 and 8A to 8C, each leg 40 of the anchor 10 can include a foot 42 having planar surface 44 to promote sliding of the foot 42 and leg 40 through the ground whilst moving to the deployed position. Each foot 42 has a pointed tip 46 provided on the planar surface 44 which points in a splaying direction (i.e. radially away from the longitudinal axis of the shaft of the respective leg). As shown in Figure 6 and 8B, each leg 40 can include a leading cutting edge 48. The leading cutting edge 48 extends a length of the respective leg 44. The leading cutting edge 48 has a tapered, sharp profile to promote the leg pivoting in the ground in response to the force applied to the anchor 10.

[055] As shown in Figure 5, each leg 40 is pivotally fastened to the body 20 via a mechanical fastener such as a roll pin 50. An end 49 of each leg 40 is pivotally fastened within a respective cavity 26 defined underneath the body 20. Each cavity 26 is defined by a pair of opposing plates 28 which tight fittingly receive therebetween the end 49 of the respective leg 40. The respective roll pin 50 extends between the respective opposing plates 28 and through a hole 47 in the end 49 of the respective leg 40.

[056] As shown in Figures 1 and 2, the legs 40 of the anchor 10 in the stowed position do not substantially extend past a horizontal footprint of the body 20. In Figure 5, the legs 40 are freely hanging from the collar 22 and due to the shift in the centre of gravity of each leg compared to the embodiment shown in Figures 1 to 4, each leg slightly extends past the footprint of the collar 22. However, the legs 40 can be pulled toward the central shaft during installation such that the legs do not extend past the horizontal footprint of the collar 22. This enables the anchor to be located within a hole in the ground which closely matches the horizontal footprint of the collar if required.

[057] Referring to Figure 9 there is shown a flowchart representing a method 900 for installing an anchor according to the examples shown in Figures 1 and 5.

[058] In particular, at step 910 the method 900 includes locating the shaft of the anchor 10 to

contact the ground surface 100 whilst the anchor 10 is in the stowed position. At step 920, the method includes applying the driving force to the anchor causing at least a portion of the shaft to be driven into the ground surface 100 whilst the legs 40 engage the ground surface 100 and splay out relative to the shaft.

[059] In step 910, the method 900 further includes creating a hole in the ground surface 100, wherein the step of locating the shaft 30 of the anchor 10 includes locating the anchor 10 within the hole. The hole could be made using a core drilling machine. In some instance, if pavers, tiles or the like have been laid over the top of the ground surface 100, the core drilling machine may be able to be used to cut through this layer and then create a hole in the ground.

[060] In step 920, the method 900 can include locating the force receiving portion 32 within a bit of an electrically powered hammer tool, and operating the electrically powered hammer tool to applying the driving force to the force receiving portion 32 of the anchor 10, thereby driving the ground protruding portion 32 of the shaft 30 into the ground whilst the legs 40 splay in the ground.

[061] After the driving force has been applied to the anchor 10 such that the legs 40 have splayed within the ground and the anchor has been deployed, the method 900 further includes pouring a connecting material such as concrete, non-shrink grout or the like into the hole. Generally this involves locating a portion of the structure that is to be supported within the hole in a suspended manner prior to then filling the hole with concrete or non-shrink grout. For example, in the case of installing a glass panel fence, the glass panels with attached spigots are support on timber or jacks at the appropriate height whilst the attached spigots are suspended within the holes with the deployed anchors. Concrete or non-shrink grout can then be poured into the holes to connect each spigot to the respective deployed anchor in the respective hole.

[062] As shown in Figure 10, in one variation the anchor 10 can include a ring component 60 which is threadably received over the shaft 30. During movement of the anchor 10 from the stowed position to the deployed position, the trailing edge 45 of each leg 40 presses against an upper surface of the ring component 60 which rests upon the ground surface 100. An opposite force is applied by the ring component 60 against the trailing edge of each leg 40 thereby

promoting the splaying of the legs 40 in the ground.

[063] In another variation, the force receiving portion 32 may alternatively be an upper surface of the collar 22. In this arrangement, a portion of the shaft 30 does not protrude upwardly through the centre of the collar 30. Thus, a force can be applied to the force receiving portion of the upper surface of the collar 22, thereby causing the ground protruding portion of the shaft 36 and the feet 42 of the legs 40 to protrude into the ground surface 100 such that the legs 40 begin to pivot outwardly and splay relative to the shaft 30 as the anchor 10 is driven into the ground.

[064] In a further variation as shown in Figure 1 and Figures 11 to 13, each legs 40 can include one or more serrated trailing edges to restrict withdrawal of the legs 40 from the ground 100 in the deployed position. However, in alternate arrangements as shown in Figure 5, the legs 40 can include a smooth edge to promote sliding within the ground 100.

[065] In another optional form, the body and shaft may not be secured together, but rather could be separable. In particular, as shown in Figure 1, the shaft can be located in a central hole in the collar and threaded therethrough. The force receiving portion of the shaft which extends upwardly from the collar can include a stop portion which acts against the upper surface of the collar to prevent the shaft passing all the way through the collar. As the force is applied to the force receiving portion of the shaft, the stop of the shaft transfers this force downwardly upon the upper surface of the collar, resulting in the legs splaying. In some instances, the ground protruding portion of the shaft may hit a rock or hard object which may prevent the anchor being progressed further into the ground. In this situation, the shaft can be withdrawn from the collar, and the force can be applied to the top surface of the collar thereby allow the legs to fully splay. In other instances, the installer may not want the shaft to be protruding upwards from the collar once installed. In this instance, after the legs have fully splayed, the shaft can be pulled out of the ground leaving the body coupled to the legs in the ground in the deployed position.

[066] The anchor can be used in other applications. For example, in instances where a concrete slab has begun to sink into the ground, one or more anchors can be installed to reinforce (i.e. "sure up") the concrete slab to slow, reduce, or prevent the sinking of the

concrete slab into the ground. In particular, the installer can core drill one or more holes through the concrete slab and into the ground surface. Generally, a plurality of holes is needed for concrete slabs. The holes can be spaced equally in a matrix format. However, in some situations only a portion of the slab may have begun to sink and thus only holes may be drilled into the appropriate sunken portion of the concrete slab. Anchor are located into each hole and a driving force is applied downwardly to the anchor such that it protrudes into the ground. The legs deploy outwardly substantially in a plane located proximate and under the bottom of the concrete slab, thereby attempting to reinforce a portion of the concrete slab from sinking further into the ground. Once the plurality of anchors have been deployed, the holes can be refilled with concrete. This process is considered more preferable in a number of circumstances compared to demolishing the concrete slab and relaying a new concrete slab.

[067] Whilst the above example has been described in relation to a concrete slab, it is possible that the above technique could be used for other structures which are installed upon a ground surface which requires reinforcement. For example, leaning fences may be as a result of the ground requiring reinforcement. Holes can be created in the ground adjacent the leaning fence and an anchor can be deployed in each hole. The splaying of the legs of the anchor can act to reinforce the fence. The holes can then be refilled, such as with dirt, concrete, other composite materials or the like.

[068] In another optional embodiment, the legs can be pivotally coupled to the body via a bolt and nut fastening arrangement.

[069] In another optional embodiment, one or more of the legs can be removed from the body prior to installation. In particular, as shown in the examples, the anchor includes four equally spaced legs. In certain instances, the anchor may be used in a position where it is undesirable to have a leg splay in a particular direction. For example, a wobbly or leaning post may require the nearby ground to be reinforced with an anchor, however one of the legs may hit the post during deployment. Therefore, a pivotal fastener (e.g. roll pin, or nut and bolt fastener) can be unfastened such that one of the legs can be uncoupled from the body of the anchor. Therefore, in this example, the anchor can be orientated such that the remaining three legs splay in appropriate directions without hitting the nearby post such that the ground and the post are reinforced by the anchor.

[070] In a further embodiment, as shown in various figures but most clearly in Figures 11, 12 and 13, the shaft 30 can include a collar on the force receiving portion. The collar includes a series of grooves which align with registration portions of the collar 22. In particular, the collar 22 includes registration portions provided in the form of a plurality of upright fins that encircle the hole of the collar 22 which the shaft 30 protrudes therethrough. When the shaft 30 is being threadably received through the collar 22, the shaft 22 is orientated such that the grooves of the collar of the shaft 30 align with the edges of the fins of the collar 22 such that they align thereby allowing the collar of the shaft 30 to be engaged in registration with the collar. As mentioned above, the shaft 30 can then be welded to the collar 22. Alternatively, the shaft 30 may be separable from the collar 22 such as after deployment if required and thus is not welded. The fins provide further structural strength to the anchor due to the force that impact the force receiving portion of the of the shaft during deployment. Furthermore, in the event that concrete is used to fill a hole which the anchor is deployed therein, the fins provide additional surface area for the concrete to engage the anchor within the hole.

[071] In another embodiment, as shown in Figures 14A and 14B, a mesh sleeve 300 may be placed over the collar or protruding force receiving portion 32 of the anchor 10 after deployment. The mesh sleeve 300 may be substantially cylindrical in nature with one ends. In particular, the mesh sleeve 300 may be located in the hole 200 in the ground 100 such that the force receiving portion 32 of the anchor 10 protrudes upwards from the base of the hole 200 is located approximately at a centre of the mesh sleeve 300. Connecting material such as concrete or non-shrink grout can then be poured into the hole 200. The mesh sleeve 300 promotes the reinforcement of the connection of the connecting material with the deployed anchor 10. In one form, the mesh sleeve 300 could be made from wire. In one form, the mesh sleeve 300 could couple to the anchor 10 such as the collar or shaft 30. For example, the mesh sleeve 300 could include one or more arms 310, as shown in Figure 14B, that protrude radially inward from the mesh, wherein each arm 310 includes or is connected to a coupling element such as a loop to be received over the force receiving portion 32 of the shaft 30, thus enabling the position of the mesh sleeve to be substantially fixed relative to the force receiving portion 32 of the shaft 30 despite any forces experienced during the pouring of the connecting material into the hole 200. A fastener, such as a nut, clamp or the like may be used to secure the coupling between the mesh sleeve 300 and the anchor 10. The mesh sleeve 300 together with

the anchor form an anchor assembly 400. In one form, the anchor assembly 400 may be provided in the form of a kit which includes the anchor 10 and the mesh sleeve 300.

[072] Optional embodiments of the present invention may also be said to broadly consist in the parts, elements and features referred to or indicated herein, individually or collectively, in any or all combinations of two or more of the parts, elements or features, and wherein specific integers are mentioned herein which have known equivalents in the art to which the invention relates, such known equivalents are deemed to be incorporated herein as if individually set forth.

[073] Although a preferred embodiment has been described in detail, it should be understood that various changes, substitutions, and alterations can be made by one of ordinary skill in the art without departing from the scope of the present invention.

Claims

1. An anchor including:
a body;
a shaft extending from the body; and
a plurality of legs pivotally connected to the body, wherein the plurality of legs are movable from a stowed position to a deployed position in response to a driving force being applied to the anchor such that at least a portion of the shaft is driven into a ground surface whilst the plurality of legs engage the ground surface and splay outwardly relative to the shaft.
2. The anchor according to claim 1, wherein the body is a collar such that the shaft extends through a hole in the collar and is connected to the collar.
3. The anchor according to claim 2, wherein the shaft is welded to the collar or separable from the collar.
4. The anchor according to any one of claims 1 to 3, wherein the shaft includes:
a force receiving portion configured to receive the driving force applied to the anchor;
and
a ground protruding portion which is configured to be driven into the ground surface.
5. The anchor according to claim 4, wherein the force receiving portion is configured to be received within a bit of an electrically powered hammer tool.
6. The anchor according to claim 4 or 5, wherein ground protruding portion of the shaft includes a pointed tip to protrude into the ground surface.
7. The anchor according to any one of claims 1 to 6, wherein each leg includes a foot having planar surface to promote sliding of the foot through the ground whilst moving to the deployed position.
8. The anchor according to claim 7, wherein each foot has a pointed tip which points in a splaying direction of the respective leg.

9. The anchor according to any one of claims 1 to 8, wherein each leg includes a leading cutting edge.
10. The anchor according to claim 9, wherein the leading cutting edge extends a length of the respective leg.
11. The anchor according to any one of claims 1 to 10, wherein each leg is pivotally fastened to the body via a roll pin.
12. The anchor according to claim 11, wherein an end of each leg is pivotally fastened within a respective cavity of the body.
13. The anchor according to claim 12, wherein each cavity is defined by a pair of opposing plates which tight fitting receive therebetween the end of the respective leg, wherein the respective roll pin extends between the respective opposing plates and through a hole in the end of the respective leg.
14. The anchor according to any one of claims 1 to 13, including a ring component that is threadably received over the shaft, wherein during movement of the anchor from the stowed position to the deployed position, the ring component presses downwardly against the ground surface and exerts a force against a trailing edge of each leg to promote splaying of the legs.
15. The anchor according to any one of claims 1 to 14, wherein in the stowed position the legs do not extend past a footprint of the body.
16. An anchor assembly including:
 - an anchor configured according to any one of claims 1 to 15; and
 - a mesh sleeve that is coupled to at least a portion of the anchor.
17. A method of installing an anchor according to claim 1, wherein the method includes:
 - locating the shaft of the anchor to contact the ground surface whilst the anchor is in the

stowed position; and

applying the driving force to the anchor causing at least a portion of the shaft to be driven into the ground surface whilst the legs engage the ground engaging surface and splay out relative to the shaft.

18. The method according to claim 17, wherein the method further includes creating a hole in the ground surface, wherein the step of locating the shaft of the anchor includes locating the anchor within the hole.

19. The method according to claim 18, wherein the method further includes securing a structure to at least a portion of the anchor.

20. The method according to claim 19, wherein the method includes pouring a connecting material into the hole in order to connect the structure to at least a portion of the anchor.

21. The method according to claim 20, wherein the method includes locating a mesh sleeve over a portion of the anchor after deployment in the hole and prior to pouring a connecting material into the hole.

22. The method according to claim 21, wherein the method includes coupling the mesh sleeve to the anchor.

23. The method according to any one of claims 17 to 20, wherein the shaft of the anchor includes a force receiving portion configured to be received within a bit of an electrically powered hammer tool, wherein the method includes applying the driving force to the force receiving portion using the electrically powered hammer tool.

24. A kit for assembling an anchor assembly, including:
an anchor configured according to any one of claims 1 to 15; and
a mesh sleeve that is able to be coupled to at least a portion of the anchor.

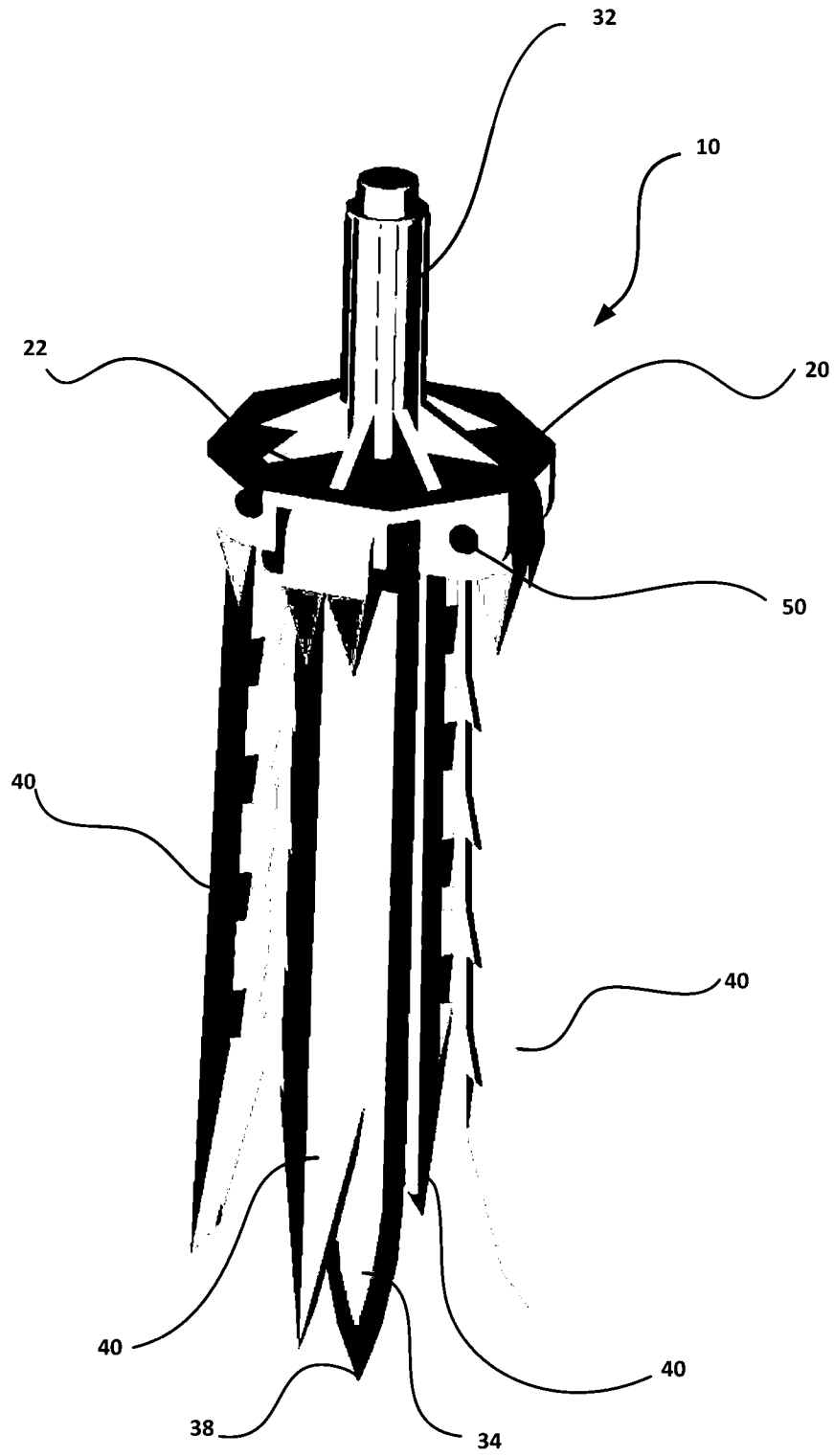


FIGURE 1

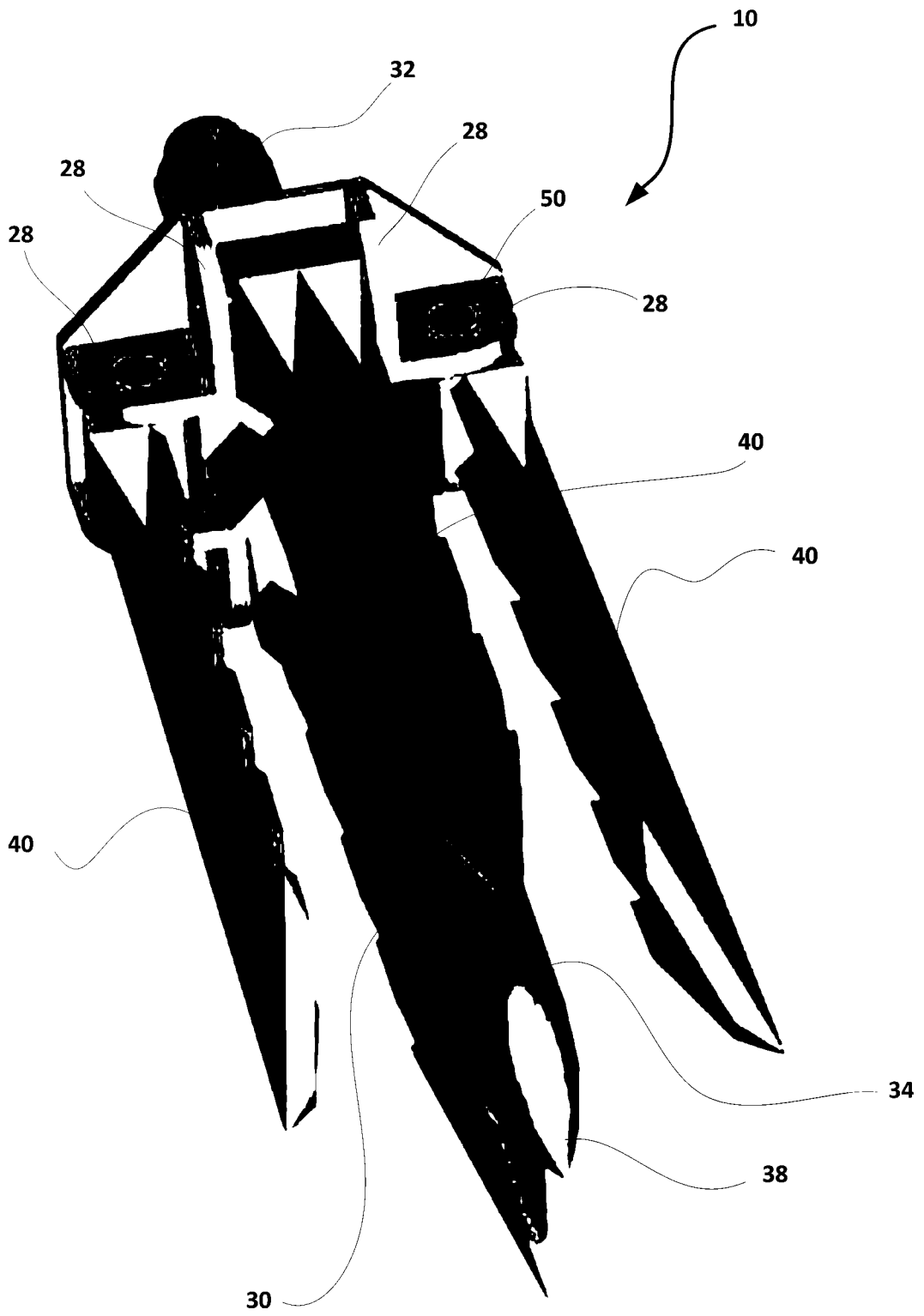


FIGURE 2

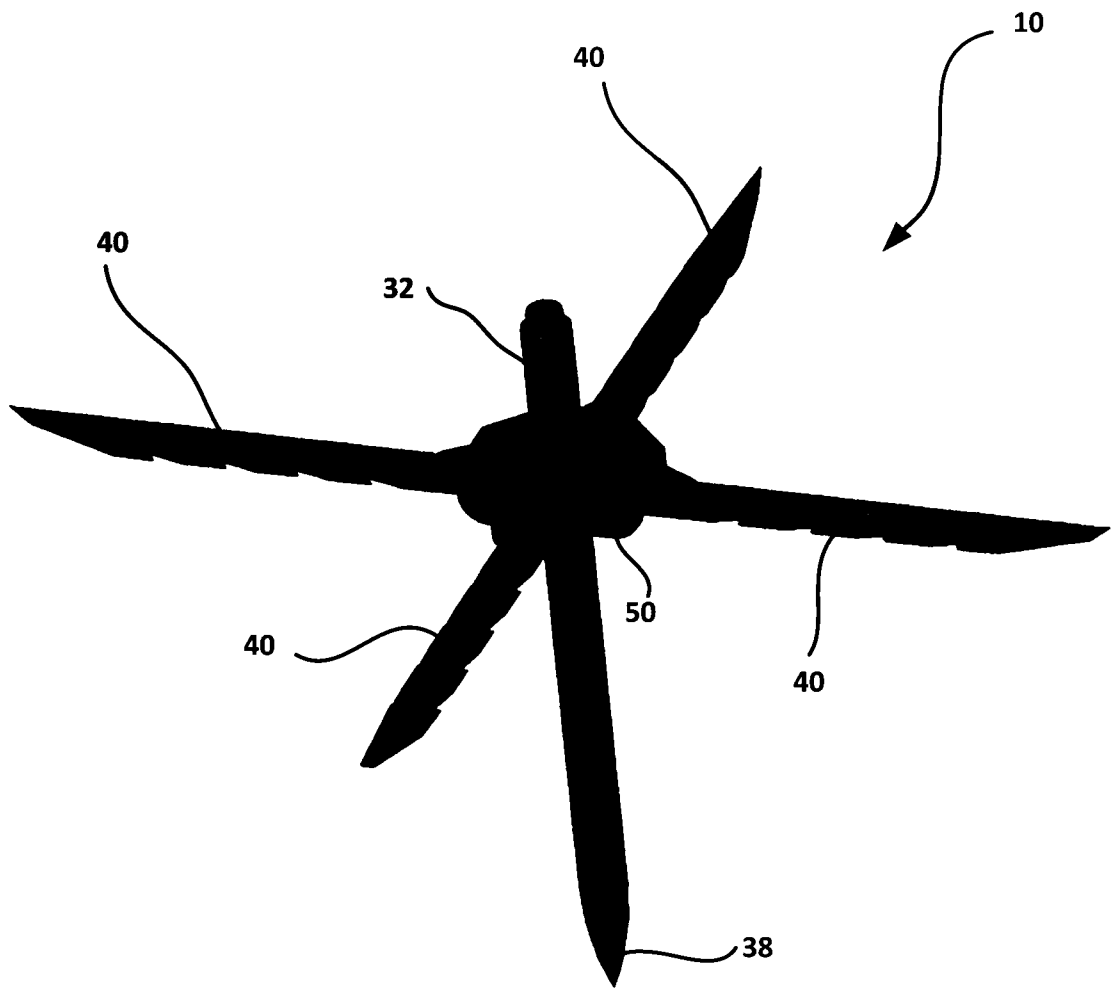


FIGURE 3

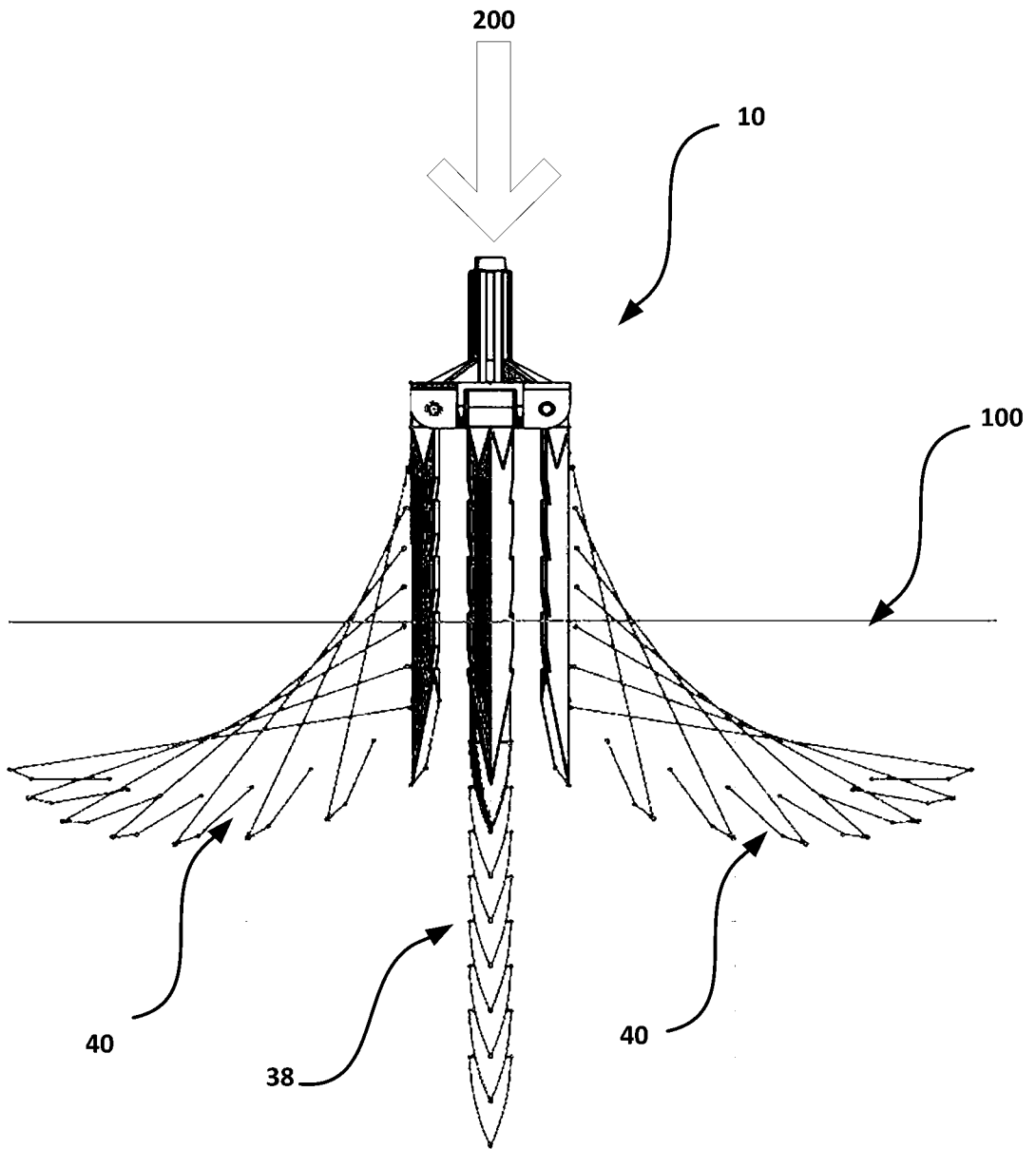


FIGURE 4

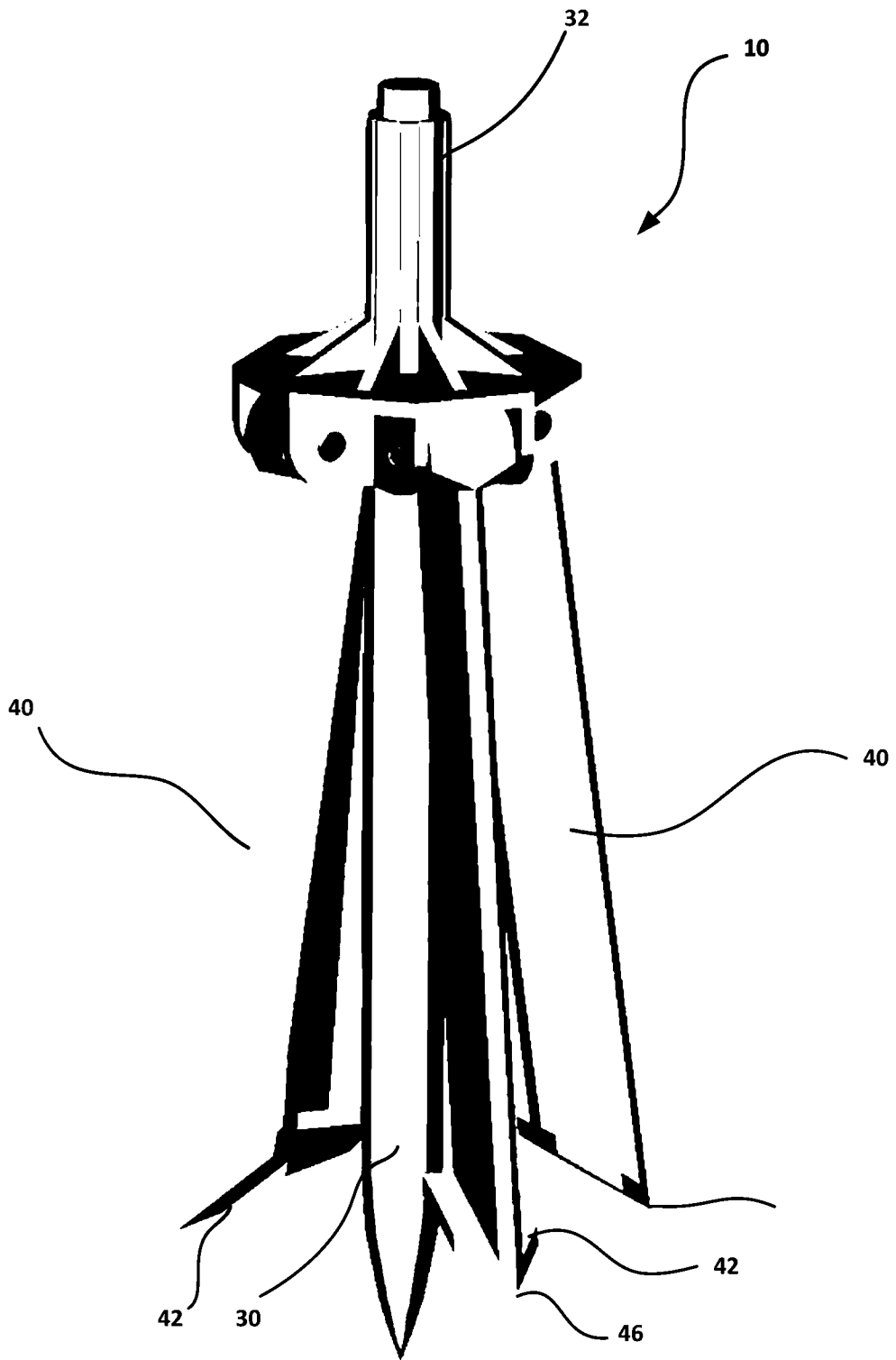


FIGURE 5

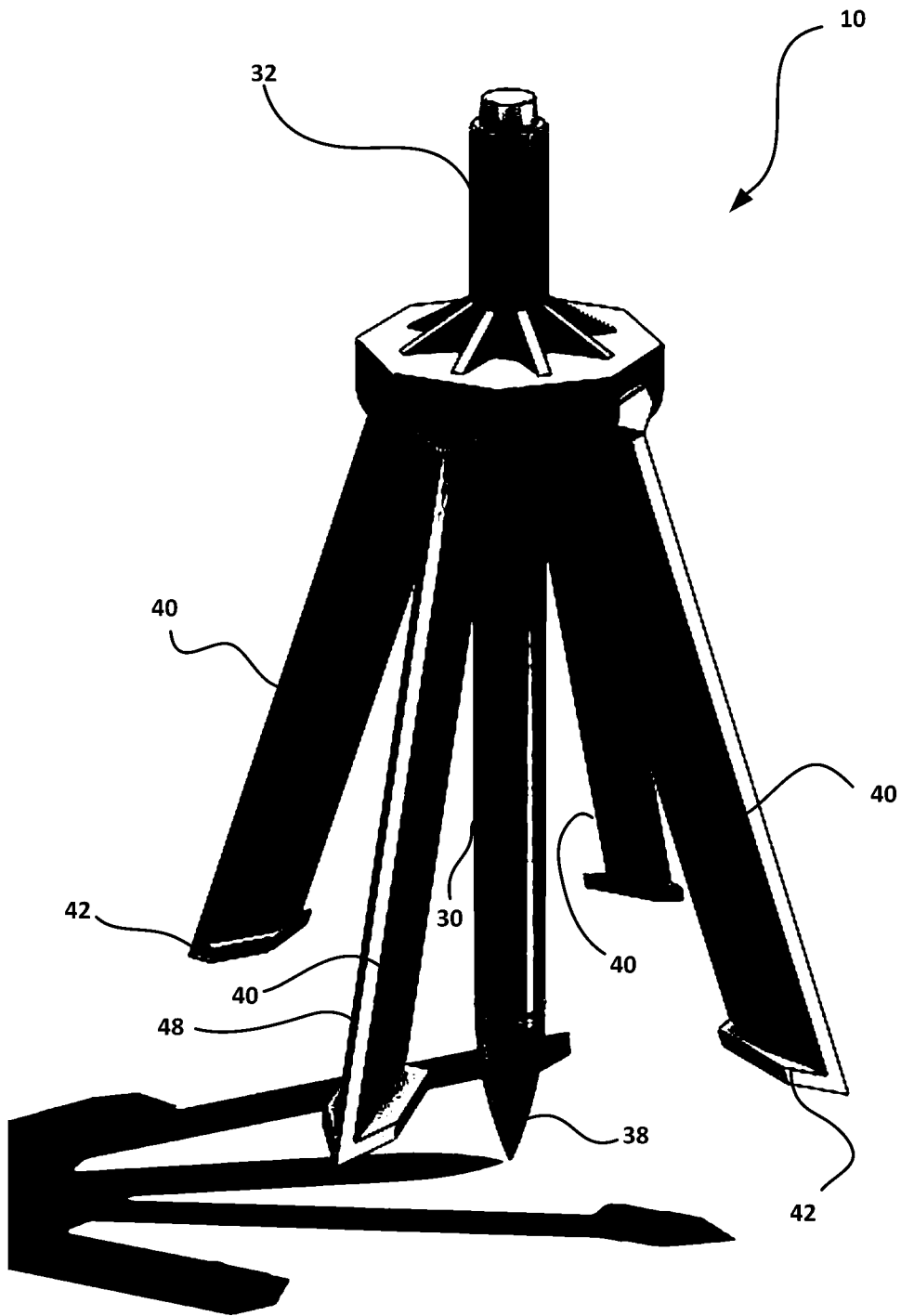


FIGURE 6

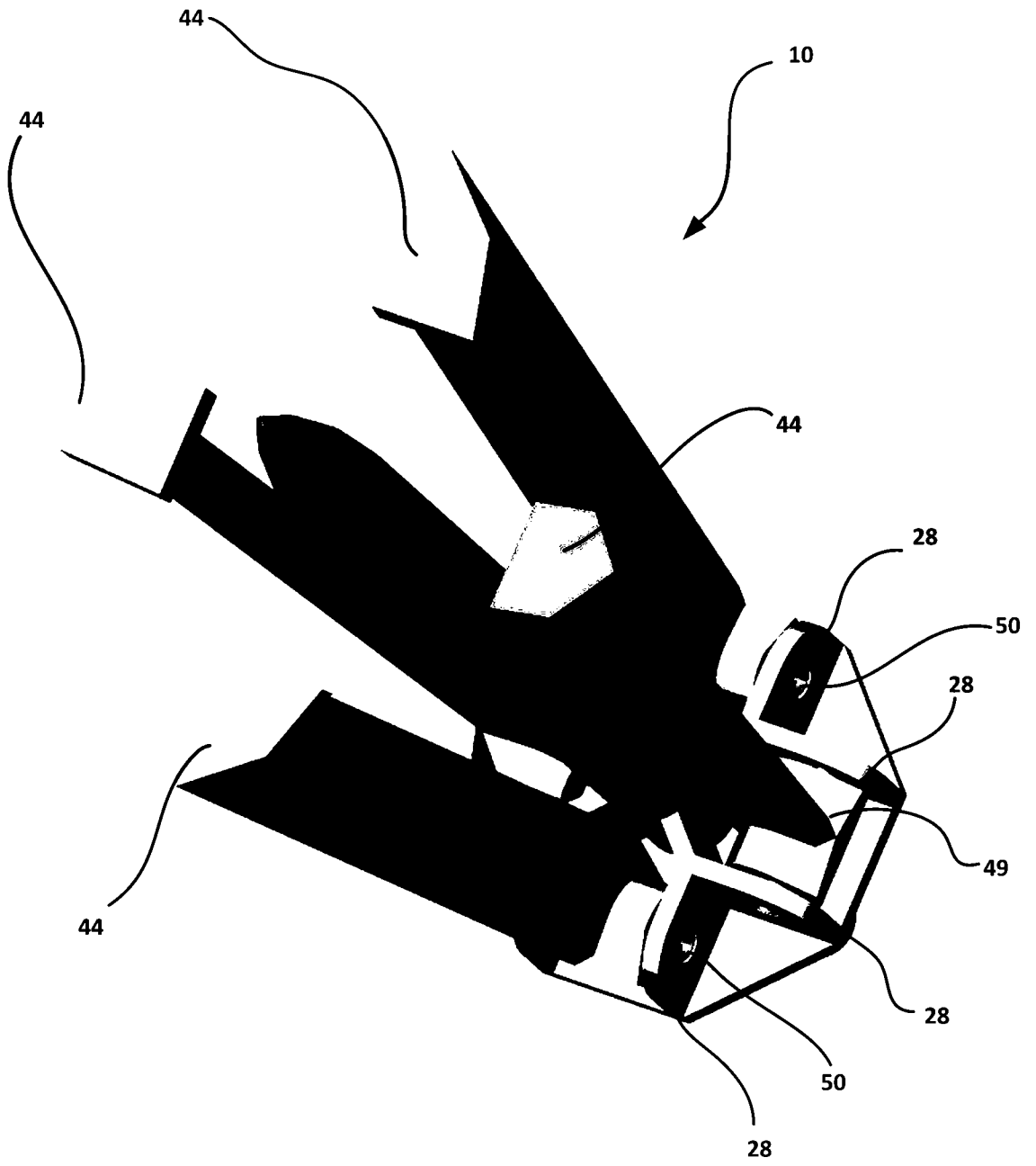


FIGURE 7

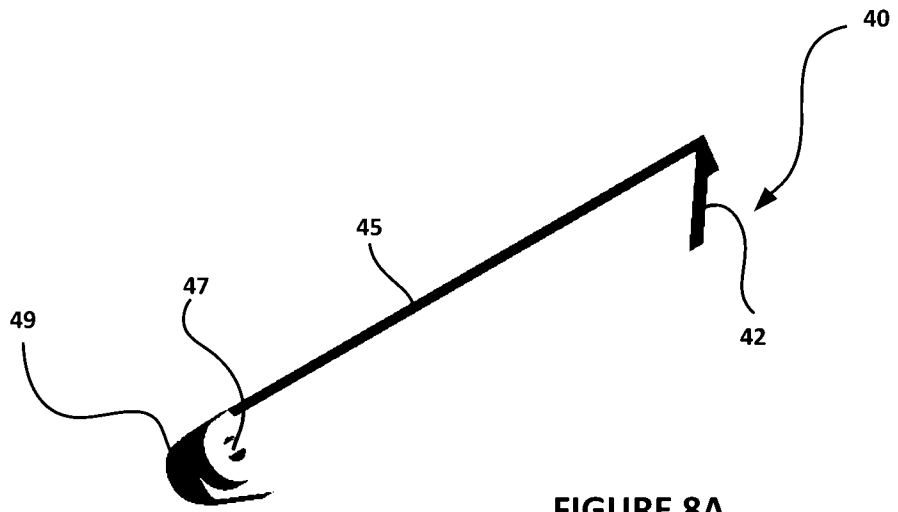


FIGURE 8A

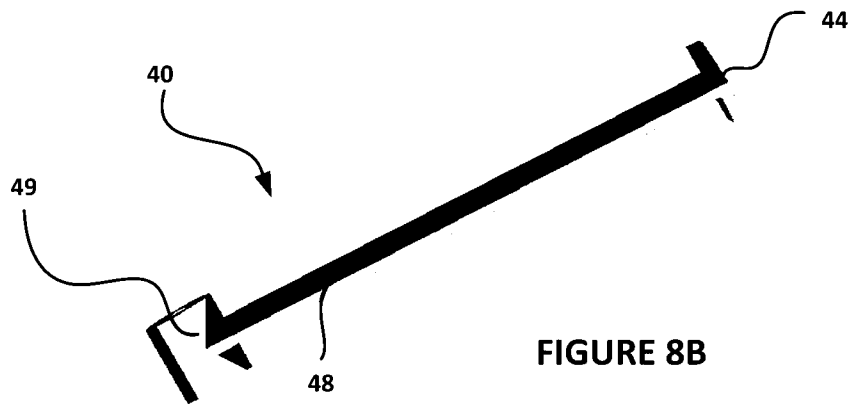


FIGURE 8B

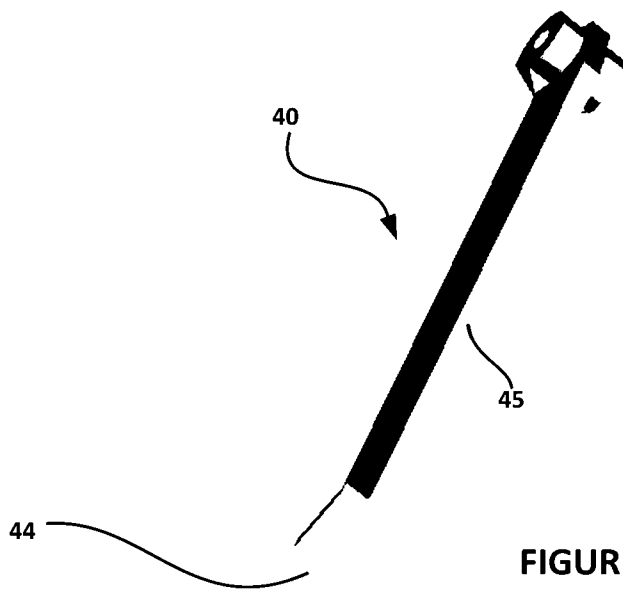


FIGURE 8C

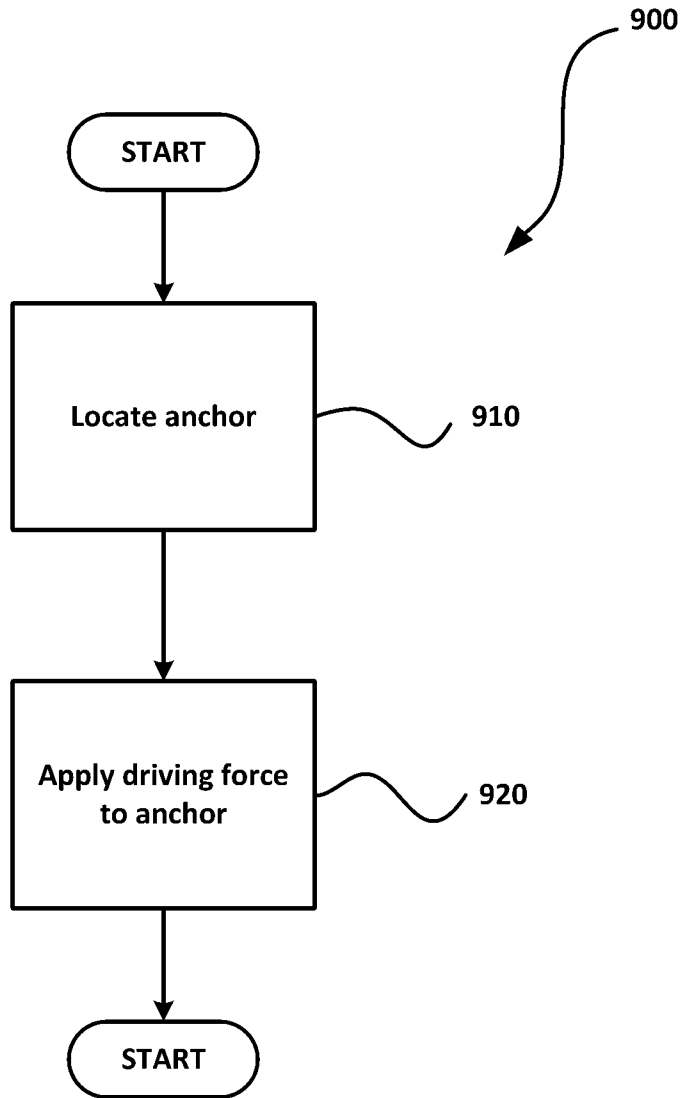


FIGURE 9

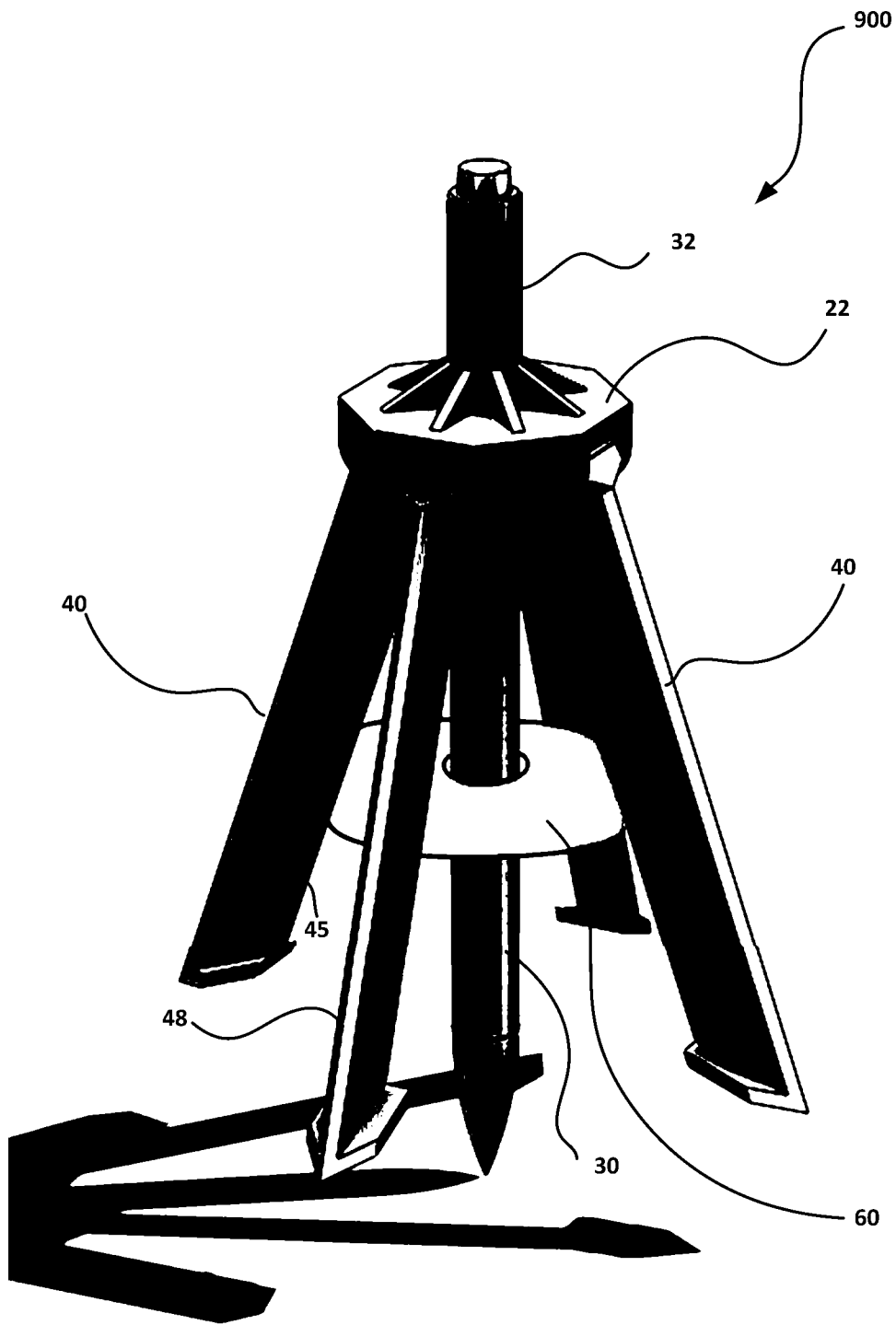


FIGURE 10

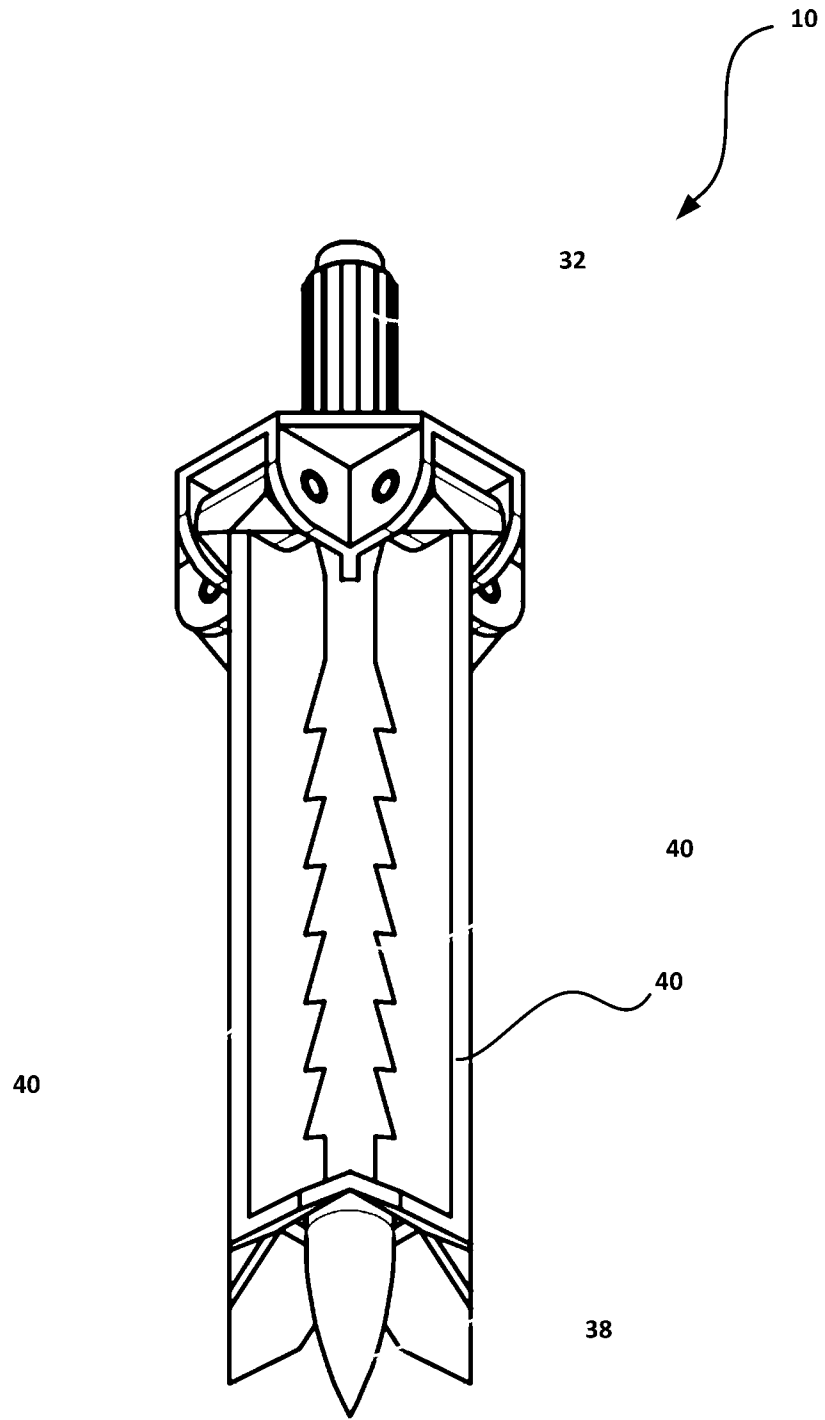


FIGURE 11

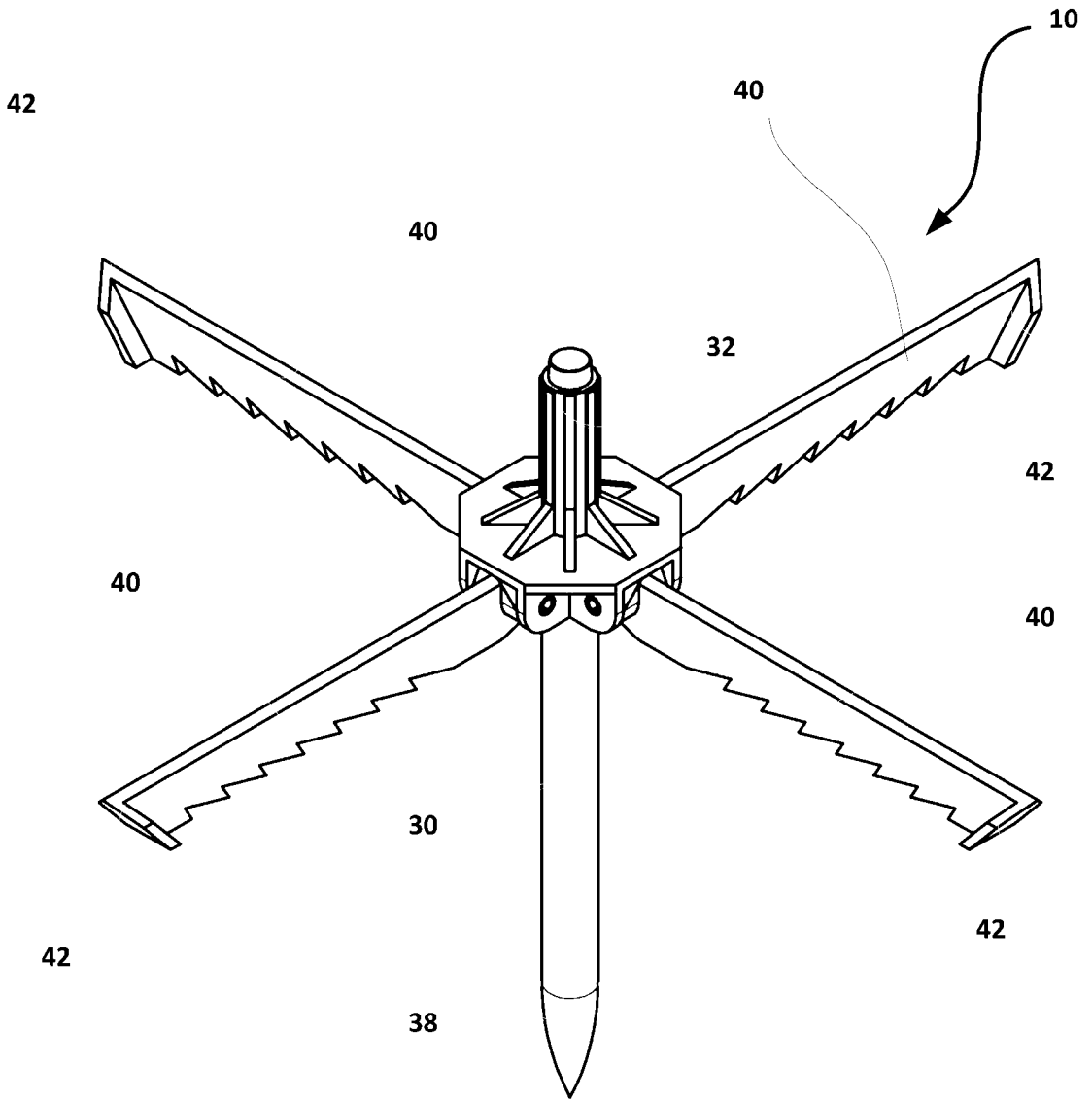


FIGURE 12

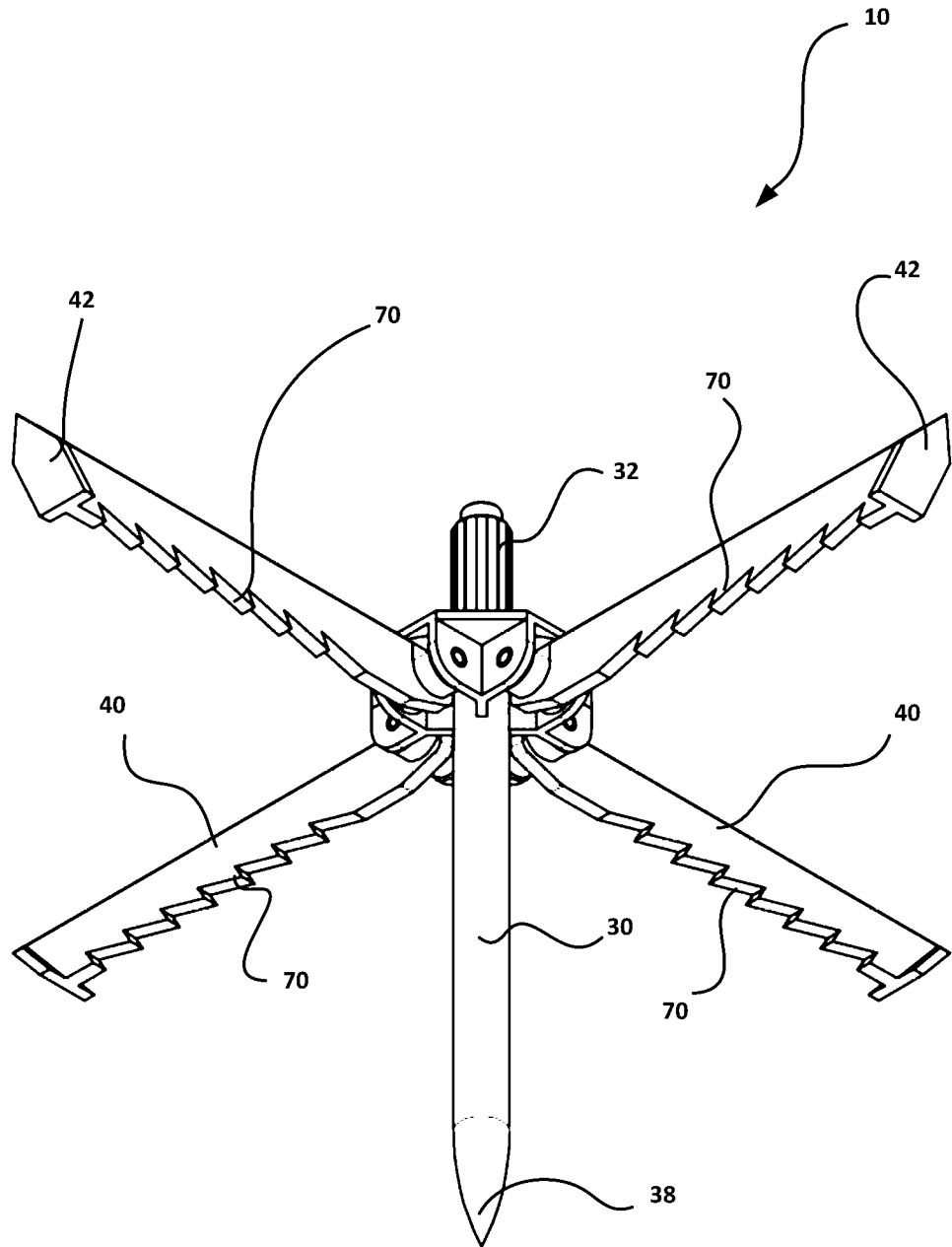


FIGURE 13

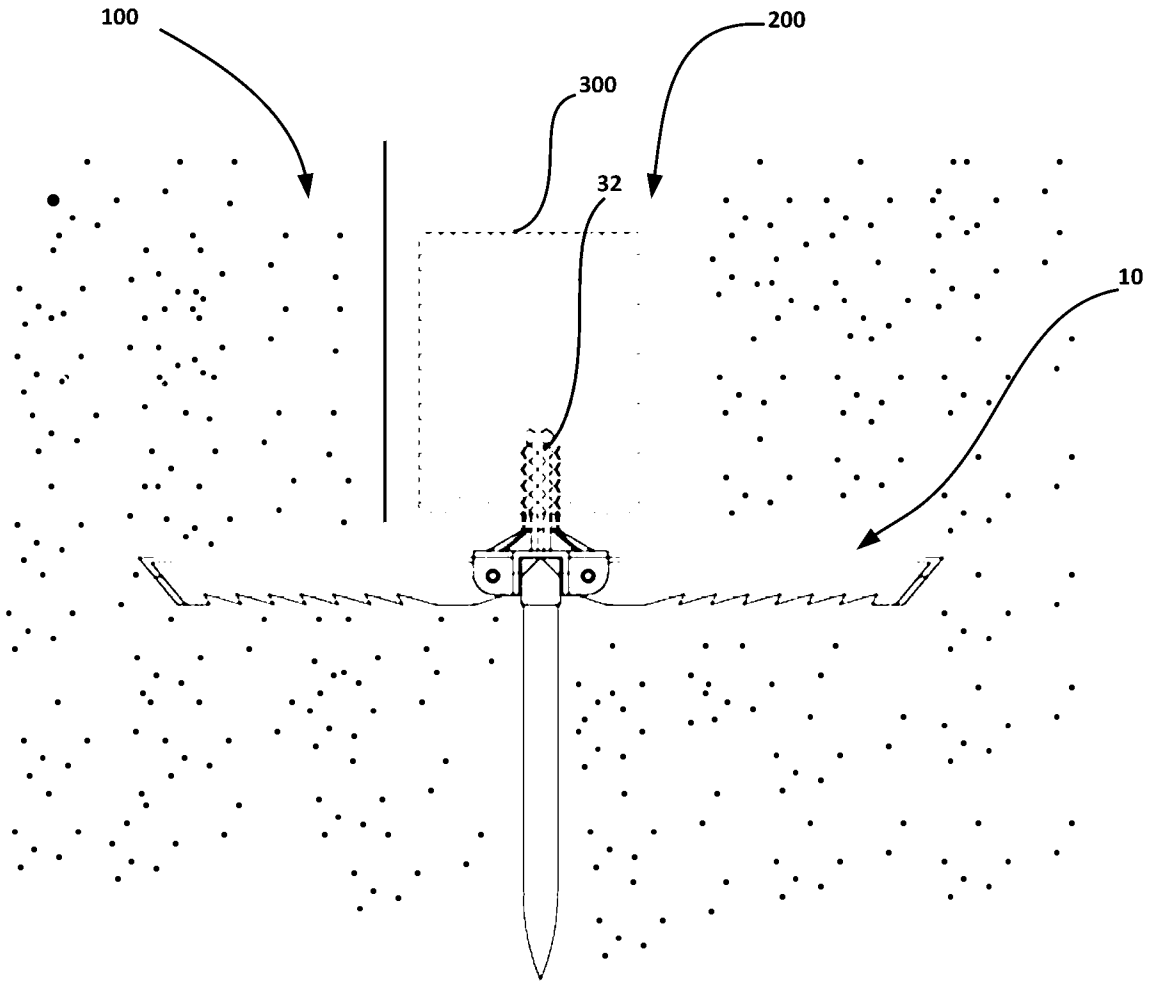


FIGURE 14A

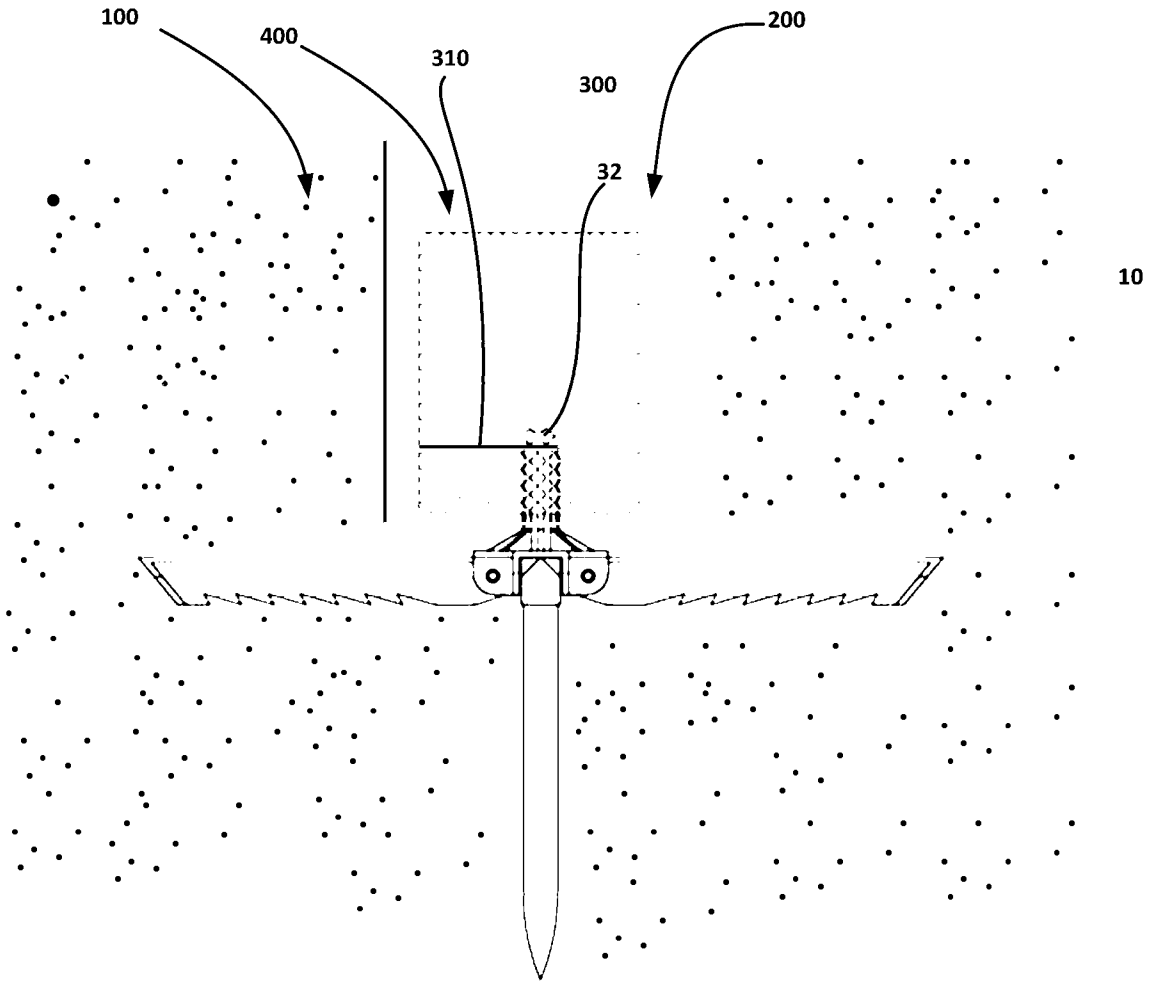


FIGURE 14B