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CA 2953468 A1 2015/12/30

(21) 2 953 468

(12) DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION

(13) A1

(86) **Date de dépôt PCT/PCT Filing Date:** 2015/06/26
(87) **Date publication PCT/PCT Publication Date:** 2015/12/30
(85) **Entrée phase nationale/National Entry:** 2016/12/22
(86) **N° demande PCT/PCT Application No.:** IB 2015/054827
(87) **N° publication PCT/PCT Publication No.:** 2015/198282
(30) **Priorité/Priority:** 2014/06/26 (ZA2014/04737)

(51) **Cl.Int./Int.Cl.** ***F42D 1/18*** (2006.01),
F42D 1/08 (2006.01), ***F42D 1/20*** (2006.01),
F42D 1/22 (2006.01), ***F42D 1/24*** (2006.01),
F42D 3/04 (2006.01)

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(54) **Titre : DISPOSITIF DE SUPPORT**
(54) **Title: A SUPPORT DEVICE**

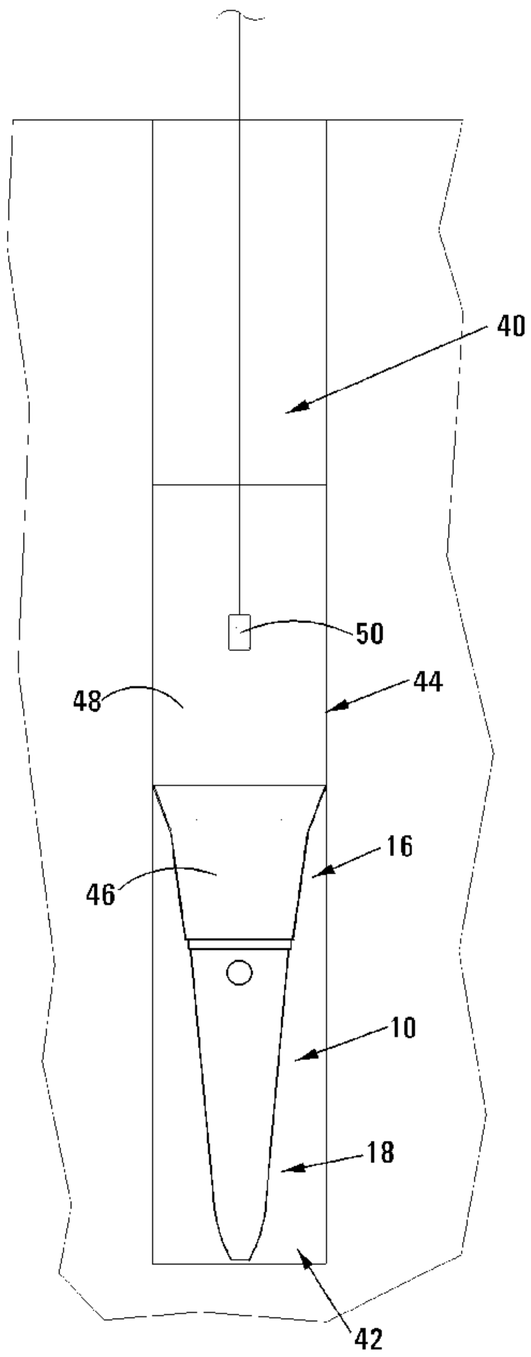


FIG 5

(57) **Abrégé/Abstract:**
A support device (10) in the form of a plastics plug for supporting material comprising stemming (46) in the form of crushed stone and an explosive charge (48) in a blast drill hole (40) at a position wherein the material is spaced above a bottom wall (42) of the drill

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(13) **A1**

(57) **Abrégé(suite)/Abstract(continued):**
hole (40). The support device (10) comprises a cup-shaped material supporting portion (16) in which the material is supported and an elongate shank portion (18) which extends from the material supporting portion (16). The shank portion (18) has a tapering hollow conical configuration and is releasebly connected to the material supporting portion(16) in an arrangement permitting separation of the material supporting portion (16) from the shank portion (18) so that the material supporting portion (16) can be used separately in a mid-hole decking application.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
30 December 2015 (30.12.2015)

WIPO | PCT

(10) International Publication Number
WO 2015/198282 A1

(51) International Patent Classification:
F42D 1/18 (2006.01) *F42D 3/04* (2006.01)
F42D 1/22 (2006.01) *F42D 1/08* (2006.01)
F42D 1/24 (2006.01) *F42D 1/20* (2006.01)

(21) International Application Number:
PCT/IB2015/054827

(22) International Filing Date:
26 June 2015 (26.06.2015)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2014/04737 26 June 2014 (26.06.2014) ZA

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU,

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(54) Title: A SUPPORT DEVICE

(57) Abstract: A support device (10) in the form of a plastics plug for supporting material comprising stemming (46) in the form of crushed stone and an explosive charge (48) in a blast drill hole (40) at a position wherein the material is spaced above a bottom wall (42) of the drill hole (40). The support device (10) comprises a cup-shaped material supporting portion (16) in which the material is supported and an elongate shank portion (18) which extends from the material supporting portion (16). The shank portion (18) has a tapering hollow conical configuration and is releasebly connected to the material supporting portion(16) in an arrangement permitting separation of the material supporting portion (16) from the shank portion (18) so that the material supporting portion (16) can be used separately in a mid-hole decking application.

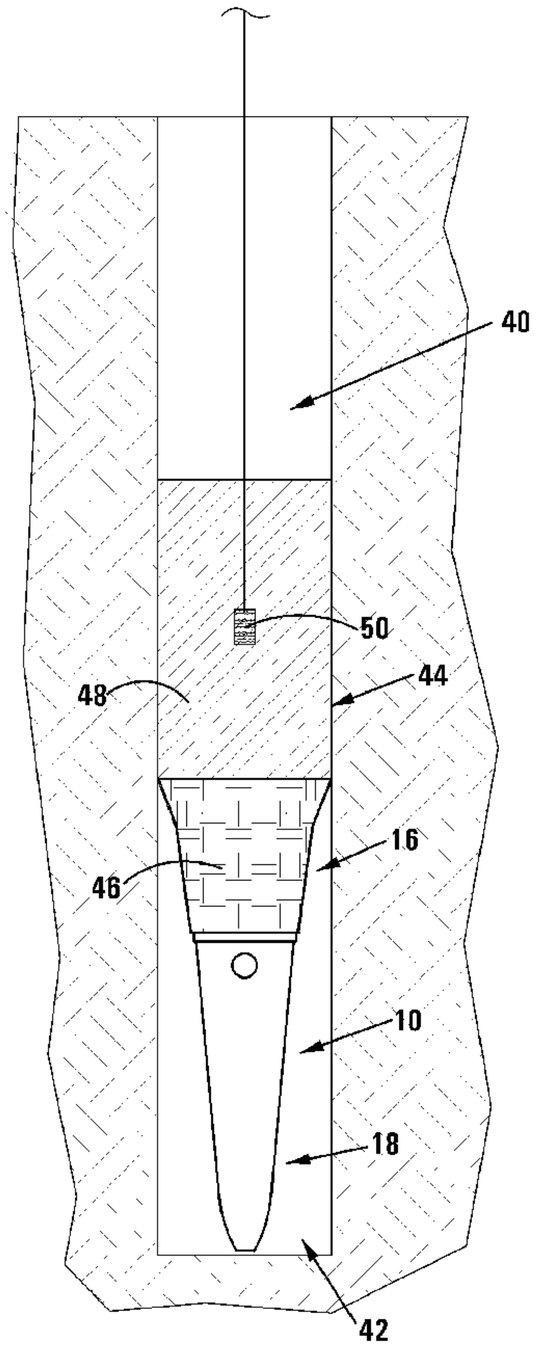


FIG 5

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TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

A SUPPORT DEVICE

FIELD OF INVENTION

This invention relates to a support device for supporting material in a blast drill hole in rock blasting applications such as open-cast mining, quarrying or underground excavation or tunneling applications.

BACKGROUND TO INVENTION

In rock blasting operations, one or more drill holes are drilled in the rock and an explosive charge is located in the drill hole. The explosive charge is initiated in the drill hole causing fragmentation and breaking down of the rock due to the resultant shock waves caused by the blast.

It is an object of the present invention to provide a support device for supporting material in a blast drill hole at a position spaced above the bottom of the drill hole.

SUMMARY OF INVENTION

According to a first aspect of the invention there is provided a support device for supporting material in a blast drill hole at a position spaced from a base of the drill hole, the support device including:

a cup-shaped material supporting portion for holding at least part of the material to be supported in the drill hole; and

an elongate shank portion having a hollow, generally conical configuration, which extends from the material supporting portion, for spacing the material supporting portion from the base of the drill hole.

The shank portion may have a distal end which abuts the base of the drill hole, in use, the shank portion tapering from a region thereof proximate the material supporting portion towards the distal end thereof.

The shank portion may define an internal space.

The shank portion may define a first opening at the distal end thereof which leads into the internal space.

The shank portion may have a generally conical side wall extending between the material supporting portion and the distal end of the shank portion, the side wall defining at least one second opening in a side of the shank portion between the material supporting portion and the distal end of the shank portion.

The material supporting portion may include a wall engagement formation for engaging a wall of the drill hole in which the support device is positioned.

The wall engagement formation may have a frusto-conical configuration and may be of a resiliently deformable construction and dimensioned for resiliently deforming upon insertion of the material supporting portion of the support device in a drill hole thereby to engage the wall of the drill hole.

The material supporting portion and the elongate shank may be in the form of separate members which are releasably connected to one another in an arrangement permitting separation of the material supporting portion from the shank portion.

The support device may be of a plastics material.

According to a second aspect of the invention there is provided a support device for supporting material in a blast drill hole at a position spaced from a base of the drill hole, the support device including:

a cup-shaped material supporting portion for holding at least part of the material to be supported in the drill hole, the material supporting portion including a wall engagement formation for engaging a wall of the drill hole in which the support device is positioned; and

an elongate shank portion which extends from the material supporting portion for spacing the material supporting portion from the base of the drill hole.

The wall engagement formation may have a frusto-conical configuration and may be of a resiliently deformable construction and dimensioned for resiliently deforming upon insertion of the material supporting portion of the support device in a drill hole thereby to engage the wall of the drill hole.

The material supporting portion and the elongate shank may be in the form of separate members which are releasably connected to one another in an arrangement permitting separation of the material supporting portion from the elongate shank.

The support device may be of plastics material.

The invention extends to the material supporting portion of the support device described and defined hereinabove in accordance with the first or second aspects of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Further features of the invention are described hereinafter by way of a non-limiting example of the invention, with reference to and as illustrated in the accompanying diagrammatic drawings. In the drawings:

Figure 1 shows a side view of a support device in accordance with the invention;

Figure 1A shows an enlarged sectional side view of detail A of Figure 1;

Figure 2 shows a top plan view of the support device of Figure 1;

Figure 3 shows an enlarged, fragmentary sectional side view of the support device of Figure 1, sectioned along section line III-III of Figure 1;

Figure 4 shows a three-dimensional view of the support device of Figure 1;

Figure 5 shows a fragmentary sectional side view of the support device of Figure 1 located in a blast drill hole, illustrating the manner in which the support device is used for supporting material above the bottom of a blast drill hole;

Figure 6 shows the manner in which the support device of Figure 1 is used in blast drill holes in an open-cast mining application;

Figure 7 illustrates another mode use of the support device of Figure 1 in an open-cast mining application; and

Figure 8 illustrates the manner in which the material supporting portion of the support device of Figure 1, is used separately in a mid-hole air decking application.

DESCRIPTION OF PREFERRED EMBODIMENTS

With reference to Figures 1 to 8 of the drawings, a support device in accordance with the invention, is designated generally by the reference numeral 10. The support device 10 is in the form of a plug of a plastics material, which is positioned, in use, in a blast drill hole for supporting material in the drill hole at a position spaced above the bottom of the drill hole. The blast drill holes described in this example are of a type typically used in open-cast mining and quarrying applications and have a generally vertical orientation. It will be appreciated, however, that in other applications such as underground mining or tunneling, the blast drill holes may have a generally horizontal orientation.

The support device 10 has an upper end 12 and a lower end 14 and comprises, broadly, a cup-shaped material supporting portion 16 defining a receptacle in which material is supported and an elongate shank portion 18 which extends from the material supporting portion.

The material supporting portion 16 is configured for holding at least part of the material to be supported in the drill hole. The shank portion 18 has a hollow, generally conical configuration and is configured for spacing the material supporting portion from the base of the drill hole as will be explained in further detail hereinbelow.

The shank portion has a distal end which defines the lower end 14 of the support device and which abuts the base of the drill hole, in use. The shank portion tapers from an upper region thereof proximate the material supporting portion towards the distal end

thereof. An internal space is defined within the shank portion. The shank portion defines an opening 20 at its distal end which leads into the internal space.

The shank portion has a generally conical side wall 22 which extends between the material supporting portion and the distal end of the shank portion. The side wall defines two openings 24 in a side of the shank portion within a region thereof near the material supporting portion.

The material supporting portion 16 includes a base wall 26, a cylindrical first side wall portion 28 which extends upwardly from the base wall 26 and a second frusto-conical side wall portion 30 which extends from an upper end of the first side wall portion 28. More specifically, the second side wall portion 30 tapers from an upper end thereof towards a lower end thereof where it joins the first cylindrical side wall portion 28. The first and second side wall portions 28 and 30 define a number of circumferentially spaced slots 32 which extend longitudinally from an upper position at an upper end of the second side wall portion 30 to a lower position near the base wall 26 yet spaced therefrom. The slots 32 are open at the upper end of the second side wall portion 30. The slots 32 divide the side wall portions 28 and 30 of the material supporting device into segments which extend between the slots and which are independently movable. This construction of the material supporting device allows for resilient deformation of an upper region of the first side wall portion 28 and of the second side wall portion 30 in order to allow resilient deformation of the material supporting device upon insertion of the material supporting portion into a drill hole thereby to engage the wall of the drill hole. As such, an upper region of the first side wall portion 28 and the second side wall portion 30 and more specifically, the segments defined between these slots 32 provide wall engagement formations for engaging a wall of the drill hole in which the support device is positioned. It will be appreciated that the dimensions and more specifically, the diameter of the second side wall portion 30 is such that the diameter is slightly larger than the diameter of a drill hole in which the support device is to be inserted so that outer regions of the second side wall portion 30 engage the wall of the drill hole as the support device is inserted into the drill hole to a desired depth within the drill hole.

The material supporting portion 16 and the elongate shank 18 are in the form of separate members which are releasably connected to one another in an arrangement permitting separation of the material supporting portion from the shank portion. More specifically, the material supporting portion defines a depending cylindrical skirt 34 within which an upper end region 36 of the shank portion 18 is received. An upper end region of the shank portion defines an outwardly-projecting annular rib formation 38 and the material supporting portion 16 has a number of inwardly-projecting clip formations 39 which engage an underside of the annular rib formation 38 for releasably connecting the material supporting portion 16 to the shank portion 18.

In use, and with particular reference to Figures 5 to 7, the support device 10 is positioned in a blast drill hole 40 in an arrangement wherein the lower end 14 of the support device abuts a bottom wall 42 of the drill hole, with the second side wall portion of the material supporting device 16 engaging an inner side of a wall 44 defining the blast drill hole 40. Stemming 46 which typically comprises crushed stone, is located in the receptacle defined by the material supporting device 16 and an explosive charge 48 is packed into the drill hole on top of the stemming. A primer charge 50 is located in the explosive charge for initiating combustion of the explosive charge.

The support device thus supports the stemming and the explosive charge at a position within the drill hole spaced above the bottom wall 42 of the drill hole thereby ensuring that energy resulting from the combustion of the explosive charge is optimally directed to the surrounding rock structure. In particular, spacing of the explosive charge from the bottom of the drill hole causes shock waves to travel downwards initially unimpeded by rock, which results in enhanced blasting efficiency. Furthermore, water often collects in the base of the blast drill holes and the support device thus ensures that the explosive charge is supported at a height within the drill hole above water and/or mud which collects in the base of the drill hole thereby ensuring that the explosive charge remains so as to reduce the possibility of misfiring.

The conical shape of the support device allows for ease of insertion of the support device into a drill hole. More particularly, the conical configuration of the support device provides the support device with directional stability as it is pushed down a drill hole until it comes to rest at the bottom of the drill hole. The holes 20 and 24 which are defined in the distal end and the side wall of the shank portion of the support device, respectively, allow for water to enter into the internal cavity defined within the support device without displacing the water which would otherwise have the effect of causing the water level to rise within the drill hole.

With reference to Figure 6, a number of support devices are shown located at the bottom of drill holes within a rock overburden 52 in which three blast drill holes 40.1, 40.2 and 40.3 have been drilled. It can be seen that in the drill hole 40.3 water 46 has collected at the bottom of the drill hole, with the material supporting portion of the support device being disposed above the water level.

With reference to Figure 7 of the drawings, the manner in which the support device 10 can be used as a plug for a closing off the top of a drill hole is illustrated. By doing so, dirt and drill chippings are prevented from falling back into the blast hole which may contaminate the explosive charge supported by a support device at the base of the drill hole.

With reference to Figure 8 of the drawings, the manner in which the material supporting portion 16 can be used separately in a mid-hole air decking application is illustrated. For this application, the material supporting portion 16 is separated from the shank portion and a hole is drilled in the base wall 26 thereof. The material supporting portion 16 is then inserted into the drill hole 40 to a desired depth where it is suspended by a piece of rope 54 which is threaded through the hole in the base wall and a knot tied in an end of the rope such that rope is prevented from passing through the hole. An upper end of the rope is fastened to a rod 56 which is positioned transversely over the upper end of the hole. In this manner, the material supporting portion 16 is located in the blast drill hole at a desired depth. Air decking is desirable in many blast drilling applications

wherein an air space is created within the blast drill hole when the material supporting portion is located at any desired depth within the drill hole above the bottom of the hole. In the example shown in Figure 8, the material support portion 16 is shown located mid-hole at a location spaced above an explosive charge 48 located in the base of the hole, the air space being designated by the reference numeral 56.

CLAIMS:

1. A support device for supporting material in a blast drill hole at a position spaced from a base of the drill hole, the support device including:

a cup-shaped material supporting portion for holding at least part of the material to be supported in the drill hole; and

an elongate shank portion having a hollow, generally conical configuration, which extends from the material supporting portion, for spacing the material supporting portion from the base of the drill hole.

2. The support device as claimed in Claim 1, wherein the shank portion has a distal end which abuts the base of the drill hole, in use, the shank portion tapering from a region thereof proximate the material supporting portion towards the distal end thereof.

3. The support device as claimed in Claim 2, wherein the shank portion defines an internal space.

4. The support device as claimed in Claim 3, wherein the shank portion defines a first opening at the distal end thereof which leads into the internal space.

5. The support device as claimed in Claim 4, wherein the shank portion has a generally conical side wall extending between the material supporting portion and the distal end of the shank portion, the side wall defining at least one second opening in a side of the shank portion between the material supporting portion and the distal end of the shank portion.

6. The support device as claimed in any one of Claims 1 to 5, wherein the material supporting portion includes a wall engagement formation for engaging a wall of the

drill hole in which the support device is positioned.

7. The support device as claimed in Claim 6, wherein the wall engagement formation has a frusto-conical configuration and is of a resiliently deformable construction and dimensioned for resiliently deforming upon insertion of the material supporting portion of the support device in a drill hole thereby to engage the wall of the drill hole.

8. The support device as claimed in any one of Claims 1 to 7, wherein the material supporting portion and the elongate shank are in the form of separate members which are releasably connected to one another in an arrangement permitting separation of the material supporting portion from the shank portion.

9. The support device as claimed in any one of Claims 1 to 8, wherein the support device is of a plastics material.

10. A support device for supporting material in a blast drill hole at a position spaced from a base of the drill hole, the support device including:

a cup-shaped material supporting portion for holding at least part of the material to be supported in the drill hole, the material supporting portion including a wall engagement formation for engaging a wall of the drill hole in which the support device is positioned; and

an elongate shank portion which extends from the material supporting portion for spacing the material supporting portion from the base of the drill hole.

11. The support device as claimed in Claim 10, wherein the wall engagement formation has a frusto-conical configuration and is of a resiliently deformable construction and dimensioned for resiliently deforming upon insertion of the material supporting portion of the support device in a drill hole thereby to engage

the wall of the drill hole.

12. The support device as claimed in Claim 10 or Claim 11, wherein the material supporting portion and the elongate shank are in the form of separate members which are releasably connected to one another in an arrangement permitting separation of the material supporting portion from the elongate shank.

13. The support device as claimed in any one of Claims 10 to 12, wherein the support device is of plastics material.

14. The material supporting portion of the support device as claimed in any one of Claims 10 to 13.

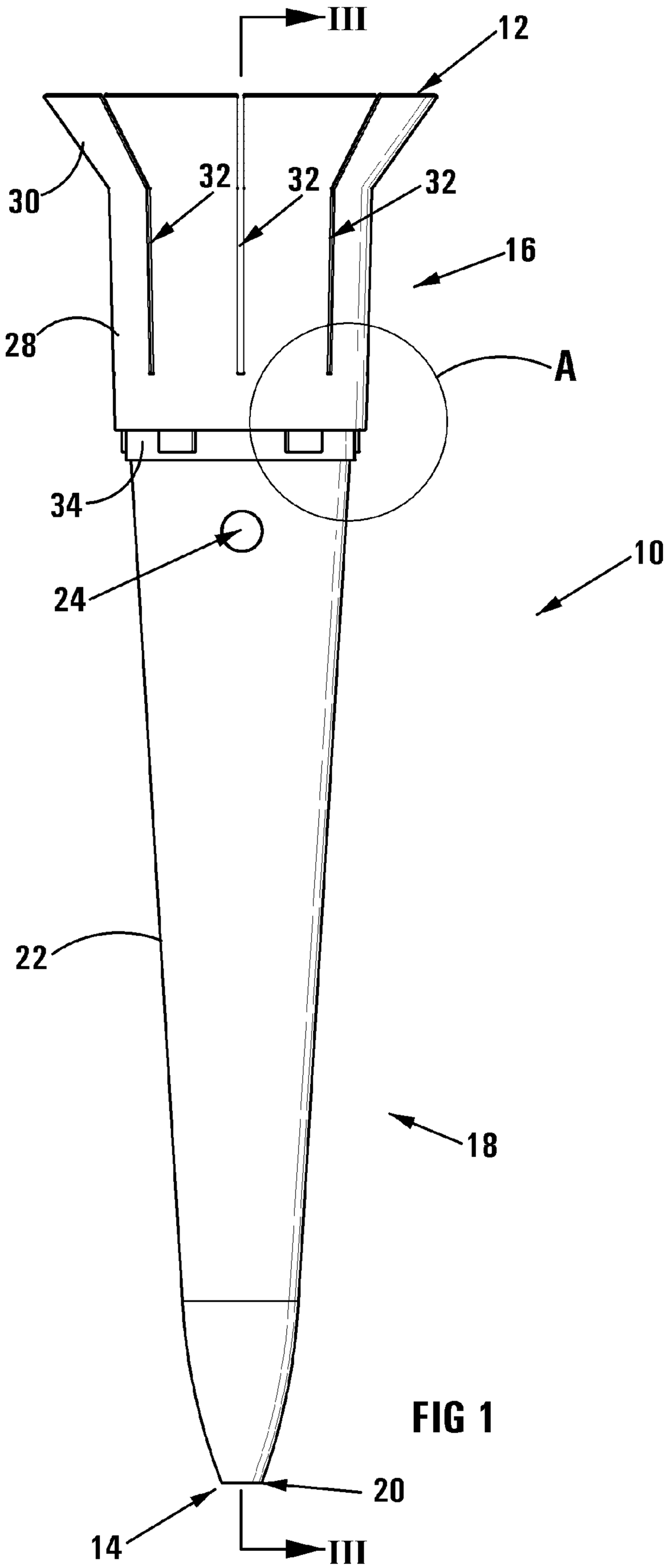


FIG 1

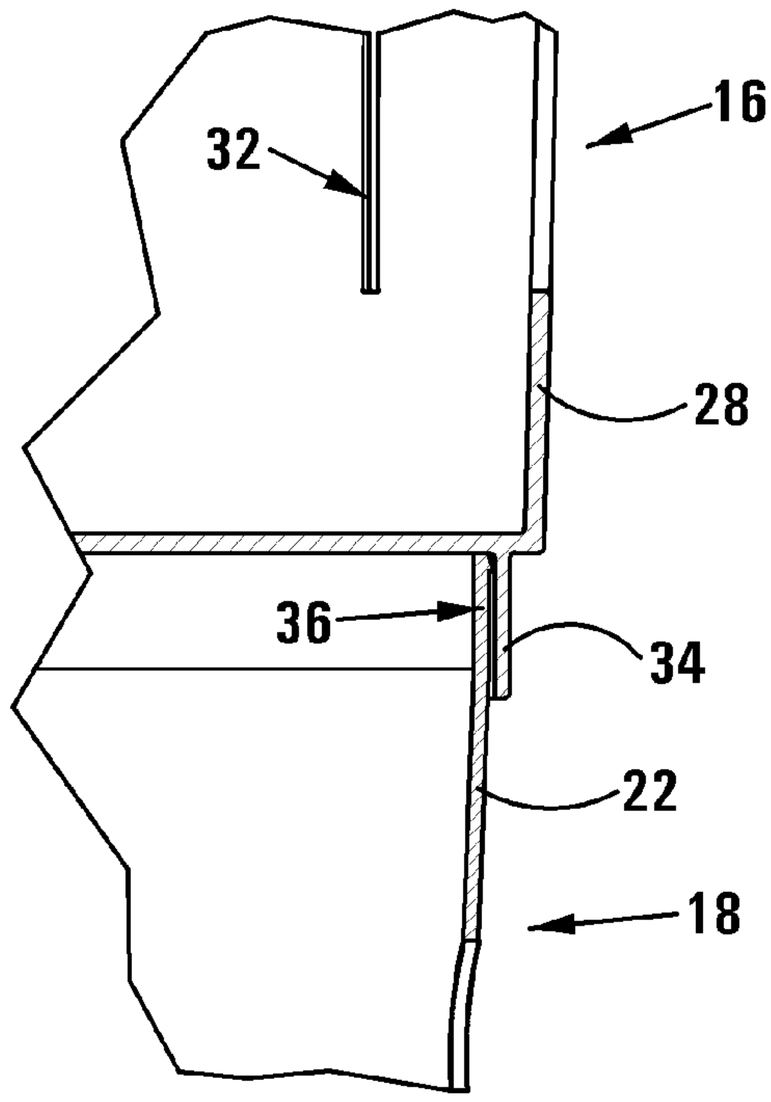


FIG 1A

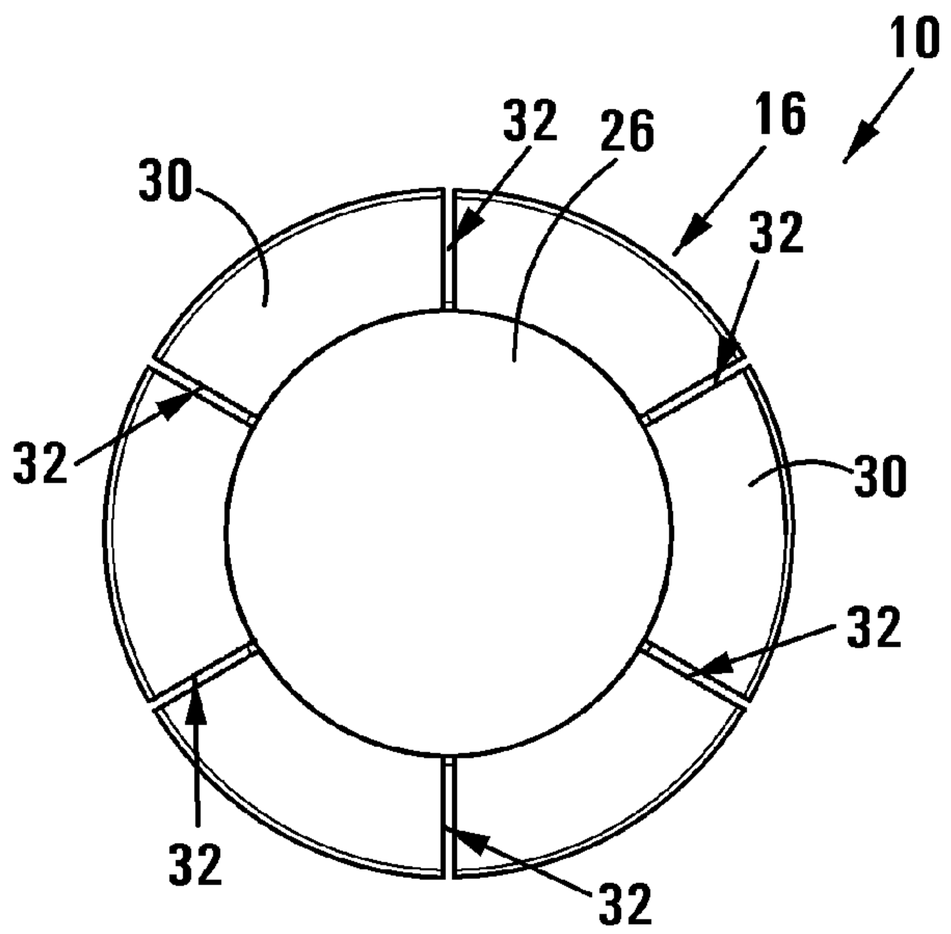


FIG 2

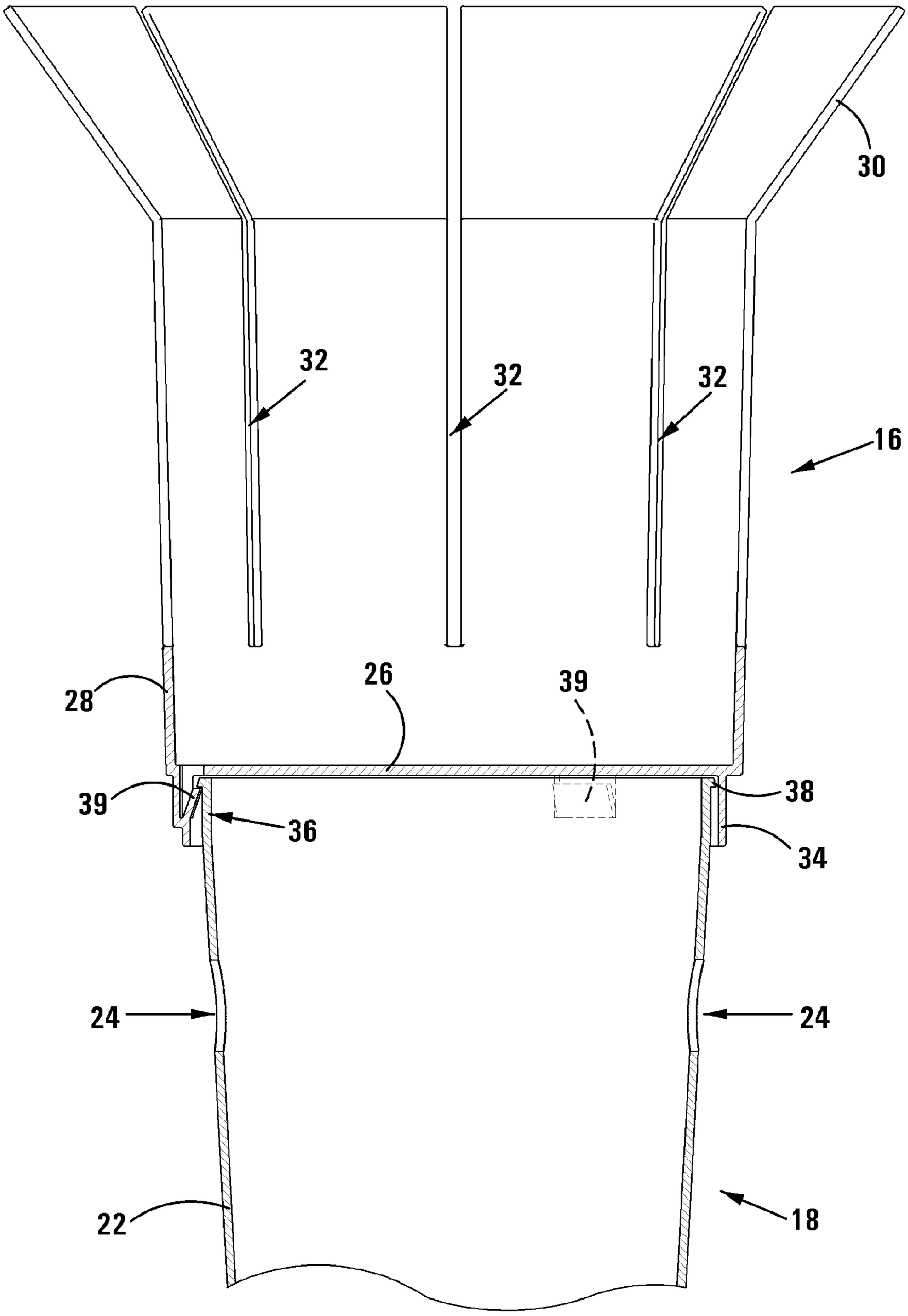


FIG 3

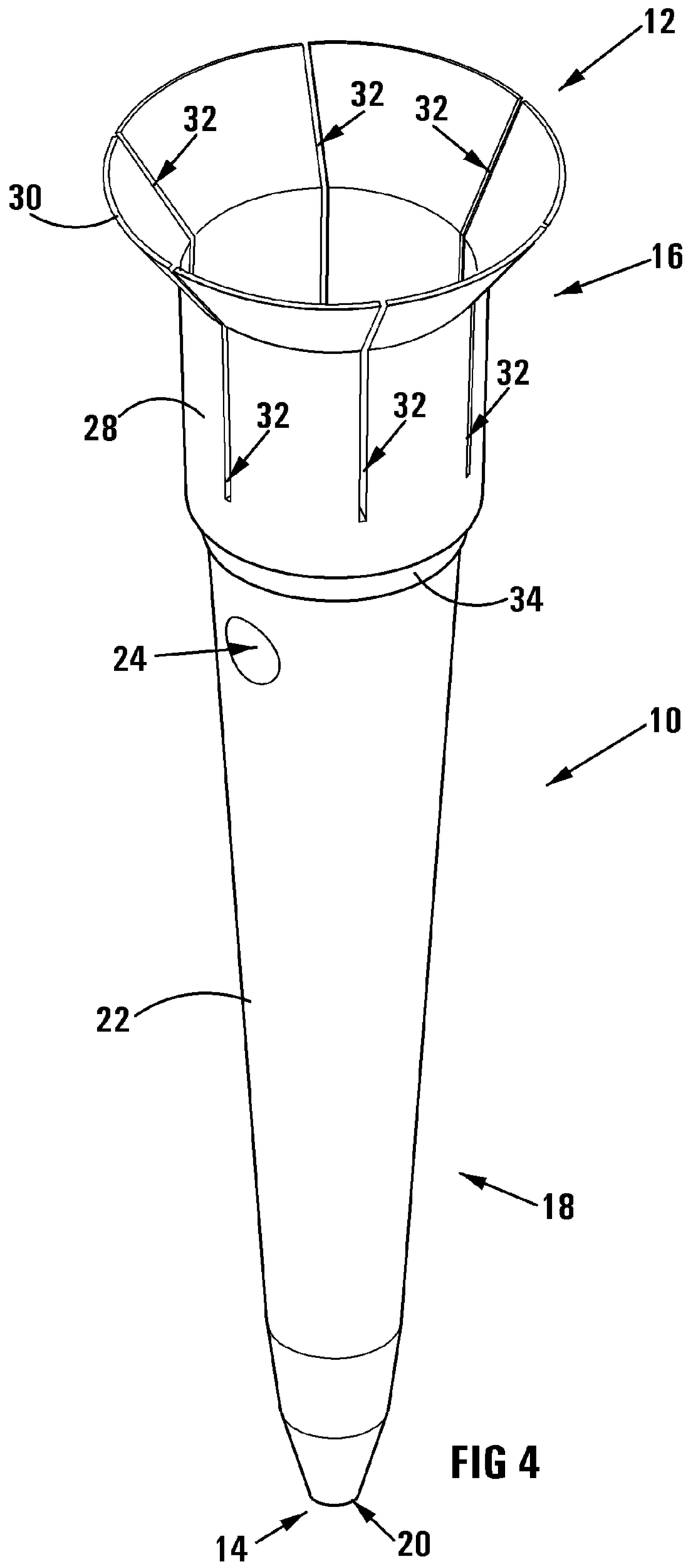


FIG 4

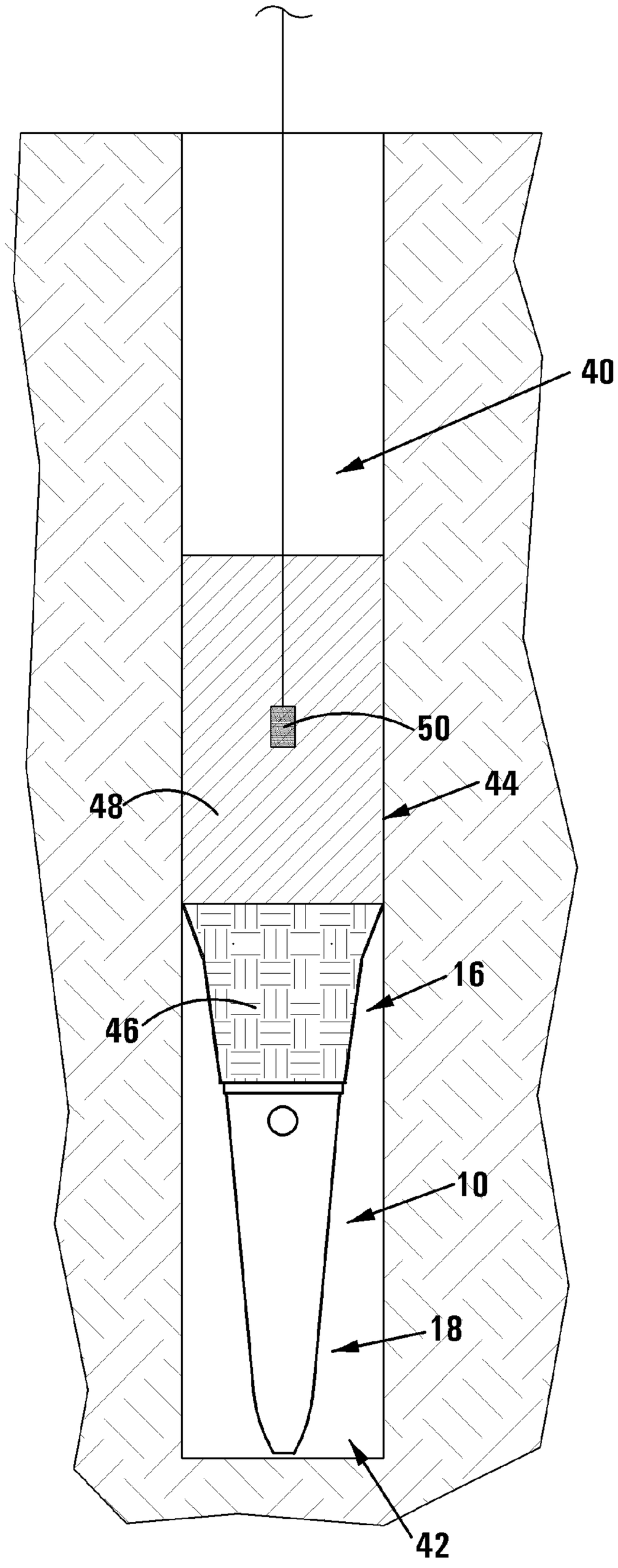


FIG 5

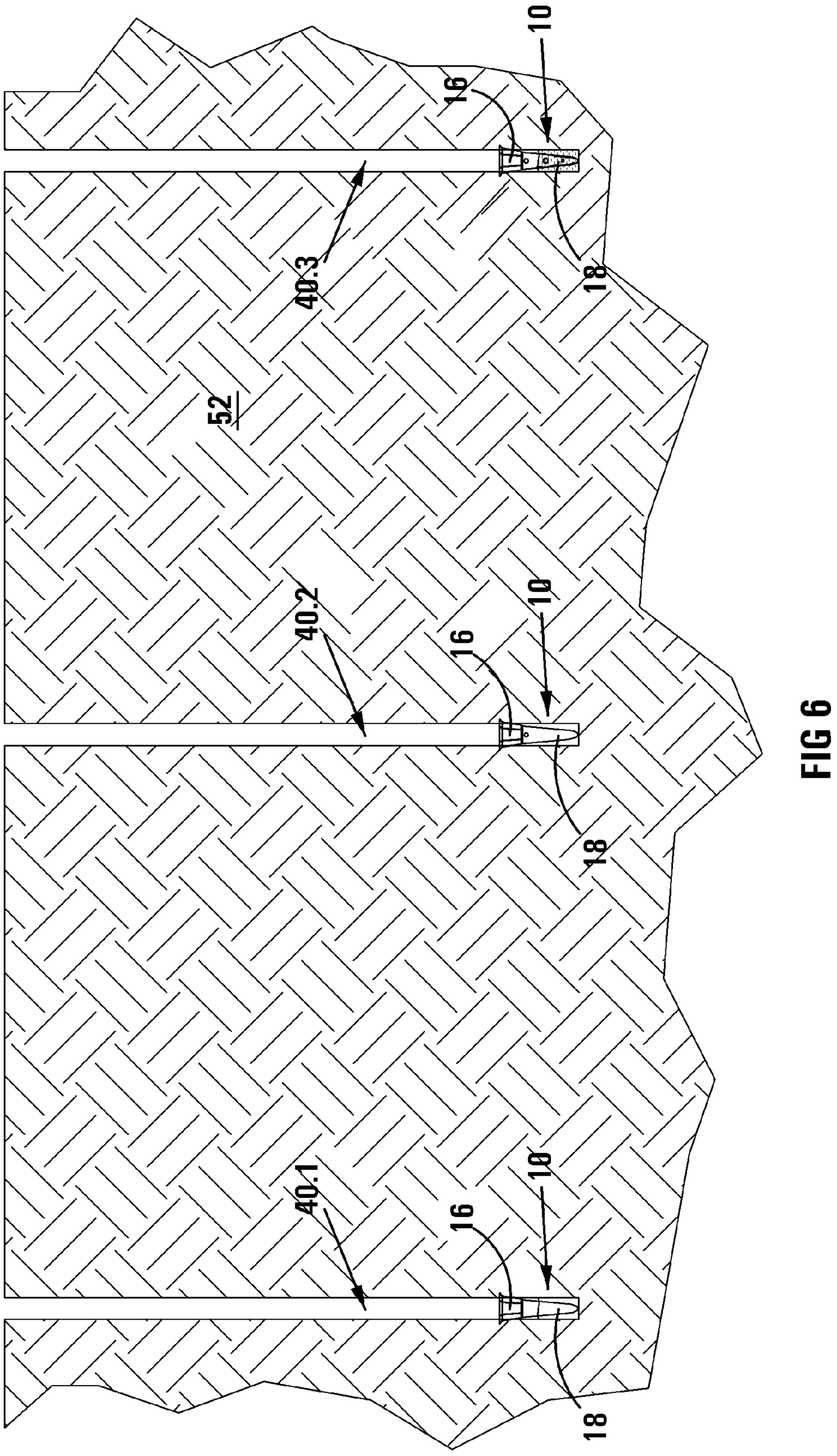


FIG 6

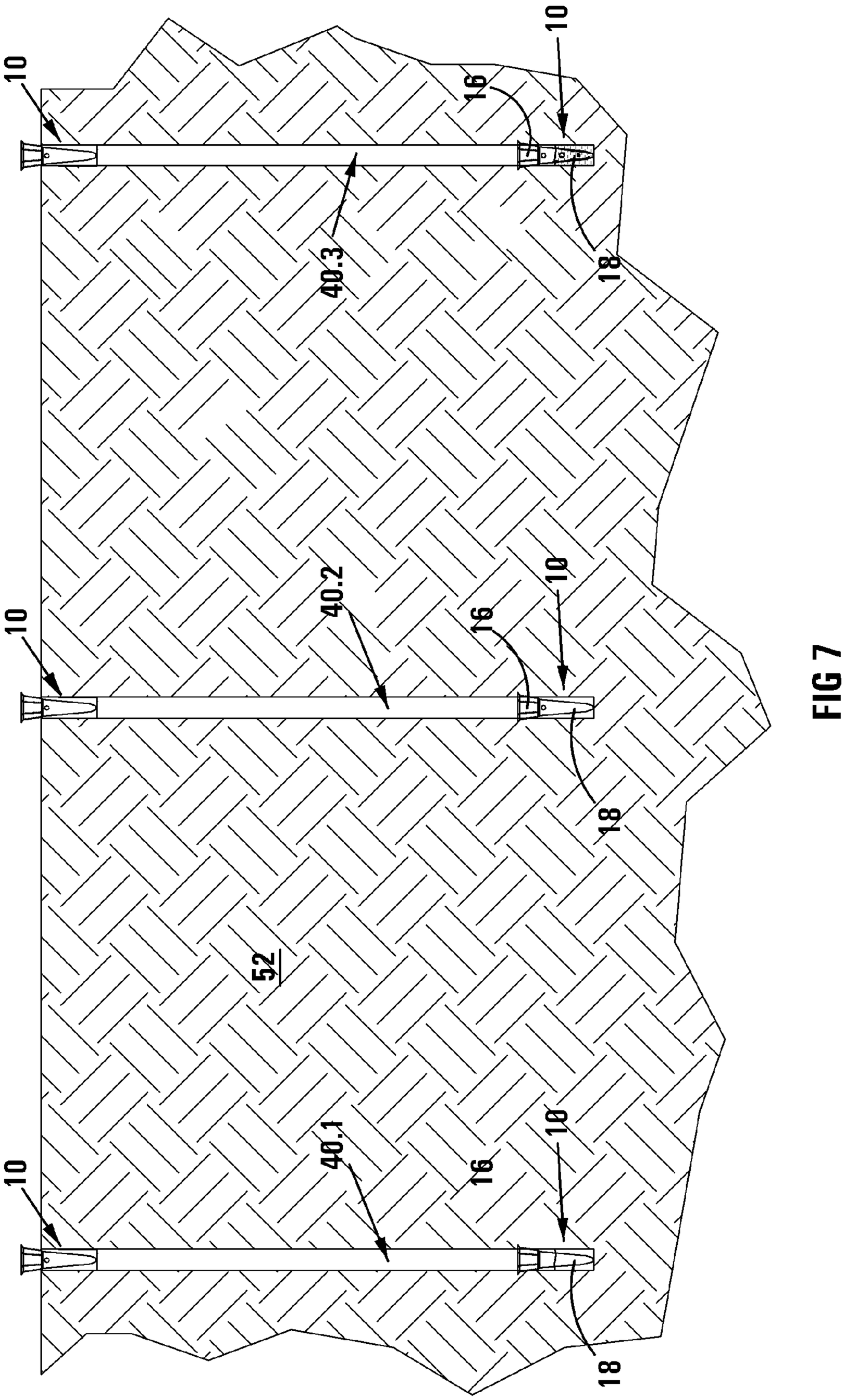


FIG 7

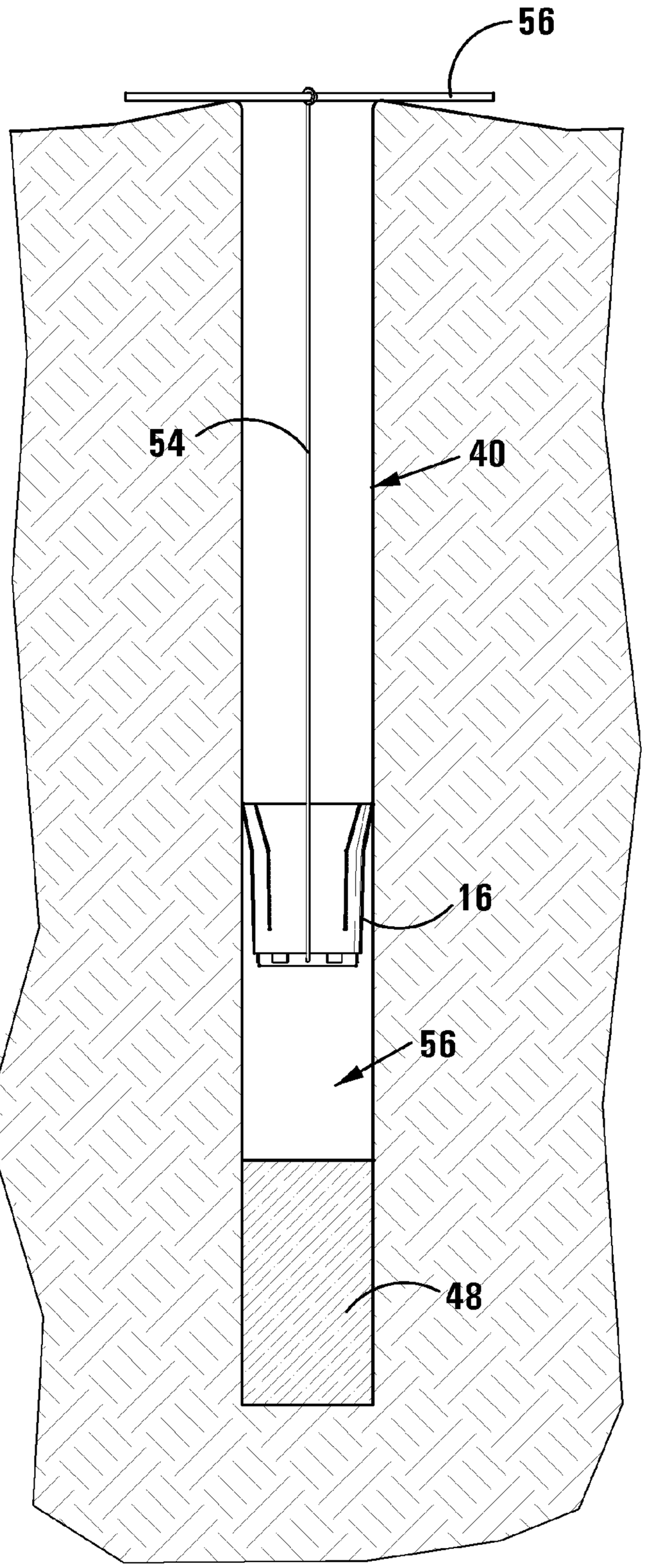


FIG 8

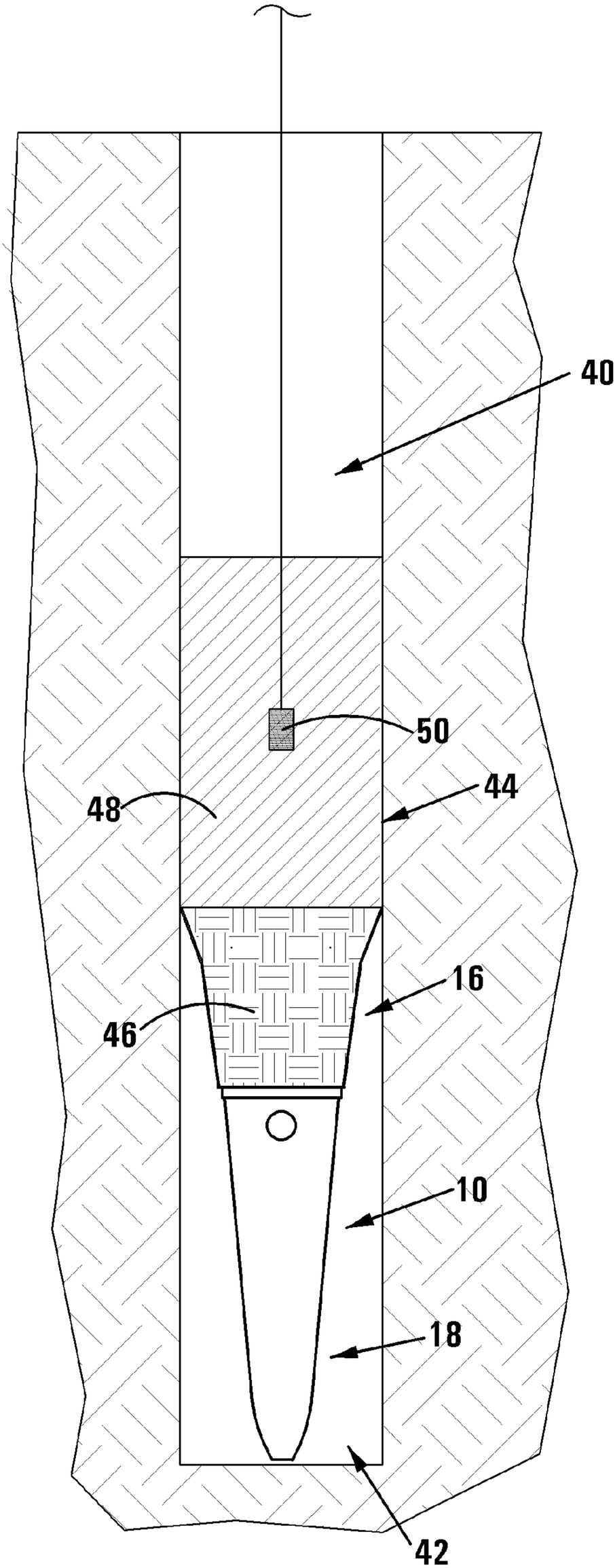


FIG 5