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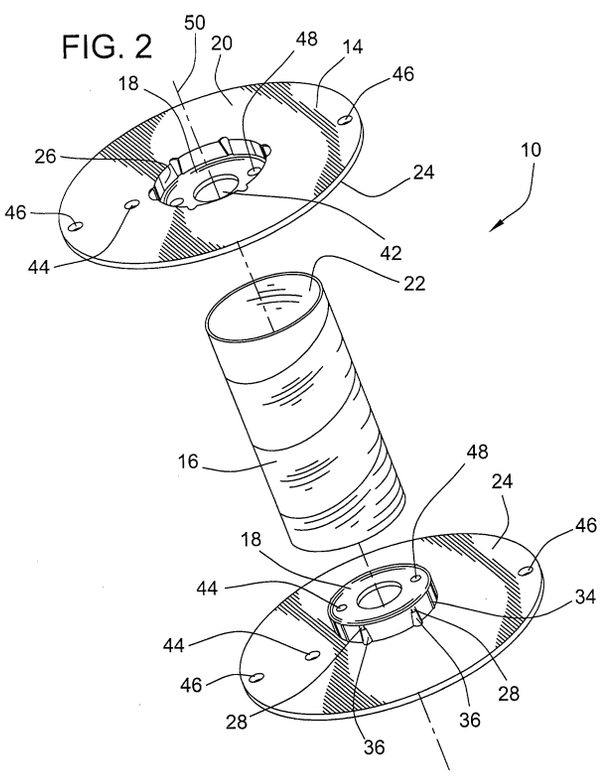
(54) Three piece spool

(57) A wire spool comprising three structural components including two end flanges (14) and a rigid fiberboard barrel (16). The end flanges (14) may be molded plastic or stamped sheet metal. The end flanges have central plug portions (18) that are mechanically locked into the barrel (16). The central plug portions include teeth (28) which dig into the barrel (16) to substantially permanently secure the end flanges (14) to the barrel such that the wire spool has sufficient strength to allow electricians to pick up a fully loaded wire spool by the end flange and such that the end flanges cannot typically be removed by hand except with the assistance of leverage tools. The plug portion (18) also may include elongate axially extending lugs (34) that engage the barrel (16) and enhance torque transfer between the barrel and the end flanges.

FIG. 2



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Description

CROSS-REFERENCE TO RELATED PATENT APPLICATIONS

[0001] This patent application claims the benefit of U. S. provisional patent application 60/229,618, filed August 31, 2000.

FIELD OF THE INVENTION

[0002] The present invention generally relates to wire spools upon which wire, cord, string, cable or other material can be wound and more particularly relates to three piece wire spools comprising three primary structural components.

BACKGROUND OF THE INVENTION

[0003] One requirement of a wire spool is that a wire manufacturer is able to draw or wind wire onto the spool which requires torque transfer between the barrel and the end flange. A second requirement is that the spool must have sufficient strength to carry the load of the wire and does not collapse or fall apart when transported or when an electrician picks up a fully loaded spool by the end flange.

[0004] There are about three conventional and widely used types of wire spools including wood spools, plastic spools and metal spools. Most wood spools are comprised of wood end flanges and a rigid fiberboard barrel that are tied together with tie rod assemblies that run through the barrel and axially retain the wood end flanges of the ends of the barrel. Some wood spools are comprised of five pieces and includes a pair of plastic or metal plugs such as those commercially available from Badger Plug, Inc. to lock the wood end flanges to the barrel. Metal Spools are typically comprised of either three or five structural components and are structurally comprised of formed sheet metal material. Plastic spools commonly comprise of three structural components including a plastic central barrel and a pair of plastic end flanges.

[0005] Each different type of spool has certain advantages over the other types of wire spools. The primary advantage of plastic spools is that they offer an inexpensive alternative to wood or metal spools. Plastic material is typically much less expensive than metal or wood materials. With that being said, prior art plastic spools have had one significant problem, namely, that the current process for assembling the plastic end flanges on the ends of the plastic barrel requires MEK (Methyl Ethyl Keytone) which is a hazardous and environmentally unfriendly substance. This substance prepares or softens the plastic material and allows a strong bond to form between the end flanges and the barrel when assembled. However, many wire manufacturers do not want to have MEK (Methyl Ethyl Keytone) at their workplace and therefore will not allow the spools to be assembled at the location where the wire is wound onto the spools. This often means that the spool is assembled at the spool manufacturing plant which can cause environmental difficulties for the spool manufacturer. More importantly, this is inefficient having the undesirable result that large amounts of air are shipped from the spool manufacturer to the wire manufacturer because assembled spools take up much more space than unassembled spool components. Based on the foregoing, there has been and continues to be a desire to provide a plastic wire spool that is not assembled with MEK (Methyl Ethyl Keytone) or any other environmentally unfriendly or hazardous process.

[0006] Three-piece and five piece metal spools may also have certain advantages such as superior strength and durability, the ability to assembly the metal spool at the location of the wire manufacturer and the fact that product information, decoration and advertising can be easily printed on the outside faces of the flange. However, there have also been assembly difficulties with prior metal spools. In particular, complex stamping dies are needed to facilitate assembly of these spools. In addition, the center barrel is an expensive component requiring a rolling and seaming operation.

BRIEF SUMMARY OF THE INVENTION

[0007] It is a primary object of the present invention to provide a wire spool assembled from less expensive materials and that does not require difficult assembly or environmentally unfriendly assembly.

[0008] In that regard, according to one aspect of the invention it is a further object of the present invention to provide a wire spool including plastic components that can be readily assembled without environmental concerns at the location of the wire manufacturer to avoid the inefficiencies involved with shipping air.

[0009] In regard again to the first object, according to another aspect of the invention it is a further objective of the present invention to provide a wire spool including metal components which is less expensive and/or easier to assemble.

[0010] In keeping with the purpose of the invention in the above objects, it is a further objective of the present invention to provide a wire spool that has torque transfer capabilities between the end flanges and the center barrel.

[0011] In accordance with these objectives, the present invention is directed toward an inexpensive wire spool comprising three structural components including two end flanges and a rigid fiberboard barrel. The end flanges have central plug portions that are mechanically locked into the barrel. The central plug portions include teeth which dig into the barrel to substantially permanently secure the end flanges to the barrel such that the wire spool has sufficient strength to allow electricians to pick up a fully loaded wire spool by the end flange and

such that the end flanges cannot typically be removed by hand except with the assistance of leverage tools or damaging the spool components. The plug portion also may include elongated axially extending lugs which enhance torque transfer between the barrel and the end flanges.

[0012] According to one aspect of the present invention the end flanges are unitary components of molded plastic material (not two separately molded pieces joined together). According to another aspect of the present invention, the end flanges are stamped or formed from sheet metal.

[0013] Other objectives and advantages of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The accompanying drawings incorporated in and forming a part of the specification illustrate several aspects of the present invention, and together with the description serve to explain the principles of the invention. In the drawings:

[0015] FIG. 1 is an isometric illustration of a wire spool containing wire according to a preferred embodiment of the present invention.

[0016] FIG. 2 is an exploded isometric assembly drawing for the wire spool shown in FIG. 1.

[0017] FIG. 3 is an enlarged isometric view of one of the end flanges shown in the wire spool of FIG. 2 without the center barrel.

[0018] FIG. 4 is a cross section of the wire spool shown in FIG. 1, taken about line 4-4 with the center barrel secured.

[0019] While the invention will be described in connection with certain preferred embodiments, there is no intent to limit it to those embodiments. On the contrary, the intent is to cover all alternatives, modifications and equivalents as included within the spirit and scope of the invention as defined by the appended claims.

DETAILED DESCRIPTION OF THE INVENTION

[0020] For purposes of illustration a preferred embodiment of the present invention has been depicted in the drawings as a wire spool 10 for holding long strands of cable or metal wire 12 thereon. The spool 10 may also be used for other forms of cordage such as string or cord or other material. The spool 10 includes three structural components including a pair of end flanges 14 and a high strength, rigid fiberboard barrel 16.

[0021] In the preferred embodiment, the end flanges 14 are molded from relatively strong and rigid plastic material such as high impact polystyrene, polypropylene or ABS. However, the end flanges 14 could also be metal material and of uniform thickness being stamped and formed from sheet steel. In either event, each end flange 14 includes a central plug portion 18 and a disc portion 20 integrally joined together such that the end flange is made as a single component. The plug portion is closely sized to the openings or open ends 22 of barrel 16 to allow sliding insertion of the plug portion 18 into the open ends 22. It should be noted that wire spools typically come in about 6 inch diameters and 10 inch diameter sizes (the diameters of the end flanges), although other sizes are possible. Barrels 16 having a diameter of between about 2 inches to about 4 inches are desirable, with a substantially smaller diameter than that of the end flanges such that the end flanges 14 provide opposed disc shaped retaining walls 24 extending radially beyond the outer radial periphery of the barrel 16 that serves the essential purpose of holding and axially retaining the desired load of wire 12 therebetween.

[0022] To assembly the spool 10, the plug portions 18 are slidably inserted into the open ends 22 with a sufficient pressing force. The plug portions 18 include a projecting cylinder portion 26 that contacts and engages the inner diameter surface of the barrel 16 for radial support. The cylinder portion 26 includes gripping teeth 28 that dig into the fiber material of the barrel 20 for axial retention. Each tooth 28 has a chamfered cam surface 30 on its inside face and a square or perpendicular face 32 on its outer face. The cam surface 30 engages and slides against the inside surface of the barrel 16 during assembly which in turn causes radial expansion of the barrel 16 for clearance and/or the teeth 28 to deflect slightly for clearance radially inward. In either event, sufficient clearance allows the plug portions 18 to be slid into the open ends 22 of the barrel 16, until the ends of the barrel 16 abut the inside surface of the disc portions 20. Gaps or slots 36 are provided axially behind the teeth 28. Once the plug portion 18 is inserted, the connection is substantially permanent because the perpendicular face 32 on the teeth 28 locks the end flanges 14 to the barrel 16 to prevent removal. In particular, any attempted removal force in the axial direction would tend to urge the teeth 28 radially outward and deeper into the fiber material of the barrel 16.

[0023] The plug portion 18 also includes thin elongate lugs 34 at spaced locations. The lugs 34 extend axially are collectively positioned at a diameter just larger than the inside diameter of the barrel 16. When the plug portion is inserted 18, the lugs 34 dig into the fiber material to engage the barrel 16 to enhance torque transfer between the end flanges 14 and the barrel 16. The teeth 28 also provide some torque transfer benefits. Collectively, the teeth 28 and the lugs 34 prevent slippage between the end flanges 14 and the barrel 16 during wire winding operations.

[0024] The end flange 14 include diametrically opposed central openings 42 coaxial about a predetermined axis 50 of rotation for the spool 10. The spool 10 can be supported for rotation on a support rod (not shown) that extends through the central openings 42. The end flanges 14 also preferably include a starting

hole 44 disposed radially inward in the disc portion 20 for receiving the starting strand of wire 12 or cable and a finishing hole 46 disposed radially outward for receiving the cut or terminating strand of wire 12 or cable. If the end flanges 14 are metal, they may also have support ribs (not shown) for increased strength and a safety curl (not shown) at its outer radial periphery for safety purposes. The plug portion 18 of each end flange 14 also includes a pair of 180° degree apart drive holes 48 for receiving the driving mechanism which rotates the spool to wind wire or cable tightly onto the spool.

[0025] The foregoing description of various preferred embodiments of the invention has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Obvious modifications or variations are possible in light of the above teachings. The embodiments discussed were chosen and described to provide the best illustration of the principles of the invention and its practical application to thereby enable one of ordinary skill in the art to utilize the invention in various embodiments and with various modifications as are suited to the particular use contemplated. All such modifications and variations are within the scope of the invention as determined by the appended claims when interpreted in accordance with the breadth to which they are fairly, legally, and equitably entitled.

Claims

1. A spool for supporting a strand of cordage wound about spool, comprising:

a cylindrical barrel of fiberboard material extending between first and second open ends, the cylindrical barrel being coaxial about a spool axis;

first and second one piece end flanges, each end flanges comprising a disc portion and a plug portion, the disc portion surrounding the plug portion, the plug portions of the first and second end flanges being inserted into the first and second open ends, respectively, the plug portion including a plurality of radially outwardly projecting teeth engaging the cylindrical barrel locking the end flanges to the cylindrical barrel in a substantially permanent manner, the disc portions extending radially outward beyond the barrel such that the spool is adapted to hold cordage axially between end flanges.

2. The spool of claim 1 wherein each of the end flanges comprises a central opening coaxial about the spool axis.

3. The spool of any of claims 1 or 2, wherein each of the end flanges includes a pair of drive holes disposed radially between the central opening and the disc portion.

4. The spool of any of claims 1, 2, or 3 wherein each plug portion includes a cylindrical portion projecting axially in one of the open ends, the teeth being providing on the cylindrical portion.

5. The spool of claim 4 wherein the teeth have a radially extending edge engaging the barrel, further comprising a plurality of slots in the cylindrical portion axially between the teeth and the end flange, the slots providing resiliency to the teeth for facilitating assembly of the end flanges and the barrel.

6. The spool of claim 5 wherein each of the teeth has a chamfered surface relative to the axis and a substantially perpendicular surface relative to the axis, the chamfered surfaces of the first and second end flanges facing axially inward toward each other for facilitating assembly of the end flanges and the barrel, the perpendicular surfaces being adjacent the slot and facing axially outward for preventing removal of the end flanges from the barrel.

7. The spool of claim of any of claims 4, 5, or 6 wherein the cylindrical portion has a plurality of elongate lugs, each elongate lug having an axially extending edge engaging the cylindrical barrel preventing angular slippage between the end flanges and the cylindrical barrel.

8. The spool of any of claims 1, 2, 3, 4, 5, 6, or 7 wherein the spool has cordage selected from the group consisting of metal wire and metal cable wound about the cylindrical barrel.

9. The spool of any of claims 1, 2, 3, 4, 5, 6, 7, or 8 wherein the end flanges are locked to the cylindrical barrel with a sufficient locking force such that the spool fully loaded with the cordage can be carried by lifting and supporting the spool with one end flange only.

10. The spool of any of claims 1, 2, 3, 4, 5, 6, 7, 8 or 9 wherein each of the end flanges comprise rigid plastic material.

11. The spool of any of claims 1, 2, 3, 4, 5, 6, 7, 8 or 9 wherein each of the end flanges comprise metal material.

12. The spool of any of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11 wherein the cylindrical barrel has an outer diameter of between about 2 inches and about 4 inches, and wherein the end flanges have an outer diameter of between about 6 inches and about 10 inches.

13. The spool of any of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 or 12 wherein each of the end flanges include a starting hole and a finishing hole formed into the disc portion, the finishing hole located radially outward from the starting hole, the starting hole retaining a leading end of the cordage, the finishing hole retaining a trailing end of the cordage.

14. A method of making a spool for supporting a strand of cordage wound about spool, comprising:

providing a barrel of fiber material having open ends;
providing a pair of end flanges, each end flanges comprising a disc portion and a plug portion, the disc portion surrounding the plug portion;
inserting the plug portion into one of the open ends; and
locking the plug portion to the barrel in a substantially permanent manner with the disc portion extending radially outward beyond the barrel such that the spool is adapted to hold cordage axially between end flanges.

15. The spool of claim 1 wherein each end flange is locked to the cylindrical barrel with a sufficient locking force such that when the spool fully loaded with cordage, the spool can be carried by lifting and supporting the spool with one end flange only.

16. The spool of claim 14 wherein the plug portion includes a plurality of teeth projecting radially outwardly for engaging the barrel, further comprising:

flexing the teeth radially inwardly during said to allow insertion of the plug portions into the open ends of the barrel.

17. The spool of claim 14 further comprising winding cordage selected from the group consisting of metal wire and metal cable about the barrel.

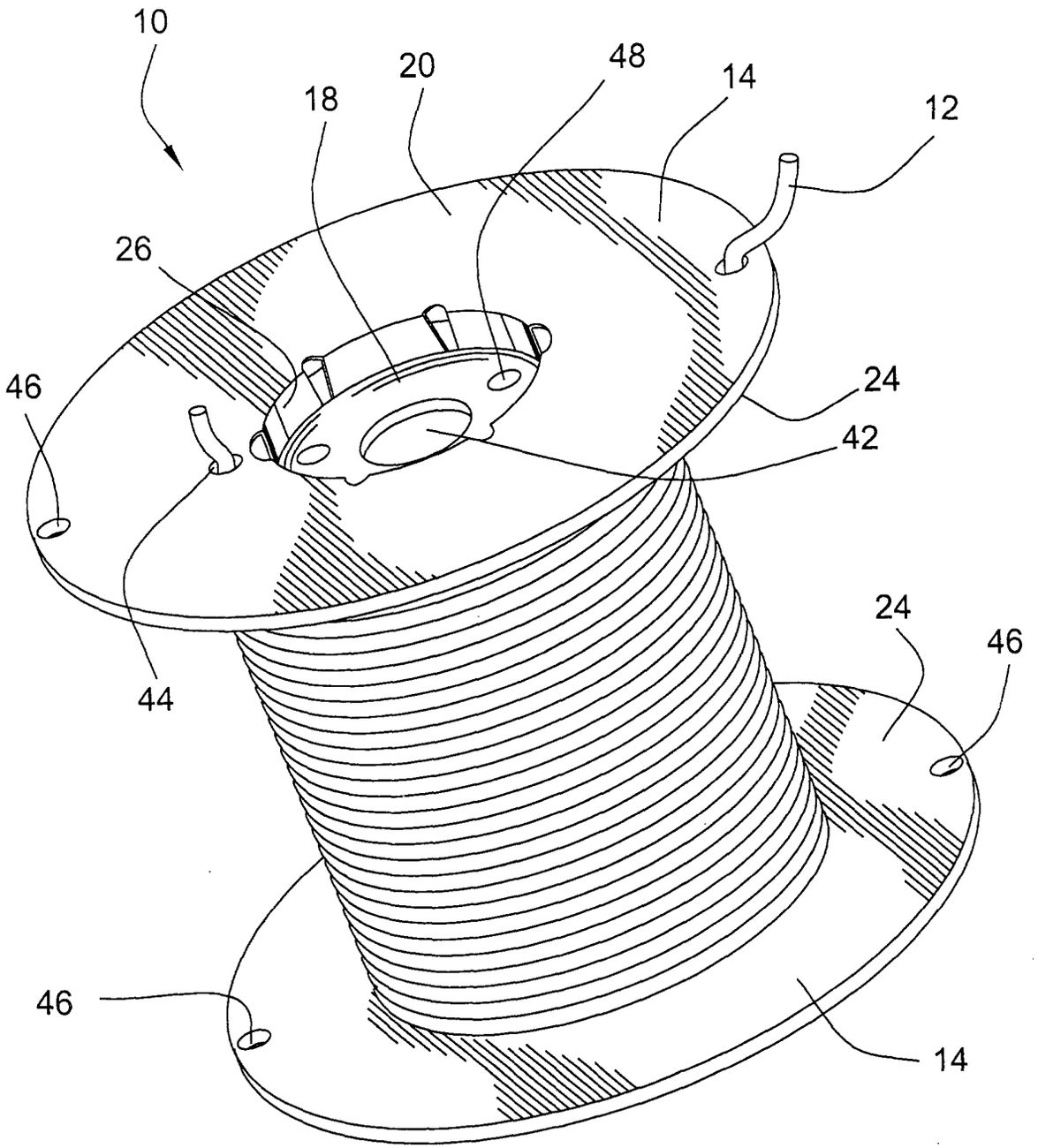
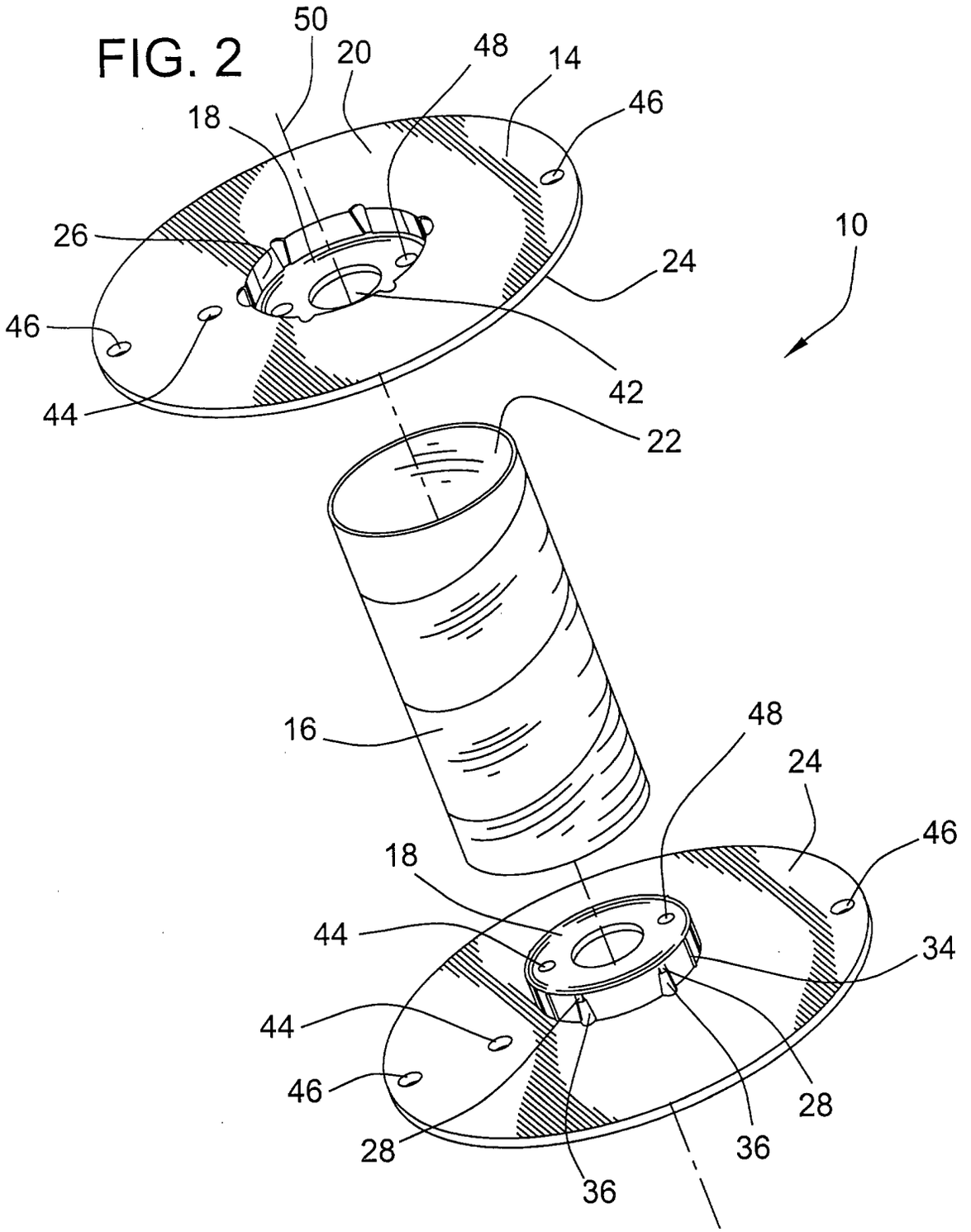


FIG. 1

FIG. 2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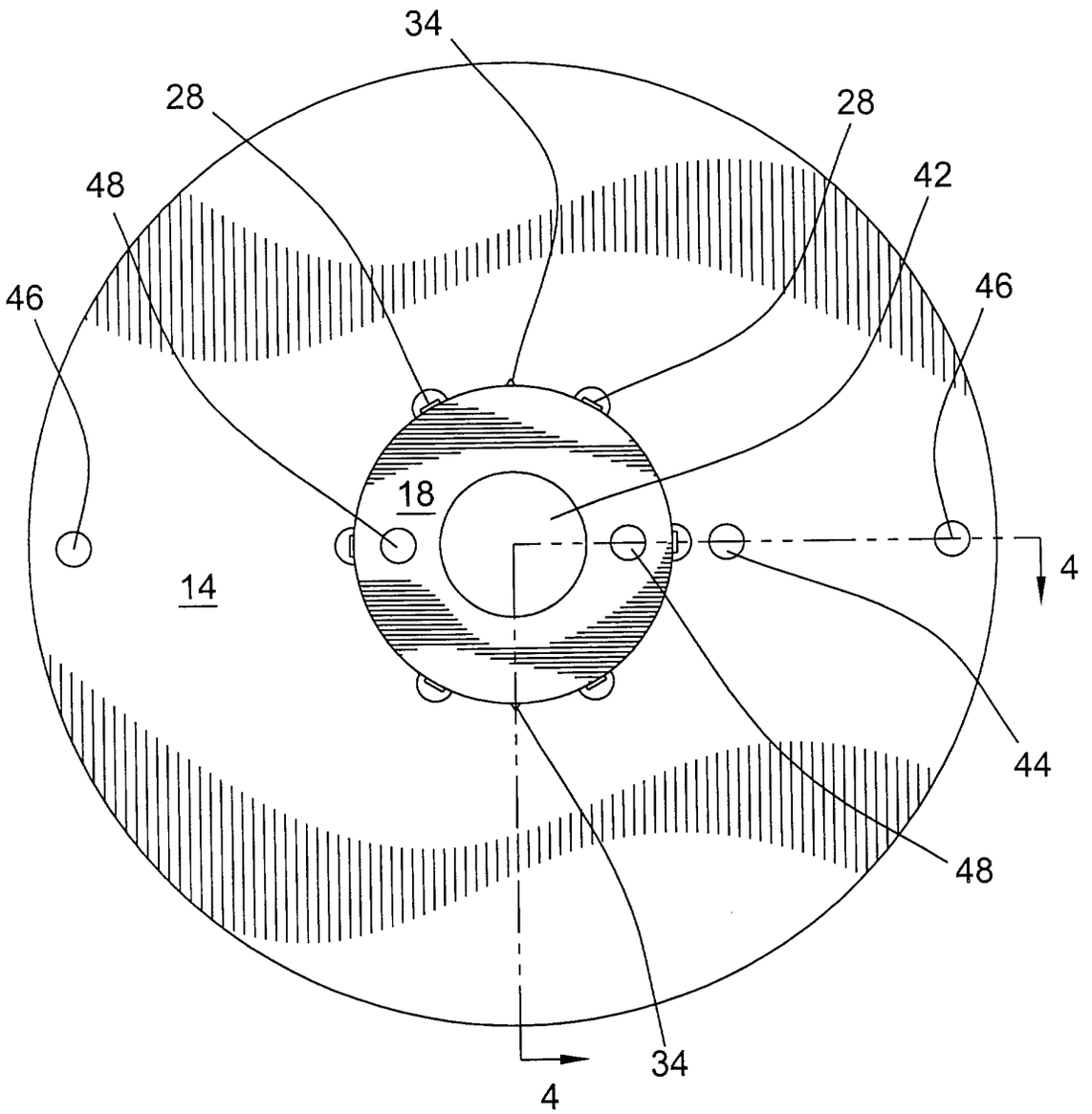

FIG. 3

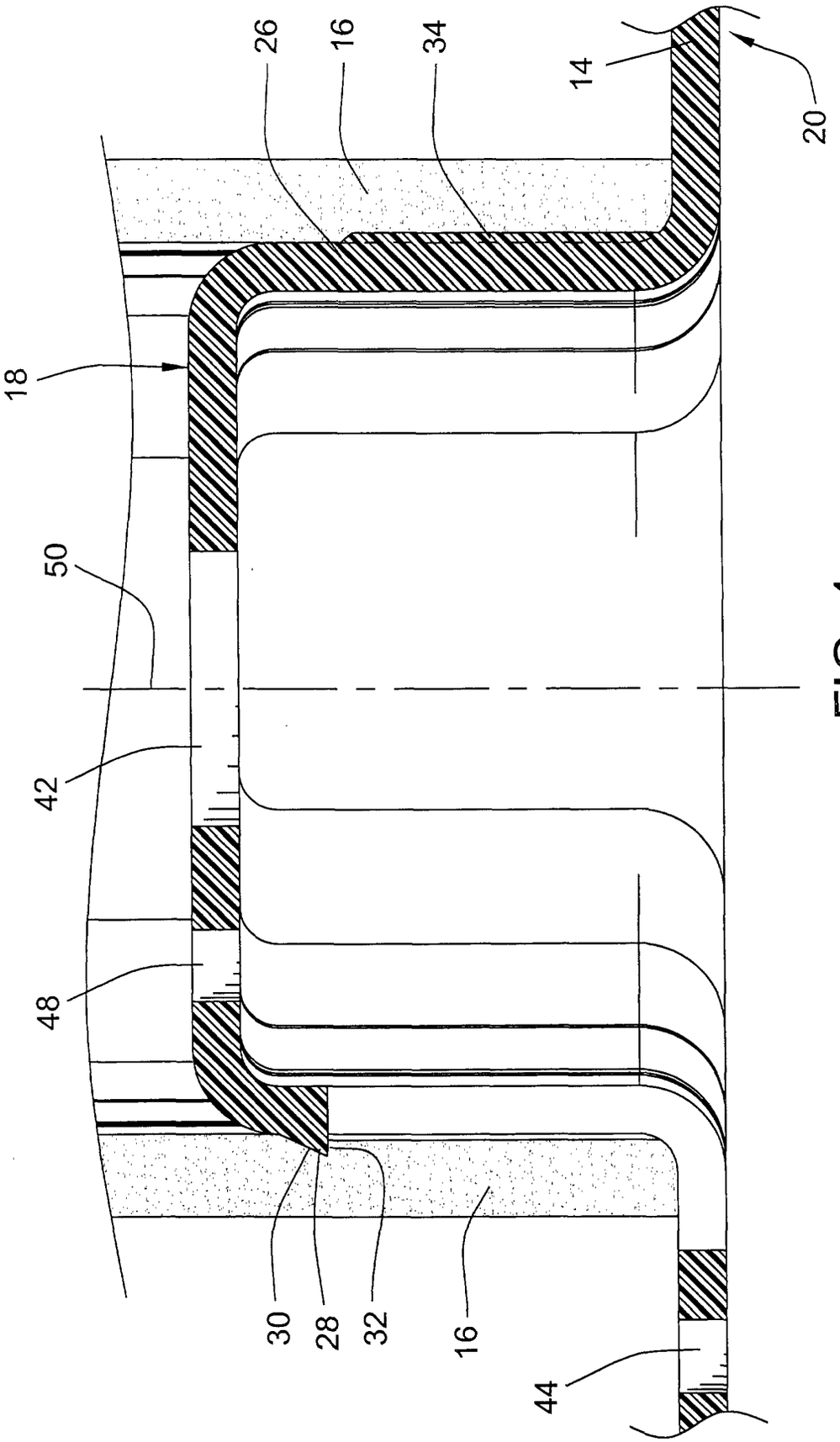

FIG. 4