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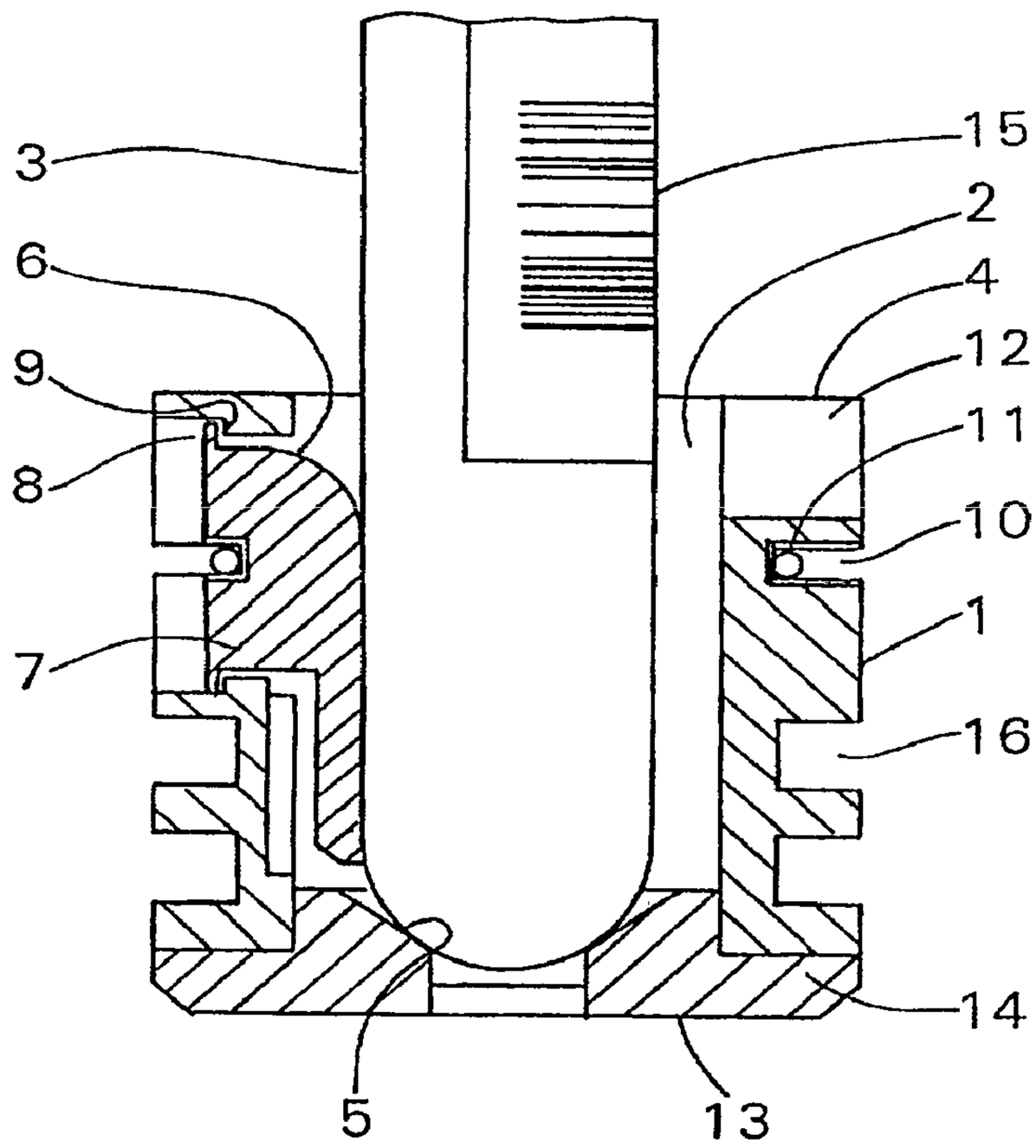

(57) Abrégé/Abstract:
A holder suitable for holding vials for transport on a conveyor line comprising a body (1) having a cavity (2) therein open at an upwardly facing side (4), being of suitable size and shape to receive the lower part of a vial (3), the cavity (2) having a wall surface in which are one or more recesses (6), in each recess (6) being a resilient member (7) extending into the cavity (2), to a distance sufficient to grip a vial (3) inserted into the cavity.

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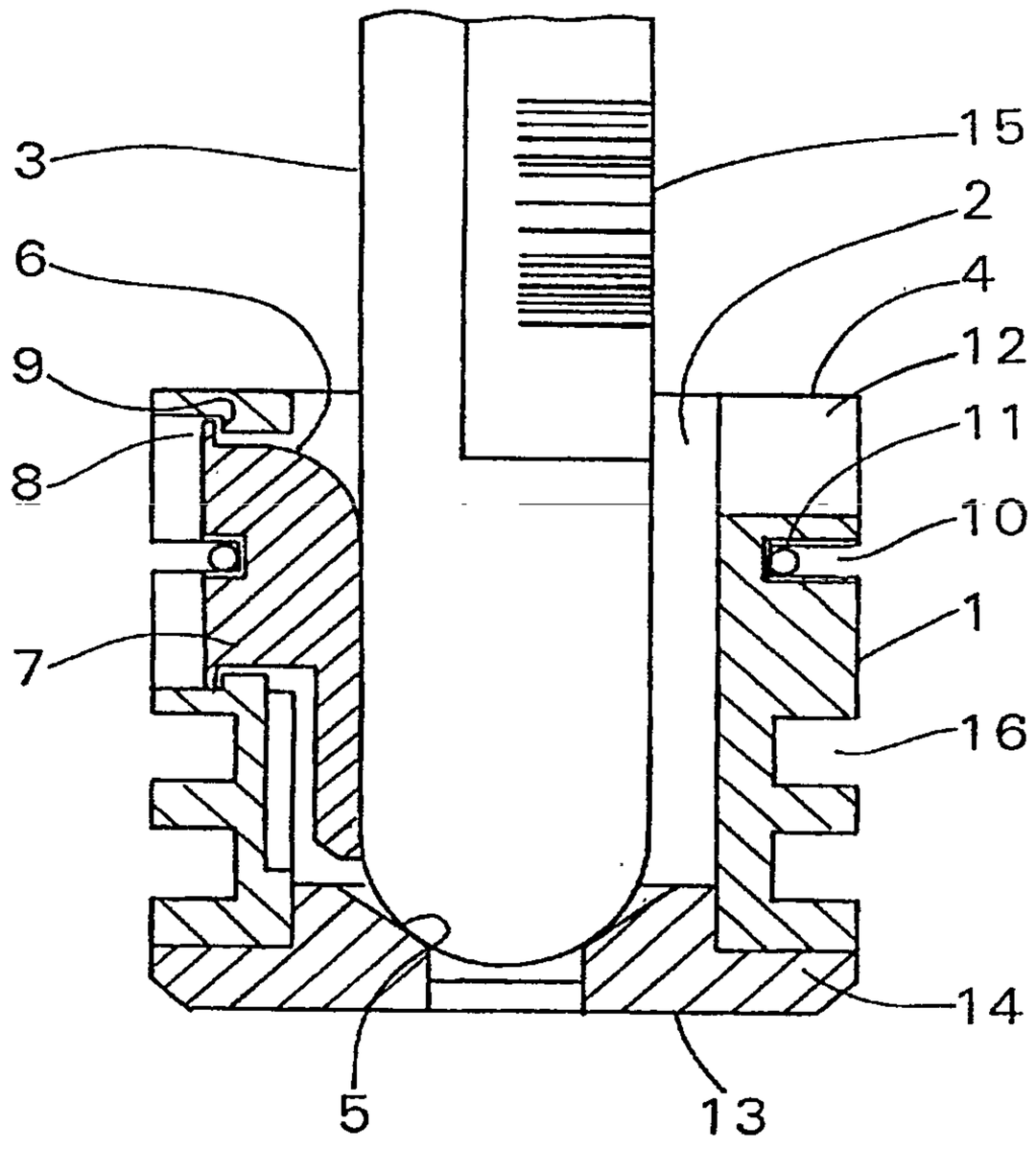
(57) Abstract

A holder suitable for holding vials for transport on a conveyor line comprising a body (1) having a cavity (2) therein open at an upwardly facing side (4), being of suitable size and shape to receive the lower part of a vial (3), the cavity (2) having a wall surface in which are one or more recesses (6), in each recess (6) being a resilient member (7) extending into the cavity (2), to a distance sufficient to grip a vial (3) inserted into the cavity.



Vial Holder

Scope of the Invention

This invention relates to holders for vials containing biological samples which are to be transported on the conveyor line of automated testing equipment.

Background of the Invention

Specimens of biological materials such as blood etc. taken from patients for biological testing, are often tested using automated testing equipment on which vials containing the specimens are transported on a conveyor belt to various testing instruments located at points adjacent to the conveyor line. Such instruments are generally automated, and mechanical interfaces are provided to transport the vials to the instruments or vice versa.

Normally such vials are held in holders adapted to be carried securely on the conveyor and to hold the vials securely in an upright orientation. Known holders generally comprise a rigid plastics material body with a cavity therein into which a vial may be inserted. A problem with known holders is that they can generally hold only one diameter of vial securely, as a cavity suited to one diameter will be too small for larger diameter vials, whilst smaller diameter vials will be a loose fit and will not be held upright.

EP 047644A and EP 0339775 respectively disclose holders for vials in which a number of respectively downwardly and upwardly pointing resilient fingers extend inwardly into the cavity to bear upon a vial therein. US 531676 discloses a holder for vials in which a number of resilient vanes in a cavity hold a vial therein. US 5306469 discloses a holder for vials in which a flexible tubular holder is located within the cavity to hold vials. None of these disclosed holders are readily adjustable to hold vials of a wide range of diameters.

It is an object of the present invention to provide a holder for such vials which can securely hold vials of two or more different diameters in an upright orientation.

Summary of the Invention

According to this invention a holder suitable for holding vials in a generally upright orientation for transport on a conveyor line comprises:

a body having a cavity therein open at an upwardly facing side of the body, the cavity being of suitable size and shape to receive the lower part of a vial inserted therein, the cavity having bottom and side surfaces, characterised in that in the inwardly facing wall surface of the cavity are one or more recesses, in each recess there being a resilient member extending into the cavity, each member extending into the

cavity to a distance sufficient to exert by their resilience a grip upon a vial inserted into the cavity.

Description of the Invention

The vials may be the known vials normally used for containing biological samples such as blood etc. on the conveyors of known automated testing equipment, i.e. small glass or plastics material tubes of about 17ml capacity, and ca. 1-2 cm in diameter. The conveyor may be of known type, for example a Flex Link - XS™ or Flex Link - XM™ type conveyor.

The body of the holder can be made of any type of material and by any means. Preferably it will be made of mouldable or otherwise workable plastics materials such as polyethylene, polypropylene, PTFE etc. The body may be of generally cylindrical shape. One of the ends of such a cylinder preferably forms a flat base upon which the holder may be stood whilst on the conveyor, and the other end of the cylinder may also be generally flat and may form the upwardly facing side at which the cavity is open.

The cavity is preferably a generally cylindrical cavity, but may alternatively be polygonal. In a cylindrical body the axis of such a cavity may be parallel to the longitudinal axis of the body and the two may be coaxial. The width, i.e. the diameter of a cylindrical cavity, should be at least the width, e.g. the diameter, of the widest vial to be inserted into the cavity. The longitudinal depth of the cavity should be less than the length of the vial to be inserted therein but sufficient to allow the vial to be stably retained in the holder. Commonly such vials are labeled with an adhesive machine-readable label, e.g. bearing a bar code, which can be read by sensors arranged along the conveyor to enable detection and identification of the vial, so that it can be handled appropriately for example by automatic machinery responsive to the information on the label. The depth of the cavity should be such that such a label is exposed above the upper end of the holder. Alternatively the upper end of the holder may have downwardly extending cut-outs, for example the upper end may be castellated. Such constructions enable the label to be easily read without obstruction by parts of the body.

The said recesses may extend partly through the wall of the body between the cavity and the external surface or may comprise an aperture passing entirely through the body between the cavity and the external surface. Each member may be resiliently movably located in a recess, extending into the cavity. The member may be inherently resilient, e.g. made of resilient material of a shape and dimensions such that they can exert their resilience, or additionally or alternatively the members may be resiliently moveably located in the recesses and rendered resilient by means of one or more resilient elements bearing upon these moveable members.

The resilient element(s) may comprise one or more resilient pads, springs etc. located in the recesses behind the members, or may comprise collars or part collars around the body and the members, and bearing inwardly on the members from behind. Collars or part collars are particularly suitable when the said recesses are apertures which pass entirely through the body between the cavity and the external surface, so that the collar or part collar may surround the body.

Each recess may be generally in the form of a longitudinal slot, suitably extending for 50% or more of the length of the body, yet being relatively narrow. The members suitable for such recess may consequently be relatively long and thin, and therefore capable of extending into the cavity over 50% or more of its length to provide stable gripping of a vial therein. The members should be provided with restraint means, e.g. end-stop abutment surfaces to prevent the members falling completely into the cavity. The resilient collar or part collar may suitably prevent the member(s) from falling outwardly, or alternatively there may also be end-stops to prevent this too. Alternatively or additionally the recess may taper, widening toward the outer surface, and the member(s) may have a corresponding, e.g. wedge-shaped section. The recess(s) and member(s) may be respectively provided with engaging guide surfaces to cause the member(s) to move in a guided direction inwardly and outwardly in the recess, for example in a cylindrical cavity the member(s) may be so guided as to move resiliently in a generally radial direction.

The resilient collar may for example be an elastomer band, or a part collar may be a resilient plastics material or metal circlip around the body and member(s), and may conveniently fit into a guide groove in the body and member(s). The collar or part collar may surround the upper part of the member, so that the member may resiliently pivot about its lower part.

In a cylindrical cavity the members may extend radialy inwardly. The inward ends of the members function as internal gripping surfaces with less width between opposing ends than the width between the sides of the cavity, and the holder can consequently grip vials with a diameter intermediate between the width between the ends of opposing members and the width of the cavity, thereby enabling the holder to receive vials with a range of diameters between these two widths.

The body may incorporate additional features to suit it for use on an automated conveyor system, for example a metal base to provide a low centre of gravity, and external grooves or other engagement features to facilitate engagement with handling systems on the conveyor e.g. for presentation to an automated test.

Also, in the base or in the lower portion of the holder some type of conductive material which provides a means for sensing by conductance, capacitance, electromagnetism or otherwise the travel of a metal probe in the vial may be present.

This for example provides a means for detecting the presence of a holder on an automatic conveyor line, or for example controlling the depth to which a metal aspiration needle will travel when introduced into the vial as a means for removing a sample for testing. Additionally or alternatively a window can be placed in the lower portion of the holder to provide an a window for optical or audio means for sensing the presence of a probe at a particular location in the tube. This sensing means will have an interface with a testing device probe. It will provide one means for preventing such a probe from going down too far into the vial and damaging the vial itself or rendering the probe inoperative because of contact with the vial's surface.

In a further aspect the present invention also provides an automated test apparatus for biological samples which includes holders as described above and a conveyor system suitable to transport said holders.

In another aspect the present invention provides a method of automated testing of biological samples in vials including the step of transporting a vial around an automated test operative on a conveyor system, the vial being held in a holder as described above.

Description of the Drawings

The invention will now be described by way of example only with reference to the accompanying drawings which show:

Fig. 1 - A longitudinal sectional view of one embodiment of holder of this invention with an inserted vial.

Fig. 2 - A plan view of the holder of Fig. 1 without the vial.

Fig. 3 - A longitudinal part cutaway sectional view of a further embodiment of holder of this invention.

Fig. 4 - A plan view of the holder of Fig. 3

Figs. 5 and 6 - Views of a resiliently mounted member for the holder of Figs. 3 and 4.

Referring to Figs. 1, 2, 3 and 4, a holder comprises a hard polyethylene body 1 of generally cylindrical shape. Fig. 1 shows a longitudinal section about the line A-A of Fig. 2. Within body 1 is a cylindrical cavity 2 of a diameter capable of receiving a vial 3 inserted uprightly therein via the open end of the cavity 2 at an upper end surface 4 of the body. The vial 3 rests upon the contoured bottom surface 5 of cavity 2.

Three recesses 6 at 120° circumferential intervals extend completely through the side surfaces of the body 1 into the cavity 2. In the recess 6 are moveably located three members 7 in the form of elongated shapes of plastics material at the 120° circumferential intervals. The members 7 are of a shape and size that allows them to

slide smoothly radially inwardly and outwardly in the recess 6, but are restrained from falling into the cavity by end stop abutment surfaces 8, 9.

A circumferential groove 10 is formed around the body 1 and in the outer surface of the member 7. In the groove 10 is an elastomeric collar 11, which bears resiliently upon the member 7 to urge it inwardly.

The upper edge of the member 7 is ramp profiled to facilitate insertion of a vial 3, which forces the member 7 outwardly against the resilience of the collar 11. This consequently causes the members 7 to grip the vial 3 resiliently.

The upper end of the body 1 is castellated with a cut out 12 to facilitate reading of information off a bar code label on a vial 2 inserted therein if the label extends to a position near the bottom of the vial.

A flat base 13 of the body 1 is formed by a push in friction fit metal insert 14, which enables the holder to be stably seated on a conveyor line, and the position of the holder 1 on a conveyor to be detected by electronic sensors, e.g. responsive to capacitance, conduction or electromagnetism. On the vial 3 is a label 15 bearing an optically readable bar code so that information can be read off the vial 3 by a suitable sensor. In the outer surface of the body 1 are grooves 16 which facilitate engagement with guide means on a conveyor and/or other handling equipment.

Referring to Figs. 3, 4, 5 and 6 a further holder of this invention is shown, parts corresponding to Figs. 1 and 2 being numbered correspondingly. In the holder of Figs. 3, 4, 5 and 6 three recess 17 at 120° circumferential intervals extend completely through the side surfaces of the body 1 into the cavity 2. The recesses 17 are open to the upper surface 4 of the body 1 and have parallel sides as shown in Figs 3 and 4.

In the recess 17 are freely located three members 18 (one only shown in Fig 4, for clarity) in the form of elongated shapes of plastics material as shown in Fig 5 and 6, Fig 5 being a side view and Fig. 6 being a section about the line B -B of Fig. 5. The members 18 are of a shape and size that allows them to slide smoothly radially inwardly and outwardly in the recess 17, but are restrained from falling into the cavity by end stop abutment surfaces 19 at their outer end and an abutment foot 20 at their lower end, which abut against corresponding steps 21, 22 in the recess 17.

A circumferential groove 23 is formed around the body 1 and a corresponding groove 24 is formed in the outer surface of the member 18. In the groove 17 is an elastomeric collar (not shown in Fig 3, corresponding to 11), which bears resiliently upon the member 18 when this is in place in the recess 17 to urge it inwardly. The member 18 can therefore slide smoothly and resiliently radially inwardly and outwardly in the recess 17.

The upper surface 25 of the member 18 is ramp profiled to facilitate insertion of a vial 3 (not shown in Figs 3 - 6), which forces the member 18 outwardly against the

resilience of the collar 18. This consequently causes the members 18 to grip the vial 3 resiliently.

A particular feature of the holder of Figs 3 - 6 is that the inner face 26 of the member 18 is shaped so as to conform and fit flush with the cylindrical shape of the cavity 2 when the member 18 is urged outwardly in the recess 17, and similarly the foot 20 can fit flush into the step 22 in the recess 17. This facilitates the holding by the holder of the invention of vials 3 with an external diameter up to the full internal diameter of the cavity 2.

The holder of Figs. 3-6 is also provided with a metal base 13 (shown non-inserted) analogous to that of Figs 1 - 4, which is a tight friction fit in the lower part of the cavity 2. The upper surface 27 of the base 10 is shaped with an upstanding centre portion having a rim 28 around a central conical hollow 29. This rim 28 provides a planar surface for a flat-bottomed vial (not shown) to sit stably upon, whilst the conical hollow 29 allows a round bottomed vial (not shown) to sit stably therein.

Claims :

1. A holder suitable for holding vials in a generally upright orientation comprising a body having a cavity therein open at an upwardly facing side of the body, the cavity being of suitable size and shape to receive the lower part of a vial inserted therein, the cavity having bottom and side surfaces, including an inwardly facing wall surface of the cavity having a plurality of recesses, in each recess there being a resilient member extending into the cavity, each member extending into the cavity to a distance sufficient to exert a grip upon a vial inserted into the cavity characterized in that the member is resiliently movably located in the recess and rendered resilient by means of one or more resilient elements around the body, and bearing inwardly upon the movable members.

2. A holder according to claim 1 characterized in that the body is of generally cylindrical shape, one of the ends of the cylinder forming a flat base, and the other end of the cylinder forming the upwardly facing side at which the cavity is open, and the cavity is generally cylindrical or polygonal with a longitudinal depth less than the length of the vial to be inserted therein but sufficient to allow the vial to be stably retained in the holder.

3. A holder according to any one of claims 1 or 2 characterized in that each of the said recesses comprise an aperture passing entirely through the body between the cavity and the external surface.

4. A holder according to any one of claims 1 to 3 characterized in that the resilient elements are, or comprise a collar or part collars.

5. A holder according to any one of claims 1 to 4 characterized in that the members are provided with restraint means to prevent the members falling completely into the cavity.

6. A holder according to any one of claims 1 to 5 characterized by being made of plastics material and provided with a metal base to provide a low centre of gravity.

7. An automated test apparatus for biological samples which includes holders as claimed in any one of the claims 1 to 6 and a conveyor system suitable to transport said holders.

8. A method of automated testing of biological samples in vial including the step of transporting a vial around an automated test operative on a conveyor system, the vial being held in a holder as claimed in any one of claims 1 to 7.

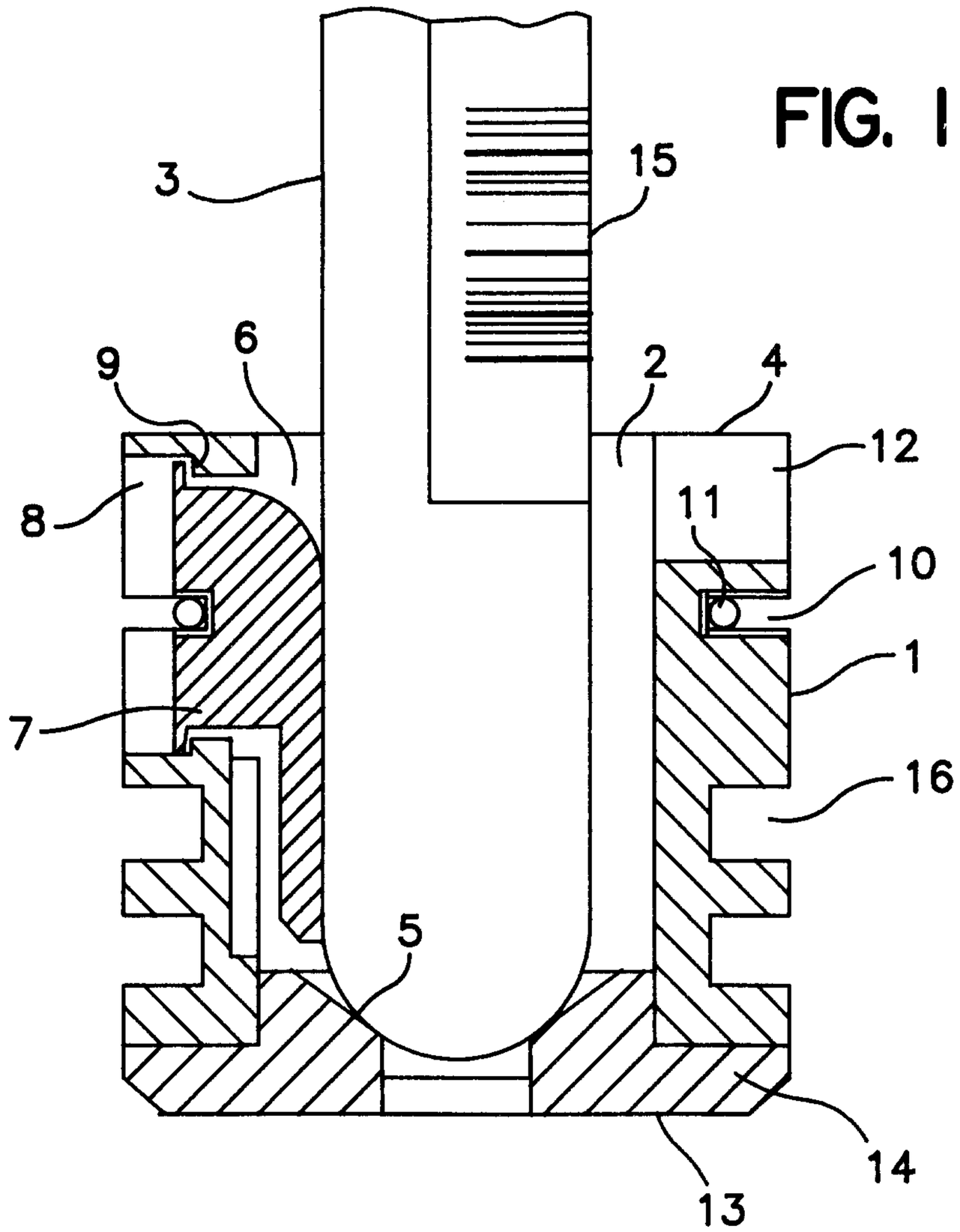


FIG. 1

FIG. 2

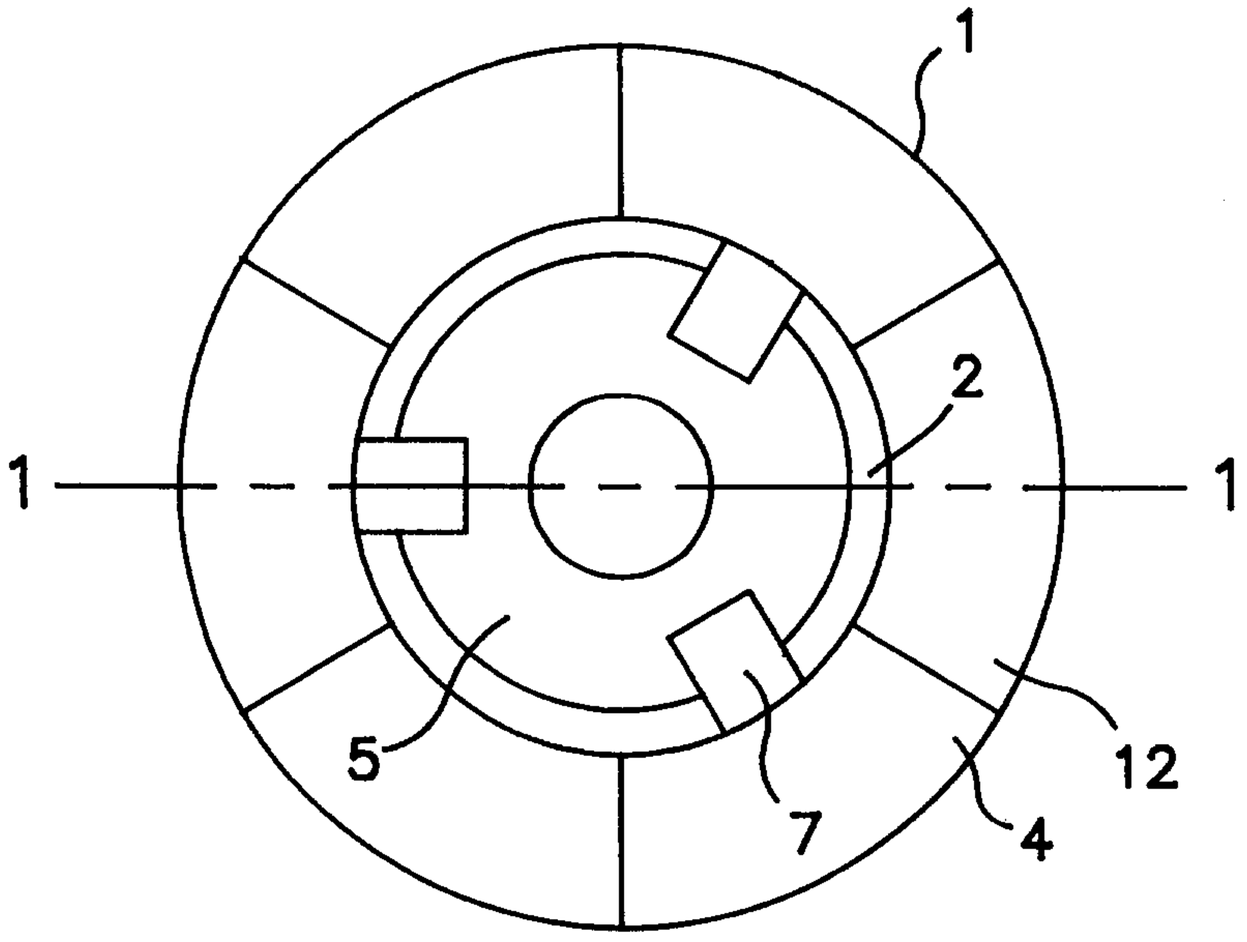


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FIG. 3

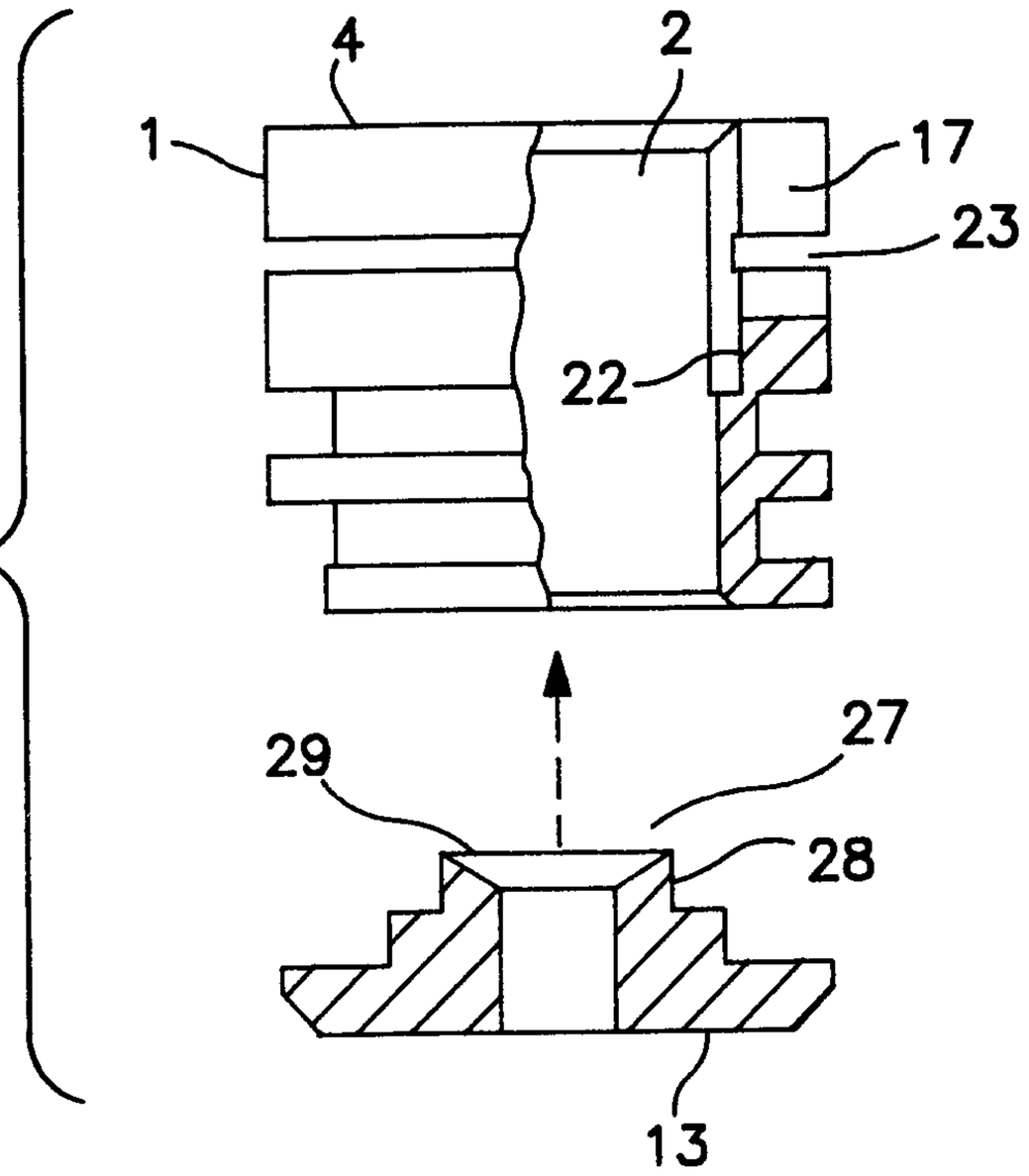


FIG. 4

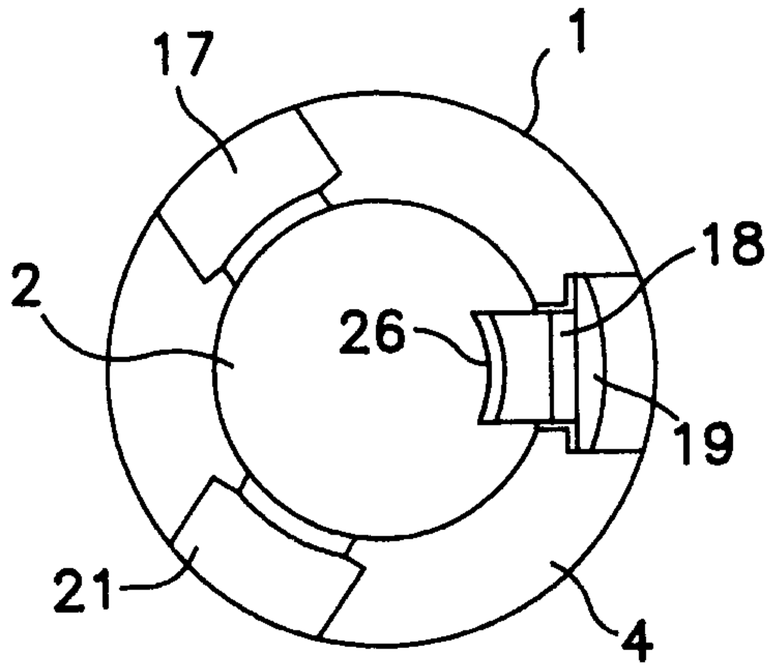


FIG. 5

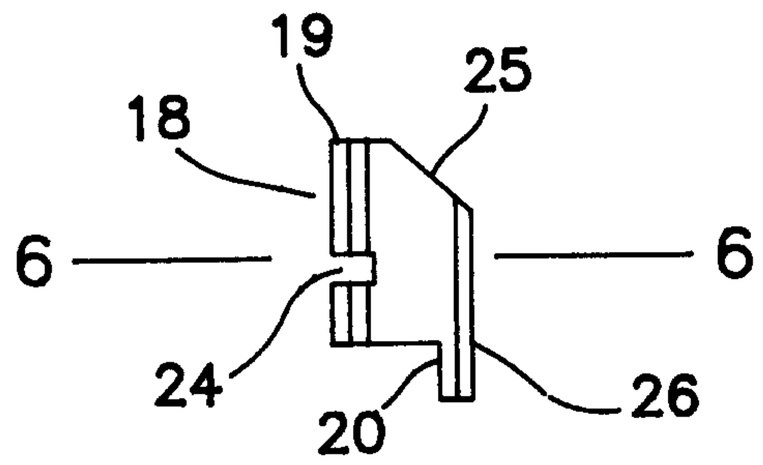
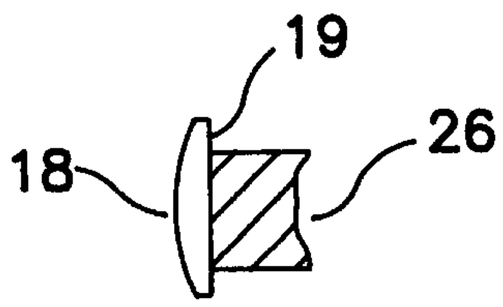


FIG. 6



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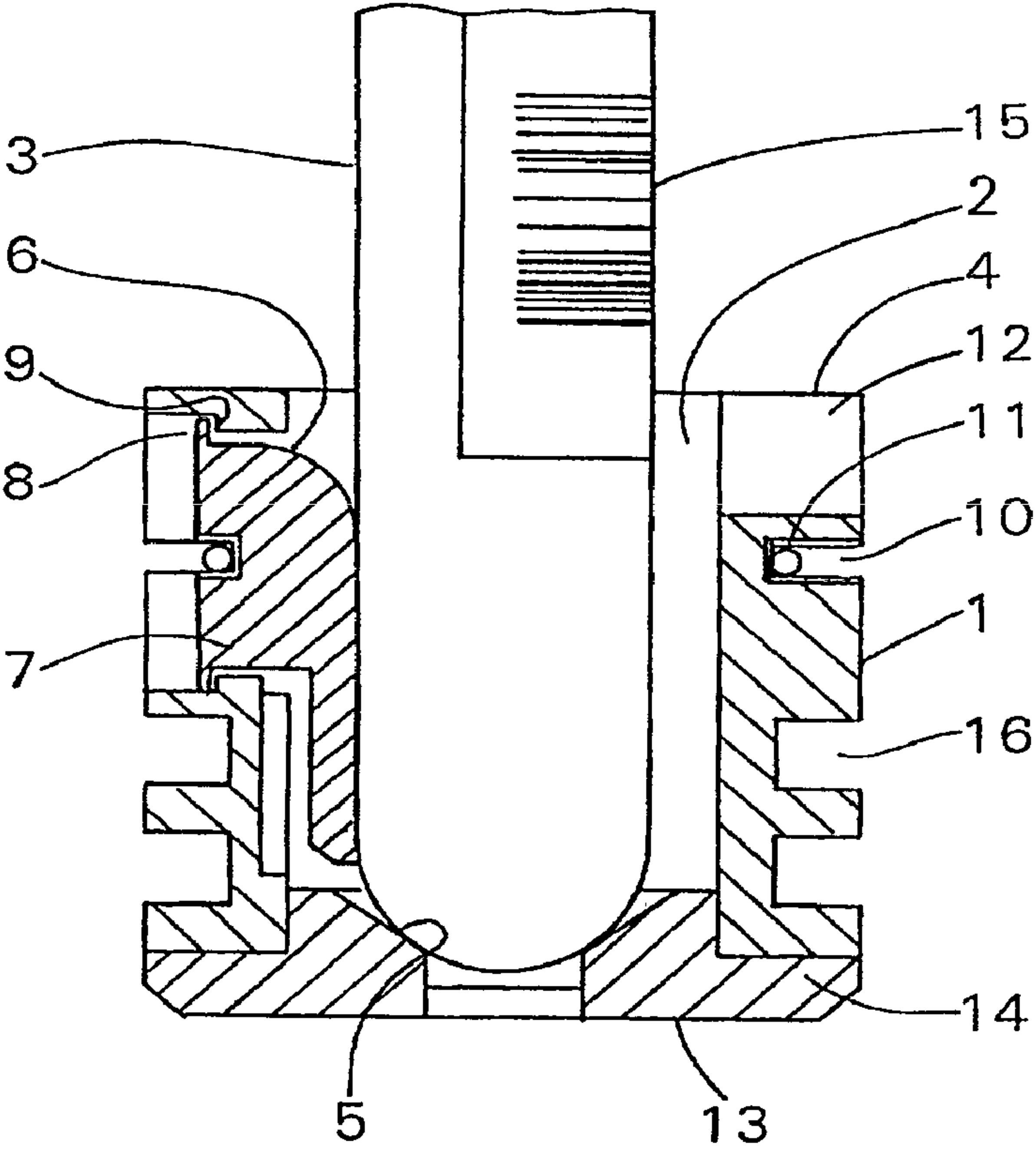
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