Dec. 27, 1966 J. J. SMITH 3,294,109

SEALING MEANS FOR FIRE HYDRANT ACTUATOR

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Fig. 1

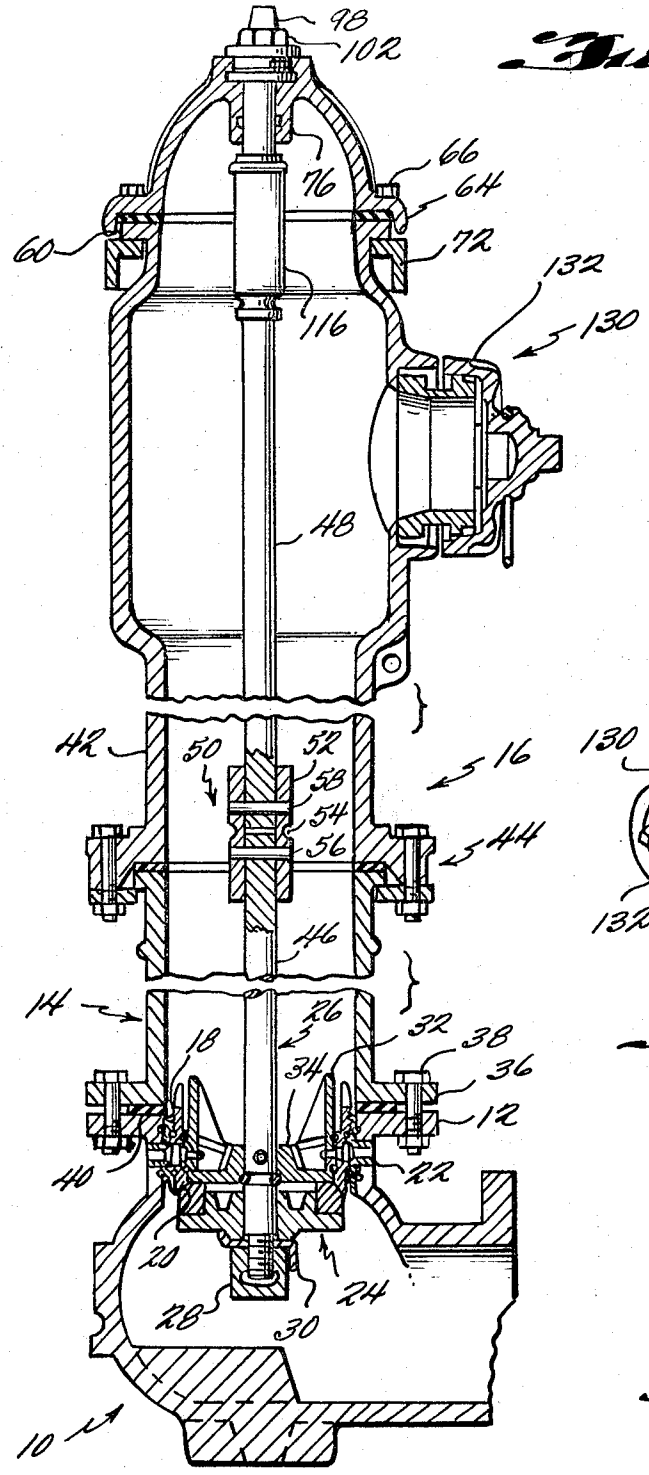
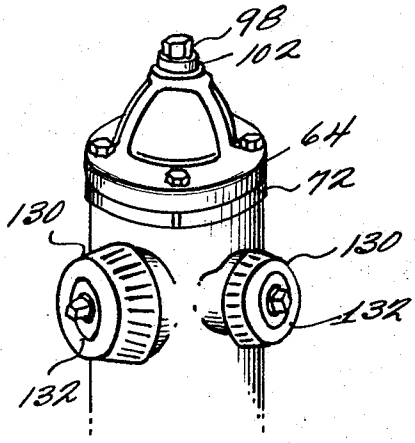


Fig. 2



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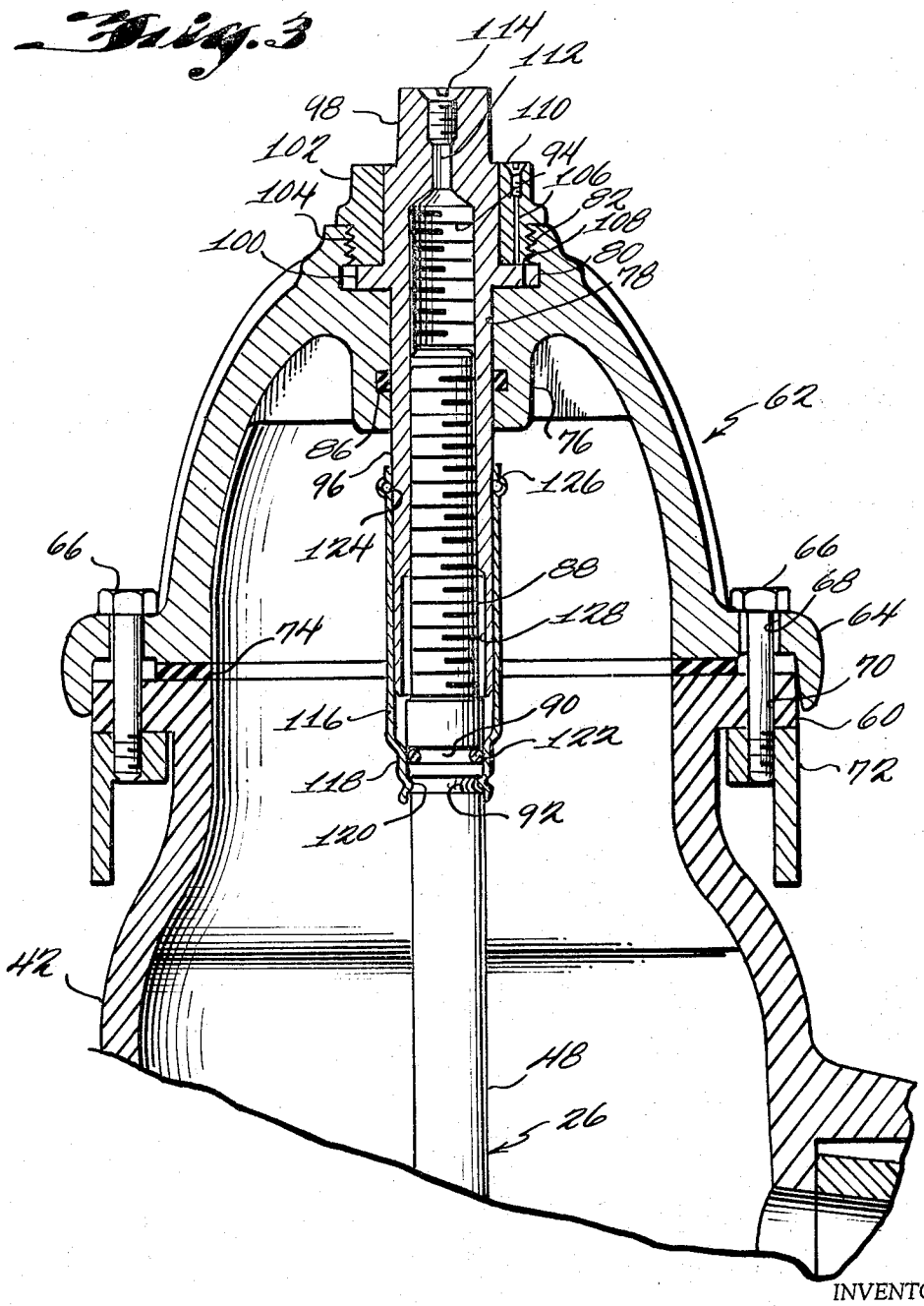
BY Cushman, Darby & Cushman
ATTORNEYS

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Fig. 3



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United States Patent Office 3,294,109 Patented Dec. 27, 1966

3,294,109

SEALING MEANS FOR FIRE HYDRANT ACTUATOR

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Filed Jan. 20, 1964, Ser. No. 338,934
15 Claims. (Cl. 137—298)

The present invention relates to improvements in fire hydrants and, more particularly, to improvements to those types of fire hydrants having a vertical barrel portion, a hydrant shoe with a hydrant valve positioned near the lower end of the barrel and capable of operation from above the top closure or bonnet of the barrel.

Fire hydrants conventionally have a valve seat ring threaded into the mouth of the hydrant shoe, the valve seat ring providing a downwardly facing valve seat. A valve element cooperating with the valve seat is provided with an upwardly extending valve stem, the valve element being operatively connected to the barrel so that the valve stem is restrained from rotation but may reciprocate vertically. At the upper end of the valve stem, exterior threads are provided which cooperate with interior threads of a rotatable operating nut supported in and extending out of the bonnet or top closure of the barrel. Heretofore, complicated and costly bonnets or closure arrangements have been provided for supporting the valve operating nut in order that a proper seal could be made to prevent leakage from the top or closure when the hydrant valve in the shoe was opened. Such prior arrangements necessitated use of a flat plate having a boss thereon and through which the valve stem extended, the plate being interposed between the closure and the top of the barrel. Other arrangements were provided wherein packings surround a good portion of the upper end of the valve stem as well as the operating nut, complicated structure being arranged in the bonnet for supporting the packings. In such prior arrangements it required considerable torque to turn the operating nut in opening and closing the valve and additionally the threads between the operating nut and stem were exposed to sweating which eventually caused corrosion and required frequent inspections and maintenance.

An object of the present invention is to provide a fire hydrant with an improved bonnet or closure arrangement for the barrel, the improved bonnet or closure arrangement enabling the hydrant to be operated by reduced torque due to the reduction in operation friction between the operating nut and the valve stem.

Another object of the present invention is to provide an improved seal for isolating the operating mechanism of a hydrant reciprocating valve stem from the interior of the hydrant barrel, the improved seal enabling the operating mechanism to have reduced turning torque and operating friction.

Ancillary to the immediate preventing object, it is a further object of the present invention to provide an improved seal which isolates the coacting threads between the operating nut and the valve stem from the interior of the hydrant barrel and thereby reduces the effect of sweating and corrosion between these two elements.

A still further object of the present invention is to provide an improved bonnet arrangement including a seal for the valve stem threads and the operating nut threads, the improvement reducing the maintenance requirement for the hydrant thus enabling the same to be put in service and operate for extended periods of time without any attention.

Further, it is an object of the present invention to provide a closure or bonnet arrangement which is cheaper to manufacture and easier to repair or replace.

These and other objects and advantages of the present invention will become more apparent from the following detailed description in the specification, claims and the accompanying drawings in which:

FIGURE 1 is a vertical sectional view of a fire hydrant embodying the principles of the present invention.

FIGURE 2 is a perspective view of the upper portion of the hydrant shown in FIGURE 1 and taken from the upper right-hand side of such figure.

FIGURE 3 is an enlarged fragmentary view in section of the upper portion of the hydrant shown in FIGURE 1.

Referring now to the drawings wherein like character or reference numerals represent like or similar parts, the hydrant of the present invention includes a hydrant shoe, generally designated at **10**, adapted to be connected to a water main (not shown) and having an upwardly opening mouth surrounded by a peripheral flange **12** to which is detachably bolted the lower end of a lower section **14** of a two part barrel **16**. The shoe **10**, which is normally formed of cast iron, may be similar to that disclosed in U.S. Patent 3,104,554, issued September 24, 1963, to Frank H. Muller and John J. Smith, the patent having a common assignee with the instant application. In more detail, the shoe **10** is provided with a brass seat ring **18** threaded into the open mouth of the shoe, the brass seat ring **18** having a downwardly facing frusto conical hydrant main valve seat **20**. Drain tubes **22** are provided in the shoe **10** immediately below the flange **12** and are arranged to coincide with apertures provided in the brass seat ring **18**.

A reciprocable valve element **24** is carried on the lower end of an upwardly extending valve stem **26** by a cap nut **28** and lock washer **30**, the valve element having a frusto conical surface arranged to cooperate with the frusto conical hydrant main valve seat **20**. The valve element **24** has an upper part **34** provided with upwardly extending rib elements **32**, the rib elements cooperating with grooves in the ring seat **18**. As is now evident, the ribs **32** prevent the valve element **24** from rotating but permit the valve element to reciprocate vertically. Suitable ports or apertures in the ribs **32** which form the upper part **34** of the valve element **24** are arranged to align with the drain tubes **22** when the valve element **24** is in its closed position as shown in the drawings so that any water in the barrel can drain therefrom when the fire hydrant is not in use. However, when the valve element **24** is moved vertically downwardly to its open position, the ports or apertures in the upper valve part **34** are out of alignment with the drain tubes **22** so that no water can flow or escape from such tubes.

The lower barrel section **14** is provided with a flange **36** and is bolted to the shoe **10** by a plurality of bolts **38** in the usual manner. A gasket **40** is positioned between the flanges **12** and **36** of the shoe **10** and barrel **16** respectively, the gasket provided the usual seal.

Barrel **16** is provided with an upper barrel section **42** which is detachably connected to the upper end of the lower barrel section **14** by means of a frangible connection generally designated at **44** and described in detail in the aforementioned U.S. Patent 3,104,554. In this respect, it is sufficient for the purposes here to point out that this type of frangible connection **44** is preferably used in the fire hydrant as it will be understood that should the upper barrel section **42** be subjected to a severe blow, as being hit by a motor vehicle, the frangible connection permits the upper barrel section to be knocked over without damage to either section.

The upwardly extending valve stem **26** is made of two parts, a lower stem part **46** and an upper stem part **48**. A frangible connection generally designated at **50** is provided between the upper and lower stem parts **46** and **48** substantially at the plane of separation between the upper

barrel section 42 and the lower barrel section 14. The frangible connection 50 includes a sleeve coupling 52 having a weakening groove 54 therein. The lower stem part 46 is connected to the sleeve by means of a pin 56 whereas the upper stem part is connected by means of a pin 58.

Referring now in detail to FIGURES 2 and 3, the upper barrel section 42 is provided with a flange 60 at its upper end for receiving a bonnet or closure 62. The bonnet or closure 62, which is preferably cast iron, is provided with a flange 64 and a plurality of studs 66 passing through apertures 68 in the flange 64 and through apertures 70 in the flange 60 are adapted to be threaded into a band-like segmental ring 72. As disclosed in the aforementioned Patent 3,104,554, a gasket 74 is provided between the flanges 60 and 64 to provide a seal therebetween. By using a ring rather than providing tapped holes in the flange 60, maintenance is reduced as it is merely necessary to replace the ring should the threads therein become stripped or should a stud break off in the same.

The bonnet 62 is provided with an interior downwardly extending boss 76 having an aperture 78 therethrough. The aperture 78 is provided with an upwardly facing bearing shoulder 80 as well as interior threads 82 at its upper end. Annular groove 84 is provided in the aperture 78 below the shoulder 80, the groove 84 receiving an O-ring seal 86.

The upper valve stem part 48 of the valve stem 26 is exteriorly threaded as indicated at 88 and is provided with a pair of circumferential grooves 90 and 92 respectively, the grooves being positioned just below the threads 88. Threads 88 are received in interior threads 94 of an elongated operation nut 96. The operating nut 96 has a head portion 98 for receiving an operating wrench (not shown) and an integral collar or flange 100 adapted to bear against the bearing surface of shoulder 80. A gland nut 102 exteriorly threaded at 104 is received in the threads 82, the lower end of the gland nut 102 bearing against the upper side of the collar 100.

Gland nut 102 is provided with a bore 106 parallel to its axis and opening at 108 to the bearing surface of the collar 100. A screw 110 is provided in the upper end of the bore 106. Operating nut 96 is provided with an axially extending bore 112 communicating with the interior of the nut, above the end of the stem 26, the bore 112 being closed at its upper end by a screw 114. As will now be evident, the screws 110 and 114 can be removed and a grease gun inserted therein for supplying lubrication to the bearing surfaces of collar 100 of the operating nut 96 as well as to the threads 94 and 88 respectively between the operating nut and the valve stem 26.

As mentioned heretofore, the valve stem 26 is provided with the circumferential grooves 90 and 92, positioned on the shank portion immediately below the ends of the threads 88. An elongated, substantially rigid, tubular sleeve 116 is provided with a reduced end portion 118 having therein an internal bead 120, the bead being snapped fit into the groove 92 so that the sleeve is detachably held by the upper end of the valve stem 26. Groove 90 of the valve stem receives an O-ring 122, the O-ring making a seal with the interior surface of the reduced end portion 118 of the sleeve 116. The sleeve 116 telescopes over the downwardly extending end portion of the operating nut 96 and has sliding contact therewith. In order that the sleeve may have a seal with the operating nut 96, the sleeve 116 is provided adjacent its upper end with an internal annular groove 124 that is adapted to receive an O-ring 126. It will be noted that the operating nut 96 is provided with a counter-bore 128 at its lower end, the counter-bore having a diameter slightly greater than the diameter of the valve stem 26 so that the valve stem can be threaded upwardly therein as viewed in FIGURE 3.

The hydrant of the present invention is provided with the usual hydrant nozzles 130 having closures 132 detachably carried thereon. When it is desired to operate the hydrant of the present invention, those closure 132 of the nozzles 130 which are desired to be used are removed and the hoses are attached to the nozzles. Then a wrench is applied to the end 98 of the operating nut and it is rotated so as to cause the valve stem 26 to move vertically downwardly. As pointed out heretofore, the valve stem 26 is restrained from rotating and thus the rotary movement of the operating nut 96 causes rectilinear movement of the valve stem. As the valve stem 26 moves downwardly, it will carry with it the sleeve 116, the sleeve maintaining a sliding and sealing contact with the outside of the operating nut 96 throughout the limits of its movement. By providing the sleeve 96 for sealing and isolating the threads 88 and 94, the effects of sweating within the barrel and bonnet do not effect the operation and efficiency of the threads as there can be no corrosion of the same. Additionally, the threads may be lubricated from time to time merely by removal of the screw 114 and passage of the lubricant through the bore 112. Also, the bearing surface of the collar 100 of operating nut 96 can be lubricated by removal of the screw 110 and the passage of lubricant through the bore 106. Since there is very little frictional engagement between the moving parts in the bonnet, the amount of torque required to turn the operating nut is materially reduced.

It is preferable that the sleeve 116 be made of brass but it is also desirable, in instances where costs are to be reduced further, to make the sleeve of a plastic material. The maintenance and repair of the sleeve 116 can be easily accomplished as the O-rings 122 and 126 can be removed and replaced and for that matter, the entire sleeve 116 can be removed and replaced when necessary.

Having set forth the nature, objects and advantages of the present invention, it will be perceived that certain changes, adjustments and modifications may be made without departing from the principle and spirit of the invention. Therefore, the terminology used throughout the specification and the details of the drawings are but for the purpose of description and not limitation, the scope of the invention being defined in the claims.

What is claimed is:

1. A fire hydrant comprising: a barrel; top closure means detachably secured to said barrel; a reciprocating valve stem extending upwardly within said barrel; means engaged between said stem and said barrel for restraining said stem from rotation while permitting reciprocating movement of the same; an elongated operating nut extending through an aperture in said closure means and threadedly engaged with the upper end of said stem, said operating nut being rotatably mounted in the aperture in said closure means and having an integral collar thereon bearing downwardly against an upwardly facing shoulder in said aperture; a gland nut threadedly engaged within the upper end of said aperture and bearing against the upper side of said collar; a substantially rigid sleeve element surrounding a portion of said stem and a portion of said operating nut, said sleeve element being fixedly attached to said stem and being slidable relative to said operating nut; and sealing means between said sleeve element and said operating nut and between said sleeve element and said stem.

2. The structure defined in claim 1 in which said sealing means includes a first O-ring between said sleeve element and said operating nut and a second O-ring between said sleeve element and said stem.

3. The structure defined in claim 1 in which said gland nut includes an oil bore therethrough opening to the surface bearing against the upper side of said collar, and a screw threaded into said bore and detachably closing the same.

4. The structure defined in claim 3 in which said operating nut includes an axially extending oil bore therethrough and a screw threadedly received in the upper end of said bore and detachably closing the same.

5. A fire hydrant comprising: a barrel; a bonnet detachably secured to the upper end of said barrel and

closing the same, said bonnet having an aperture therethrough; a reciprocating valve stem extending upwardly within said barrel; means engaged between said stem and said barrel for restraining said stem from rotation while permitting reciprocating movement of the same; an elongated operating nut extending through the aperture in said bonnet and threadedly engaged with the upper end of said stem, said operating nut being rotatably mounted in the aperture in said bonnet and having integral collar thereon bearing downwardly against an upwardly facing shoulder in said aperture; a gland nut threadedly engaged with the upper end of said aperture in said bonnet and bearing against the upper side of said collar; a substantially rigid sleeve element surrounding a portion of said stem and a portion of said operating nut, said sleeve element having an internal annular bead and said stem portion having a circumferential groove for receiving said bead and detachably securing said sleeve element thereto; and sealing means between said sleeve element and said operating nut for providing a sliding seal therebetween.

6. The structure defined in claim **5** in which said sealing means includes an annular groove within said sleeve element adjacent an end thereof opposite the end having said bead, and an O-ring carried by said sleeve element and having sealing engagement with said operating nut.

7. The structure defined in claim **6** in which said stem includes a circumferential groove closely spaced adjacent to said first mentioned circumferential groove, and an O-ring in said circumferential groove and having sealing engagement with said sleeve element.

8. A fire hydrant comprising: a barrel; a bonnet detachably secured to the upper end of said barrel and closing the same, said bonnet having an aperture therethrough; a reciprocating valve stem extending upwardly within said barrel, said valve stem having exterior threads on its upper end and a pair of axially spaced circumferential grooves positioned below said threads; means engaged between said stem and said barrel for restraining said stem from rotation while permitting reciprocating movement of the same; an elongated operating nut extending through the aperture in said bonnet and having interior threads engaged with the exterior threads on said stem, said operating nut having an integral collar thereon bearing downwardly against an upwardly facing shoulder in said aperture; a gland nut threadedly engaged with the upper end of said aperture in said bonnet and bearing against the upper side of said collar; a tubular substantially rigid sleeve element surrounding a portion of said operating nut, said tubular sleeve element having a lower reduced end portion with an internal annular bead received in one of said grooves for detachably securing the sleeve element to the stem for reciprocating movement therewith; sealing means between said sleeve element and said operating nut; and an O-ring in the other of said circumferential grooves engaging the reduced portion of said sleeve element for providing a seal therebetween.

9. The structure defined in claim **8** including means for lubricating the bearing surfaces of said collar and said gland nut and means for lubricating the interior threads of said operating nut and exterior threads of said stem.

10. The structure defined in claim **8** in which said sleeve element is made of brass.

11. The structure defined in claim **8** in which said sleeve element is made of a plastic material.

12. A fire hydrant comprising: a barrel; top closure means detachably secured to said barrel; a reciprocating valve stem extending upwardly within said barrel; means engaged between said stem and said barrel for restraining said stem from rotation while permitting reciprocating movement of the same; and elongated operating nut extending through an aperture in said closure means and threadedly engaged with the upper end of said stem, said operating nut being rotatably mounted in the aperture in said closure means and having an integral collar thereon bearing downwardly against an upwardly facing shoulder in said aperture; a gland nut threadedly engaged within the upper end of said aperture and bearing against the upper side of said collar; a substantially rigid sleeve element surrounding a portion of said stem and a portion of said operating nut, said sleeve element being fixedly attached to one of said stem and said operating nut and being slidable relative the other of said stem to said operating nut, said sleeve element including an internal annular bead and in which said one of said stem and said operating nut includes a circumferential groove for receiving said bead and detachably attaching said sleeve element to the same; and sealing means between said sleeve element and said operating nut and between said sleeve element and said stem.

13. A fire hydrant comprising a barrel; top closure means detachably secured to said barrel; a reciprocating valve stem extending upwardly within said barrel; an elongated operating nut rotatably supported in said closure means and having a portion thereof threadedly engaged with the upper end of said stem; a substantially rigid sleeve element surrounding a portion of said stem and a portion of said operating nut, said sleeve element being fixedly attached to said stem and being slidable relative to said operating nut; and sealing means between said sleeve element and said operating nut and between said sleeve element and said stem.

14. A structure as claimed in claim **13** in which said sleeve element is made of brass.

15. A structure as claimed in claim **13** in which said sleeve element is made of a plastic material.

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