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(54) **Snap-on spring clip for ceramic HID lamp**

(57) A spring clip (10) has a base (12) in a first plane and has an aperture (14) centrally located therein. U-shaped projections (16) and (18) are provided on the base (12) and are formed from first and second upstanding walls (20) and (22) and third and fourth walls (24) and (26), at each end of the base (12). A first lip (28) extends orthogonally between the first wall and second wall in a second plane and a second lip (29) extends orthogonally between the third wall and fourth wall, also in the second plane. The second plane is substantially

parallel to the first plane but spaced therefrom. Extensions (30) and (32) are formed with the first wall and the third wall and project away from them. The extension are in substantially the same plane as base (12) and at least one flag (34) can be formed with at least one of the extensions. The flags (34) project away from the extensions (32) in a plane transverse to the first and second planes and allow the clips to be attached to a frame

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## Description

### TECHNICAL FIELD

[0001] This invention relates to lamps and particularly to arc discharge lamps. Still more particularly, the invention relates to arc discharge lamps employing a ceramic arc tube, a shield or shroud and mounting means for mounting the arc tube within the shroud.

### BACKGROUND ART

[0002] Metal halide arc discharge lamps are frequently employed in commercial usage because of their high luminous efficacy and long life. A typical metal halide arc discharge lamp includes a quartz or fused silica arc tube that is hermetically sealed within a borosilicate glass outer envelope. Recent advances in the art have employed a ceramic arc tube constructed, for example, from polycrystalline alumina. It is with the latter type that this invention is particularly concerned. The arc tube, itself hermetically sealed, has tungsten electrodes sealed into opposite ends and contains a fill material that may include mercury, metal halide additives and a rare gas to facilitate starting. In some cases, particularly in high wattage lamps, the outer envelope is filled with nitrogen or another inert gas at less than atmospheric pressure. In other cases, particularly in low wattage lamps, the outer envelope is evacuated.

[0003] It has been found desirable to provide metal halide arc discharge lamps with a shroud that comprises a generally tubular, light-transmissive member, such as quartz, that is able to withstand high operating temperatures. The arc tube and the shroud are coaxially mounted within the lamp envelope with the arc tube located within the shroud. Preferably, the shroud is a tube that is open at both ends.

[0004] In those lamps using an arc tube made from quartz or fused silica or like material, the arc tube has a generally tubular body sealed at the ends by a pinch seal. The pinch seals provide a flattened area on the arc tube that lends itself to receiving a mounting structure that both positions the arc tube within the shroud or shield and allows the entire structure to be mounted upon a suitable frame within an envelope.

[0005] The shroud or shield has several beneficial effects on lamp operation. In lamps with a gas-filled outer envelope, the shroud reduces convective heat losses from the arc tube and thereby improves the luminous output and the color temperature of the lamp. In lamps with an evacuated outer envelope, the shroud helps to equalize the temperature of the arc tube. In addition, the shroud effectively reduces sodium losses and improves the maintenance of phosphor efficiency in metal halide lamps having a phosphor coating on the inside surface of the outer envelope. Finally, the shroud improves the safety of the lamp by acting as a containment device in the event that the arc tube shatters.

[0006] In lamps using ceramic arc tubes, mounting the arc tube within a shroud has proven difficult and expensive. The ceramic arc tube has a tubular, often bulbous body with ceramic, cylindrical capillaries extending therefrom. The capillaries are relatively small, often having diameters of 3 mm or so, and contain the electrodes.

### DISCLOSURE OF INVENTION

[0007] It is, therefore, an object of the invention to obviate the disadvantages of spring clips of the prior art, esp. relating to the mounting of ceramic arc tubes. It is another object of the invention to enhance the mounting of arc tubes within shrouds. It is yet another object of the invention to achieve these objects in an inexpensive manner and to provide a mount assembly that has reduced costs. Still another object of the invention is the provision of an arc tube mounting assembly that can be fabricated with minimum hand-labor.

[0008] These objects are accomplished by the characterizing features of claim 1.

[0009] These objects are accomplished, in one aspect of the invention, by a spring clip that comprises a base in a first plane and having an aperture centrally located therein. U-shaped projections are provided on the base and are formed from first and second upstanding walls and third and fourth upstanding walls, one at each end of the base. A first lip extends orthogonally between the first wall and second wall in a second plane and a second lip extends orthogonally between the third wall and fourth wall, also in the second plane. The second plane is substantially parallel to the first plane but spaced therefrom. Extensions are formed with the first wall and the third wall and project away from them. The extension are in substantially the same plane as base and at least one flag can be formed with at least one of the extensions. The flags project away from the extensions in a plane transverse to the first and second planes and allow the clips to be attached to a frame as will be seen below.

[0010] The clips are used to provide an assembly of an arc tube mounted within a shroud. The assembly then comprises a light source having a center and projecting, opposite ends arrayed along a longitudinal axis, the ends being cylindrical in cross-section. A tubular shroud surrounds the light source and is coaxial with the longitudinal axis. The shroud has two ends, and a given wall thickness. A pair of spring clips is provided, one at each end of the shroud, by fitting the U-shaped projections of the clips over the wall of the shroud. An arc tube is positioned between the clips with the ends of the arc tube encompassed within the apertures in the base of the clips. The clips are economical to manufacture, easy to use and avoid ergonomic problems that were associated with prior methods. They also lend themselves to automated assembly, further reducing the cost of the lamps with which they are used.

[0011] In addition these objects are accomplished, in

a further aspect of the invention by an arc tube mount that has a spring clip comprising a base in a first plane and having an aperture centrally located therein. A U-shaped projection is provided at a first end of the base and has first and second upstanding walls. A first lip extends orthogonally between the first wall and second walls in a second plane. A third upstanding wall is formed at the second end of the base and an extension is formed with the third wall and projects away therefrom in the second plane.

**[0012]** In a preferred embodiment of the invention the spring clip is utilized with a shroud by inserting a cylindrical end of a ceramic arc tube into the centrally located aperture of the spring clip where it is frictionally maintained and then mounting the arc tube within a shroud by fitting the U-shaped projection over the edge of the tubular shroud. By forming the U-shaped projection such that it provides a spring tension on the shroud, the arc tube is maintained within the shroud. A second spring clip is provided at the other end of the arc tube and similarly engages the other end of the shroud. In a still further preferred embodiment of the invention, the extension, or a flag formed therewith, is attached to a frame by any of a number of suitable means, as will be described hereinafter.

## BRIEF DESCRIPTION OF THE DRAWINGS

### **[0013]**

Fig. 1 is a perspective view of an embodiment of a clip of the invention;

Fig. 2 is an elevational view thereof; and

Fig. 3 is an elevational view, partially in section, of the clips of the invention in place on a shroud.

Fig. 4 is an elevational view, partially in section, of an arc tube mounted within a shroud by a spring clip of the invention;

Fig. 5 is a perspective view of the spring clip shown in Fig. 1;

Fig. 6 is a partial perspective view of an alternate embodiment of a spring clip;

Fig. 7 is a partial perspective view of yet another alternate embodiment of a spring clip;

Fig. 8 is a partial perspective view of still another alternate embodiment of a spring clip; and

Fig. 9 is a partial perspective view of another alternate embodiment of a spring clip.

## BEST MODE FOR CARRYING OUT THE INVENTION

**[0014]** For a better understanding of the present invention, together with other and further objects, advantages and capabilities thereof, reference is made to the following disclosure and appended claims in conjunction with the above-described drawings.

**[0015]** Referring now to the drawings with greater particularity, there is shown in Figs. 1 and 2 a spring clip 10 that comprises a base 12 in a first plane and having an aperture 14 centrally located therein. U-shaped projections 16 and 18 are provided on the base 12 and are formed from first and second upstanding walls 20 and 22 and third and fourth walls 24 and 26, at each end of the base 12. A first lip 28 extends orthogonally between the first wall and second wall in a second plane and a second lip 29 extends orthogonally between the third wall and fourth wall, also in the second plane. The second plane is substantially parallel to the first plane but spaced therefrom. Extensions 30 and 32 are formed with the first wall and the third wall and project away from them. The extension are in substantially the same plane as base 12 and at least one flag 34 can be formed with at least one of the extensions. In Figs 1 and 2, two flags 34 are shown. The flags 34 project away from the extensions 32 in a plane transverse to the first and second planes and allow the clips to be attached to a frame as will be seen below.

**[0016]** Referring now to Fig. 3 there is shown an assembly 40 for a lamp. The assembly comprises a light source 42, for example, a ceramic arc tube 44 having a bulbous center 46 and projecting, opposite ends 48, 50 arrayed along a longitudinal axis 52. The ends 48, 50 are cylindrical in cross-section. A tubular shroud 54 surrounds the light source 42 and is coaxial with longitudinal axis 52. The shroud 54 has two ends 56, 58, and a given wall thickness.

**[0017]** Spring clips 10 are attached to the shroud 54, one at each end, by fitting the U-shaped projections 16 and 18 over the ends of the shroud. In a preferred embodiment of the invention the walls of the U-shaped projections are formed at an angle of 88° to the vertical, as shown in Fig. 2, thus allowing a friction fit with the walls. By constructing the lips 28 and 29 larger than the given thickness of the shroud wall, variations in shroud wall thickness are accommodated.

**[0018]** Each of the ends 48; 50 of the light source 42 are frictionally engaged in the apertures 14 of the clips. After the clips and light source are mounted to the shroud to form a sub-assembly, the sub-assembly is mounted to a frame 60, for example by welding the flags 34 to the frame. The frame can then be attached to a conventional flare 62 for assembly into a lamp envelope. Alternatively, the frame can be mounted to the flare first and subsequently, the sub-assembly of shroud and arc tube can be mounted to the frame.

**[0019]** This structure thus provides an economical assembly for discharge lamps employing a shroud. The

clips themselves are easy to manufacture and provide a good structural base for mounting the arc tube or other light source.

[0020] Referring now to the drawings with greater particularity, there is shown in Fig. 4 an assembly 110 for a lamp. The assembly 110 comprises a light source 112 having a center chamber 114 and opposite ends 116, 118, arrayed along a longitudinal axis 119. The ends 116, 118 are cylindrical in cross-section. The light source 112 in this instance is an arc discharge chamber constructed of polycrystalline alumina.

[0021] A tubular shroud 120 surrounds the light source 112 and is coaxial with the longitudinal axis 119.

[0022] The light source 112 is mounted within the shroud 120 by spring clips 126 one of which is mounted at either end of the shroud, see also Fig. 5. The spring clips each comprise a base 128 lying in a first plane and having an aperture 130, for example, a star-shaped aperture, centrally located in the base. The apertures 130 in the two spring clips frictionally engage one of the ends 116, 118 of the light source 112.

[0023] Each of the spring clips 126 has a U-shaped projection 132 at and end 133 of the base 126. The U-shaped projection comprises first and second upstanding walls 134, 136 joined by a first lip 138 that extends in a second plane and is fitted over the wall of the shroud 120. One of the upstanding walls of the U-shaped projection, for example, wall 136, is formed to provide spring tension for grasping the shroud wall.

[0024] A third upstanding wall 140 is formed at the second end 142 of the base 128 and is provided with an extension 144 that projects away from the wall 140 in the second plane.

[0025] The extensions 144 are attached to a frame 146 thereby mounting the assembly. In the embodiment shown in Fig. 4 the frame 146 can be a part of one of the lamp lead-ins and an electrode 148 exiting from end 116 can be electrically and mechanically attached to an arm 150 of frame 146. A second electrode 150 exiting from end 118 can be electrically and mechanically attached to a second lead-in 152.

[0026] In the embodiment shown in Fig. 4 a flag 154 is formed with the extension 144 and extends away from the extension 144 in a plane transverse to the first and second planes and it is the flag 154 that is attached to the frame.

[0027] Alternate embodiments of the second end 142 are shown in Figs. 6-9.

[0028] Referring now to Fig. 6, second end 142 of a spring clip 126 has an extension 144a elongated and provided with a frame-receiving aperture 156 to be pressed over a wire frame 146.

[0029] The embodiment shown in Fig. 7 includes a tension member 158 formed to project inwardly toward the frame 146 and apply pressure thereto to maintain the assembly 110 in position on the frame 146.

[0030] In the embodiment shown in Fig 8 a second aperture 156a is provided spaced from but aligned with

the first aperture 156. A tension member 158a can also be provided.

[0031] In the embodiment shown in Fig. 9 a depending arm 160 is provided with a groove 162 to snap around a wire frame 146.

[0032] Many versions of the spring clips shown and described herein are preferably manufactured from a continuous strip of 6,35 mm (0.25") wide by 2,54 mm (0.10") thick stainless steel. Punch scrap is less than 10% providing for a very economical structure. The clips reference the shroud ID in four positions and provide slack for variations in the shroud glass ID. Only two welds are necessary per mount to attach the assembly to the frame and this welding is accomplished in a single plane, thus allowing for automated welding of the assembly to the frame.

[0033] While there have been shown and described what are at present considered to be the preferred embodiments of the invention, it will be apparent to those skilled in the art that various changes and modification can be made herein without departing from the scope of the invention as defined by the appended claims.

## Claims

1. A spring clip which is **characterized by** comprising:

a base (12) in a first plane and having an aperture (14) centrally located therein;  
a U-shaped projection (16, 18) at a first end of said base comprising first and second upstanding walls (20, 22) and  
at least a third upstanding wall (24) at a second end of said base;  
a first lip (28) extending orthogonally between said first wall and second walls in a second plane;  
at least one extension (30) formed with at least one of said first and third walls projecting away therefrom.

2. The spring clip (10) of claim 1 comprising:

U-shaped projections (16, 18) at each end of said base comprising first and second upstanding walls (20, 22) and third and fourth upstanding walls (24, 26);  
a second lip (29) extending orthogonally between said second and third walls in said second plane, said second plane being substantially parallel to said first plane;  
at least one flag (34) extending away from said extension in a plane transverse to said first and second planes.

3. The spring clip (126) of claim 1 comprising:

a base (128) in a first plane and having an aperture (130) centrally located therein;  
 a U-shaped projection (132) at a first end (133) of said base (126) comprising first and second upstanding walls (134, 136);  
 a first lip (138) extending orthogonally between said first wall and second walls in a second plane; and  
 a third upstanding wall (140) formed at the second end of said base and an extension (144) formed with said third wall projecting away therefrom in said second plane.

4. The spring clip of Claim 3 wherein at least one flag (154) is formed with said extension, said flag projecting away from said extension in a plane transverse to said first and second planes.

5. An assembly (40) for a lamp comprising:

a light source (42) having a center (46) and projecting, opposite ends (48, 50) arrayed along a longitudinal axis (52), said ends being cylindrical in cross-section;  
 a tubular shroud (54) surrounding said light source (42) coaxial with said longitudinal axis (52), said shroud having two ends (56, 58), and a given wall thickness, the improvement comprising;  
 at least one spring clip (10), at one end of said shroud (54), said spring clip being in accordance with one of the claims 1 to 4.

6. The assembly (40) of claim 5 comprising:

a pair of spring clips (10), one at each end of said shroud (54), each of said spring clips comprising a base (12) in a first plane and having an aperture (14) centrally located therein, each aperture of one of said spring clips frictionally engaging one of said cylindrical ends (48, 50) of said light source (42);  
 U-shaped projections (16, 18) at each end of said base comprising first and second upstanding walls (20, 22) and third and fourth upstanding walls (24, 26), said U-shaped projections (16, 18) being fitted over the walls of said shroud (54);  
 a first lip (28) extending orthogonally between said first and second walls (20, 22) in a second plane;  
 a second lip (29) extending orthogonally between said third and fourth walls (24, 26) in said second plane, said second plane being substantially parallel to said first plane; and  
 at least one extension (30, 32) formed with at least one of said first and third walls projecting away therefrom;

said first and third walls lying adjacent the outside surface of said shroud and said second and fourth walls lying adjacent the inside surface of said shroud.

7. The assembly of Claim 6 wherein at least one flag (34) is formed with at least one of said extensions, said at least one flag extending away from said extension in a plane transverse to said first and second planes.

8. The assembly of claim 5 comprising:

at least one spring clip (126) at one end of said shroud (120), said spring clip (126) comprising a base (128) in a first plane and having an aperture (130) centrally located therein, said aperture (130) of said spring clip (126) frictionally engaging one of said cylindrical ends (116, 118) of said light source;  
 said spring clip (126) having a U-shaped projection (132) at an end of said base (126) comprising first and second upstanding walls (134, 136), said U-shaped projection being fitted over the wall of said shroud;  
 a first lip (138) extending orthogonally between said first and second walls in a second plane; and  
 a third upstanding wall (140) formed at the second end (142) of said base and an extension (144) formed with said third wall projecting away therefrom in said second plane.

9. The assembly of Claim 8 wherein said assembly (110) is positioned adjacent a frame (146) and said extension (144) is attached to said frame.

10. The assembly of Claim 8 wherein at least one flag (154) is formed with said extension (144), said at least one flag (154) extending away from said extension (144, 144a) in a plane transverse to said first and second planes; said assembly (110) being positioned adjacent said frame (146) and said flag (154) being attached to said frame.

11. The assembly of Claim 8 wherein said extension (144, 144a) has an aperture (156) that engages said frame.

12. The assembly of Claim 10, wherein said aperture (156) frictionally engages said frame.

13. The assembly of Claim 8 wherein said extension (144, 144a) includes a depending portion (158) and said depending portion (158, 160) is formed to engage said frame (146):

14. The assembly of Claim 12 wherein said frame (146)

comprises a wire and said depending portion (160)  
is grooved (162) to accept said frame.

15. The assembly of Claims 8, 9, 10, 11, 12, or 13  
wherein two of said spring clips (126) are provided, 5  
one at either end of said shroud.

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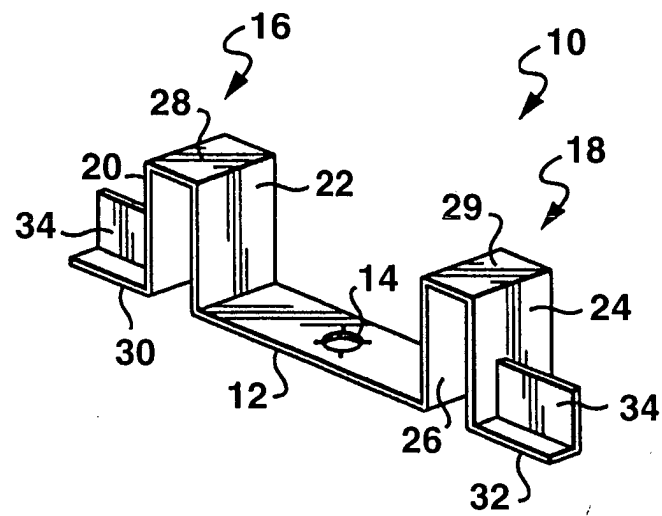


FIG. 1

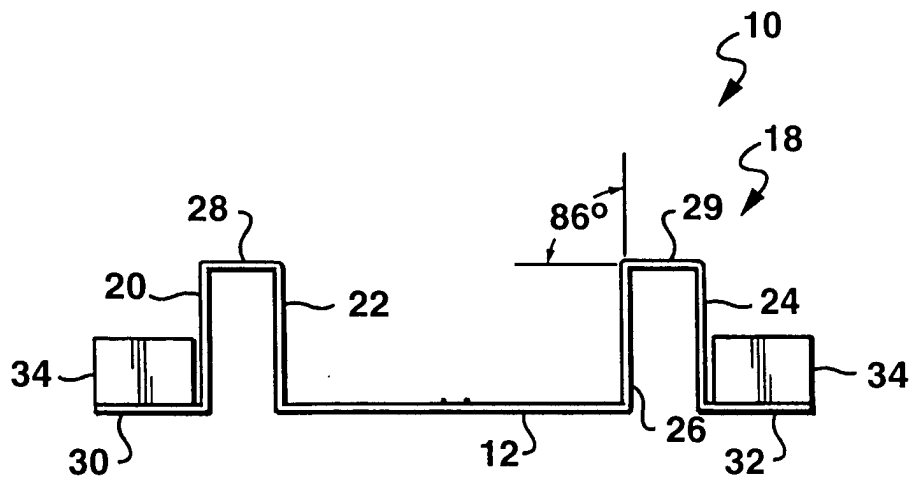
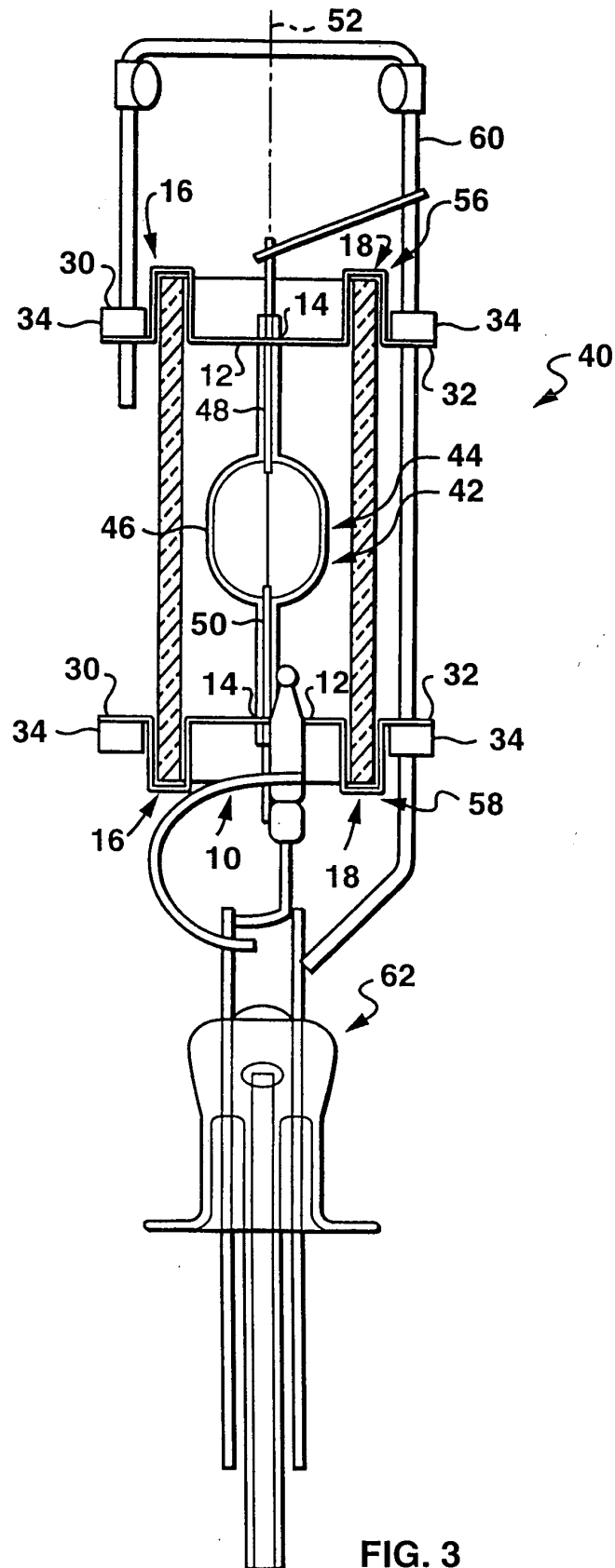


FIG. 2



**FIG. 3**

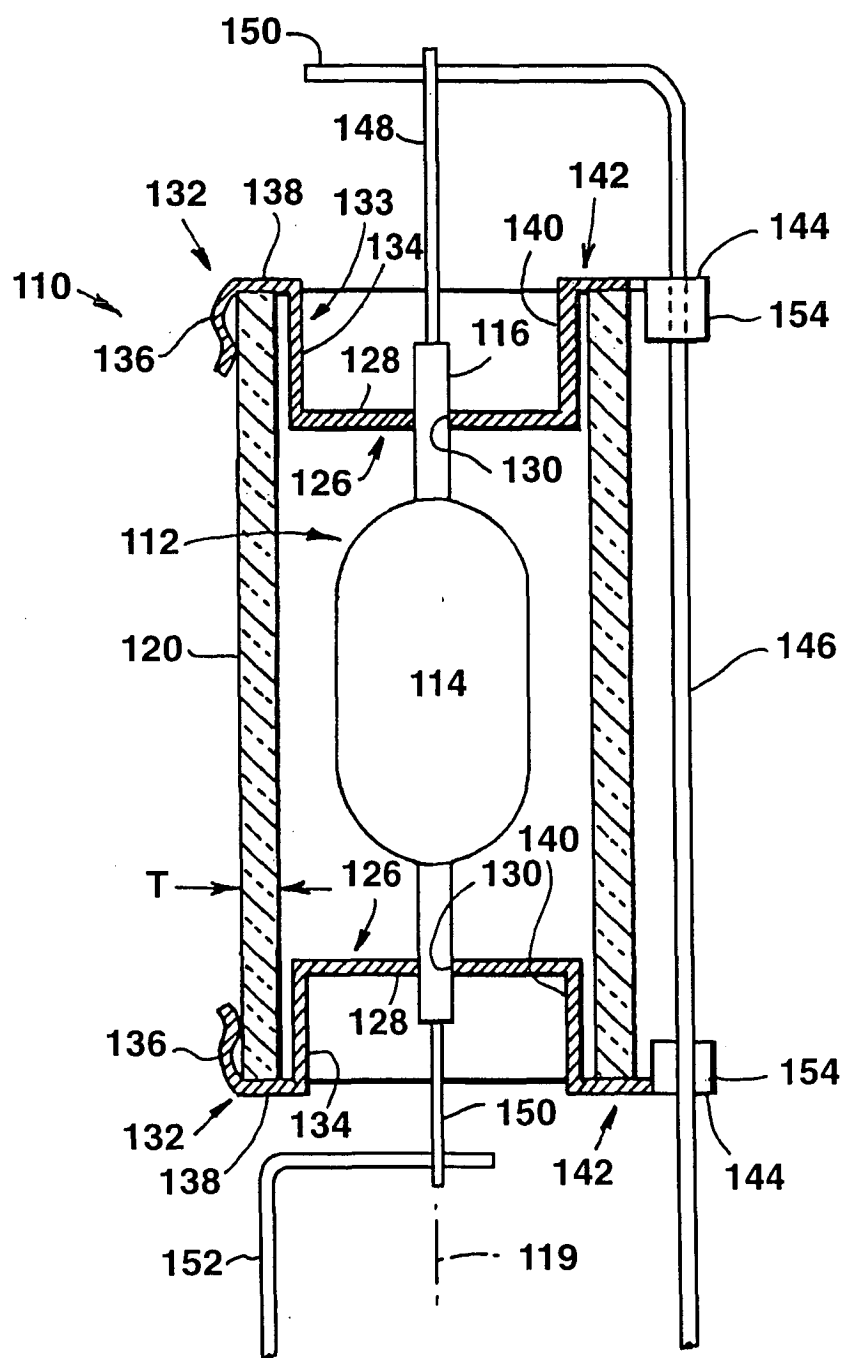


FIG. 4

