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(54) **Title:** TROLLEYS AND HANGERS FOR WASHDOWN CURTAINS

(57) **Abstract:** Example trolleys and hangers for washdown curtains are disclosed herein. An example trolley disclosed herein includes features that simplify manufacturing and promote liquid runoff to avoid bacterial growth. Some example trolleys comprise U-bolts, shoulder screws and acorn nuts. In some examples, a frame of the trolley has a nestable V-shape profile that makes the frame readily blanked and formed from sheet metal with minimal waste. In some examples, an example trolley disclosed herein has a pair of rollers that are horizontally offset to a point from which the curtain hangs so that the weight of the curtain tilts the trolley to promote liquid runoff from the trolley's frame.



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TROLLEYS AND HANGERS FOR WASHDOWN CURTAINS

Field of the Disclosure

[0001] This patent generally pertains to washdown curtains typically used for clean rooms and more specifically pertains to curtain trolleys and hangers.

Background

[0002] In contrast to common residential shower curtains that hang from a series of sliding rings or curtain hangers, industrial washdown curtains typically hang from a series of trolleys with rollers that travel along an overhead track to open and close the curtain. Washdown curtains, trolleys and tracks can have features to facilitate washing down or sanitizing the curtain. Thus, washdown curtains are particularly suitable for use in the food industry.

[0003] The tracks of industrial washdown curtains are often located or positioned higher than residential shower curtain rods. As a result, a person has to grasp the washdown curtain several feet below the track to slide it open. This creates an unfavorable angle of pull for sliding the curtain horizontally because a significant vertical component of the pulling force is downward. The downward force increases frictional horizontal drag between the curtain hanger and the track. Consequently, unlike residential shower curtains that employ sliding rings, washdown curtains often have trolleys with rollers to reduce drag or friction.

Brief Description of the Drawings

[0004] Figure 1 is a side view of example curtain trolleys supporting a washdown curtain constructed in accordance with teachings disclosed herein.

[0005] Figure 2 is a front and partial cross-sectional view of an example curtain hanger shown in Figure 1.

[0006] Figure 2A is a cross-sectional view taken along line 2A-2A of Figure 2.

[0007] Figure 2B is a cross-sectional view taken along line 2B-2B of Figure 2.

[0008] Figure 2C is a cross-sectional view taken along line 2C-2C of Figure 2.

[0009] Figure 3 is a front view similar to Figure 2, but showing an example track constructed in accordance with teachings disclosed herein.

[0010] Figure 4 is a front view similar to Figures 2 and 3, but showing an example roller constructed in accordance with teachings disclosed herein.

[0011] Figure 5 is a front view similar to Figures 2, but showing an example rod constructed in accordance with teachings disclosed herein.

- [0012] Figure 5A is a cross-sectional view taken along line 5A-5A of Figure 5.
- [0013] Figure 5B is a cross-sectional view taken along line 5B-5B of Figure 5.
- [0014] Figure 5C is a cross-sectional view taken along line 5C-5C of Figure 5.
- [0015] Figure 6 is a front view similar to Figures 2, but showing another example rod constructed in accordance with teachings disclosed herein.
- [0016] Figure 6A is a cross-sectional view taken along line 6A-6A of Figure 6.
- [0017] Figure 6B is a cross-sectional view taken along line 6B-6B of Figure 6.
- [0018] Figure 6C is a cross-sectional view taken along line 6C-6C of Figure 6.
- [0019] Figure 7 is a front and partial cross-sectional view similar to Figure 2, but showing another example curtain hanger constructed in accordance with teachings disclosed herein.
- [0020] Figure 7A is a projected view taken along line 7A-7A of Figure 7.
- [0021] Figure 7B is a plan view showing example nested trolley frames prior to forming roller-supporting tabs.
- [0022] Figure 8 is a front view similar to Figures 2 – 7, but showing another example curtain trolley constructed in accordance with teachings disclosed herein.
- [0023] Figure 9 is an end view of Figure 8.
- [0024] Figure 10 is an end view similar to Figure 8, but showing a curtain hanging from the example curtain trolley of Figures 8 and 9.

Detailed Description

[0025] In Figures 1 – 10 show example trolleys and hangers for suspending a washdown curtain 10 from various tracks. The term, “trolley” refers to any apparatus or frame with rollers for traveling along a track. The term, “hanger” refers to any apparatus or structure (e.g., a building structure or rod) from which a curtain can be suspended. In some examples, a trolley and a hanger can be combined as a single unit or unitary structure. For example, some example trolleys disclosed herein include a feature that serves as a hanger. In some examples, a trolley and a hanger disclosed herein share some of the same parts, components or structure. For example, some example trolleys disclosed herein include an axle that supports a roller and also provides a hook for suspending a curtain therefrom. In examples disclosed herein, horizontal surfaces (i.e., surfaces parallel to an axis of a track along which the curtain travels and/or a travel path of the curtain as the curtain is moved between an open position and a closed position) are avoided or minimized to help prevent the accumulation of moisture, bacteria and/or other particulate that may otherwise form or accumulate on such horizontal surfaces.

[0026] In the example illustrated in Figures 1 and 2, a plurality of curtain trolleys 12 is shown suspending curtain 10 from an overhead track 14 above a floor 16. Examples of track 14 include, but are not limited to, a substantially cylindrical member (e.g., a pipe), a round rod, a structural angle iron (e.g., track 14a of Figure 3), other structural members, rectangular bar stock, rectangular tubing, triangular shaped tubing, etc. In some examples, a mounting plate 18 may be employed to provide additional rigidity to track 14 and enable attachment of track 14 to an upper mounting surface 20 such as, for example, to a ceiling.

[0027] In some examples, each trolley 12 comprises a frame or rod 22 supporting a pair of rollers 24 to facilitate or provide smooth travel along track 14. Rod 22, in some examples, has a curved section 22a that extends through an aperture 26 in curtain 10 for hanging the curtain. In the illustrated example, rod 22 has a longitudinal centerline 28 curved in a U-shape to provide rod 22 with a first leg 22b and a second leg 22c, each extending upward from curved section 22a. In some examples, rod 22 has a substantially round and substantially uniform cross-sectional area 30 perpendicular to longitudinal centerline 28 at first leg 22b, at second leg 22c and at curved section 22a, as shown in Figures 2A, 2B and 2C, respectively. In other examples, the cross-sectional areas 30 of the first leg 22b, the second leg 22c and the curved section 22a may be non-uniform. For example the cross-sectional area 30 of the legs 22b and 22c may be smaller than the cross-sectional area 30 of the curved section 22a. The pair of rollers comprises a first roller 24 mounted to first leg 22b such that first roller 24 rotates about a first rotational axis 32 that is substantially collinear or coaxially aligned with longitudinal centerline 28 at first leg 22b. A second roller 24 is mounted to second leg 22c such that second roller 24 rotates about a second rotational axis 34 that is substantially collinear or coaxially aligned with longitudinal centerline 28 at second leg 22c.

[0028] In some examples, first roller 24 is secured or captured axially in a direction along the first rotational axis 32 between a first staked deformation, shoulder or protrusion 36 and a first end cap 38. The first end cap 38 is removably attached, clamped or otherwise coupled to a first end 40 of first leg 22b, and deformation 36 provides a radial protrusion at an intermediate location on first leg 22b. Likewise, second roller 24 is secured or captured axially in a direction along the second rotational axis 34 between a second staked deformation, shoulder or protrusion 40 and a second end cap 38. The second end cap 38 is attached, clamped or otherwise coupled to a second end 42 of second leg 22c, and deformation 40 provides a radial protrusion at an intermediate location on second leg 22c. In the illustrated example, the end caps 38 are threadably coupled to the first and second legs

22b and 22c. Each of the first and second legs 22b and 22c have threads 44 to threadably receive the end caps 38.

[0029] Rollers 24, and other example rollers, can be made of any suitable material. Example roller materials include, but are not limited to, nylon, polycarbonate, polyurethane, acetal (e.g., Delrin) and stainless steel. To prevent threads 44 on legs 22b and 22c from abrading an inner bore 46 of rollers 24 as rollers 24 rotate, in some examples, a sleeve 48 (e.g., a bearing) is inserted between threads 44 and bore 46. Sleeve 48 is made of any suitable material. Examples of sleeve materials include, but are not limited to, stainless steel, brass, plastic, etc. To prevent threads 44 from abrading sleeve 48, in some examples, sleeve 48 is prevented from rotating relative to the threads 44. In examples where sleeve 48 is prevented from rotating, relative rotation and circumferential sliding may occur between roller 24 and the generally smooth outer surface of sleeve 48. To prevent sleeve 48 from rotating or sliding relative to the threads 44, in some examples, end cap 38 is in the form of a nut that clamps or captures sleeve 48 against deformation 40 to prevent axial and rotational movement of the sleeve (48) relative to the axis of rotation 32 and/or 34. In some examples, a tight radial fit between sleeve 48 and threads 44 holds sleeve relatively fixed relative to threads 44 to prevent movement (e.g., rotation and/or sliding) of the sleeve 48 relative to the threads 44. In some examples, only a portion of legs 22b and 22c above the location of the rollers 24 is threaded to receive the cap 38 such that the sleeve 48 can be removed.

[0030] To prevent moisture and bacteria from collecting atop end caps 38, in some examples, end caps 38 have an upper surface 50 that slopes downward from a peak 52 (e.g., a curved or arcuate profile). A conventional acorn nut is one example of an end cap having such a peak and downward sloping surface.

[0031] To prevent moisture and bacteria from collecting on rollers 24, in some examples, rollers 24 have a curved outer surface 54 (e.g., substantially spherical) as shown in Figures 1 – 3. Curved outer surface 54 provides roller 24 with a substantially circular rolling line of contact 56 with track 14. In other examples, as shown in Figure 4, a roller 58 has generally conical surfaces or profile 60 for draining moisture and for engaging track 14.

[0032] In the example shown in Figure 1 – 3, rod 22 is in the form of a standard U-bolt, wherein legs 22b and 22c are substantially vertical and parallel. With such a configuration, a plane 62 lying tangent to curved outer surface 54 and intersecting the circular rolling line of contact 56 is tilted out of parallel alignment relative to longitudinal centerline 28 at first and second legs 22b and 22c. As a result, track 14 exerts a normal contact force 64 having both vertical and horizontal components. The vertical component urges roller 24 up against the

underside of end cap 38, thus preventing a moisture-collecting gap between roller 24 and end cap 38. The horizontal component of force 64 helps center rod 22 to track 14, thus preventing rod 22 from dragging, sliding or otherwise scraping along the side of track 14.

[0033] Figures 5, 5A, 5B and 5C show another example shape or profile of a rod 22', where the drawing figures correspond to similar Figures 2, 2A, 2B and 2C. In this example, rod 22' has a relatively V-shaped profile. Figures 6, 6A, 6B and 6C show yet another example shape or profile of a rod 22'', where the drawing figures correspond to similar Figures 2, 2A, 2B and 2C. In the illustrated example, rod 22'' has a first portion that is substantially straight relative to first and second leg portions, which are angled relative to the first portion. For example, the rod 22'' has a triangular-shaped profile. The first portion, for example, has along longitudinal axis that is substantially perpendicular to a longitudinal axis of the track 14.

[0034] In the example shown in Figures 7, 7A and 7B, an example curtain trolley 66 includes a pair of rollers 68 mounted to a frame 70 comprising a unitary piece of sheet metal. The term, "unitary piece" refers to frame 70 as being one continuous piece of material, as opposed to an assembly or fabrication of multiples pieces. The term, "sheet metal" refers to a piece having a substantially uniform material thickness, where the thickness is at least three times smaller than the piece's width and length. Sheet metal is readily blanked and formed using conventional manufacturing processes.

[0035] In the illustrated example, frame 70 comprises a first leg 70a and a second leg 70b extending upward from a lower section 70c. A first tab 70d with a hole 72 for mounting first roller 68 extends from first leg 70a and is tilted out of coplanar alignment with first leg 70a (e.g., protrudes away from first leg 70a). A second tab 70e with hole 72 for supporting second roller 68 extends from second leg 70b and is tilted out of coplanar alignment with second leg 70b. Tabs 70d and 70e are formed by bending a sheet metal blank along lines 74 and 76, respectively. Tabs 70d and 70e slope downward toward each other to promote drainage. With tabs 70d and 70e sloping downward, a first axle 78 and a second axle 80 are tilted out of parallel alignment with each other. In some examples, axles 78 and 80 are shoulder screws about which rollers 68 rotate. Some examples of rollers 68 are cylindrical (e.g., cylinders) and ride upon track 14.

[0036] Frame 70 is generally V-shaped such that a concave upward facing edge 70f runs from first leg 70a, along lower section 70c and to second leg 70b. A convex downward facing edge 70g extends from first leg 70a, along lower section 70c and to second leg 70b. Frame 70, being made of sheet metal, has a geometry that renders convex downward facing

edge 70g nestable (e.g., can nest) within a virtual or actual concave upward facing edge 70f of a virtual or actual identical unitary piece of sheet metal 70'. A nesting arrangement, as shown in Figure 7B, allows a plurality of sheet metal blanks 82 to be cut from a single larger sheet of material with minimal waste. Some examples of frame 70 have a curtain-receiving notch or hook 84 for hanging curtain 10.

[0037] In the example shown in Figures 8, 9 and 10, an example curtain trolley 86 includes a pair of rollers 88 mounted to a frame 90 comprising a unitary piece of sheet metal. Each roller 88 is an example of a roller apparatus, wherein the term, "roller apparatus" refers to one or more rollers rotatable about a single linear axis. Examples of a roller apparatus include a single roller on one axle, two collinear rollers on the same axle, and any plurality of collinear rollers sharing the same axle. Frame 90 is bent or formed in a V-shape having a first leg 90a and a second leg 90b extending upward from a lower section 90c. In some examples, first and second legs 90a and 90b have, respectively, first and second substantially flat faces 92a and 92b that face downward or away from the track 14. First and second substantially flat faces 92a and 92b define a pair of planes 94a and 94b, respectively, that intersect along a line 96 proximate lower section 90c.

[0038] A first axle 98 defining a first axis 100 connects a first roller 88 to first leg 90a, and a second axle 102 defining a second axis 104 connects a second roller 88 to second leg 90b. In some examples, axles 98 and 102 are standard shoulder screws. First and second axles 98 and 102 are attached to frame 90 and extend upward from first and second anchor points 105 and 106, respectively. With frame 90 being generally V-shaped, axles 98 and 102 are tilted out of parallel alignment with each other.

[0039] To promote drainage from frame 90 and thus avoid harboring bacteria, curtain trolley 86 has a curtain hanging point or hook 108 that is offset relative to (e.g., the axes 100 and 104 of) rollers 88 so that curtain trolley 86 hangs from track 14 at an angle 110 while supporting curtain 10, as shown in Figure 10. In other words, the trolley 86 has rollers 88 that are horizontally offset by a dimension 114 relative to a point 108 from which the curtain 10 hangs so that the weight of the curtain 10 tilts the curtain trolley 86 to promote liquid runoff from the frame 90. Specifically, axes 100 and 104 lie along and define a plane 112, and hanging point 108 is offset and spaced apart from plane 112 as indicated by dimension 114 in Figure 9.

[0040] Although certain example methods, apparatus and articles of manufacture have been described herein, the scope of the coverage of this patent is not limited thereto. On the

contrary, this patent covers all methods, apparatus and articles of manufacture fairly falling within the scope of the appended claims either literally or under the doctrine of equivalents.

Claims

1. A curtain trolley comprising:
 - a rod having a longitudinal centerline that defines a first leg and a second leg extending upward from a curved lower section, the rod having a substantially round and substantially uniform cross-sectional area perpendicular to the longitudinal centerline at the first leg, at the second leg and at the curved lower section,;
 - a first roller mounted to the first leg, the first roller having a first rotational axis substantially collinear with the longitudinal centerline at the first leg;
 - a second roller mounted to the second leg, the second roller having a second rotational axis substantially collinear with the longitudinal centerline at the second leg;
 - a first cap adjacent the first roller and attached to the first leg; and
 - a second cap adjacent the second roller and attached to the second leg.
2. The curtain trolley of claim 1, wherein the longitudinal centerline is curved in a U-shape.
3. The curtain trolley of claim 1, wherein the first roller and the second roller each have a substantially spherical surface and a substantially circular rolling line of contact thereon.
4. The curtain trolley of claim 1, further comprising a track, wherein the first and second rollers roll upon the track with the curved lower section hanging beneath the track.
5. The curtain trolley of claim 3, wherein the track is substantially cylindrical.
6. The curtain trolley of claim 3, wherein the first roller has a curved outer surface contacting the track to define a substantially circular rolling line of contact on the curved outer surface such that a plane lying tangent to the curved outer surface and intersecting the substantially circular rolling line of contact is tilted out of parallel alignment with the longitudinal centerline at the first leg.
7. The curtain trolley of claim 1, wherein the first leg is substantially parallel to the second leg.

8. The curtain trolley of claim 1, further comprising a first sleeve on the first leg with the first roller being rotatable relative to the first sleeve.
9. The curtain trolley of claim 1, wherein the first cap has an upper surface sloping downward from a peak of the upper surface.
10. The curtain trolley of claim 9, wherein the first cap is a domed acorn nut.
11. The curtain trolley of claim 1, further comprising a deformation providing a radial protrusion on the first leg, wherein the first roller is captured between the first cap and the radial protrusion.
12. The curtain trolley of claim 1, further comprising a curtain defining an aperture therethrough, wherein the curved lower section of the rod passes through the aperture and the curtain hangs from the curved lower section.
13. A curtain trolley comprising:
 - a unitary piece of sheet metal comprising:
 - a) a first leg and a second leg extending upward from a lower section;
 - b) a concave upward facing edge running from the first leg, along the lower section and to the second leg;
 - c) a convex downward facing edge running from the first leg, along the lower section and to the second leg, the unitary piece of sheet metal being of a geometry that renders the convex downward facing edge nestable within a virtual concave upward facing edge of a virtual unitary piece of sheet metal having an identical geometry to the geometry of the unitary piece of sheet metal;
 - d) a first tab extending from the first leg and being tilted out of coplanar alignment with the first leg; and
 - e) a second tab extending from the second leg and being tilted out of coplanar alignment with the second leg;
 - a first axle extending from the first tab;
 - a second axle extending from the second tab;
 - a first roller mounted to the first axle; and

a second roller mounted to the second axle.

14. The curtain trolley of claim 13, wherein a combination of the first leg, the second leg and the lower section defines a generally V-shaped profile.
15. The curtain trolley of claim 13, wherein at least one of the first leg, the second leg and the lower section defines a curtain-receiving notch.
16. The curtain trolley of claim 13, wherein each of the first tab and the second tab slopes downward.
17. The curtain trolley of claim 16, wherein the first tab and the second tab slope downward toward each other.
18. The curtain trolley of claim 13, wherein the first axle and the second axle are tilted out of parallel alignment with each other.
19. The curtain trolley of claim 13, wherein the first axle is a shoulder screw.
20. The curtain trolley of claim 13, further comprising:
 - a track upon which the first roller and the second roller roll; and
 - a curtain suspended from the unitary piece of sheet metal.
21. The curtain trolley of claim 20, wherein the track is substantially cylindrical.
22. A curtain trolley from which a curtain can be hung, the curtain trolley comprising:
 - a frame;
 - a first axle defining a first axis and being attached to the frame at a first anchor point;
 - a second axle defining a second axis and being attached to the frame at a second anchor point;
 - a maximum of two roller apparatuses including a first roller apparatus mounted to the first axle and being rotatable about the first axis, and a second roller apparatus mounted to the second axle and being rotatable about the second axis; and

a hanging point situated to be engaged by the curtain when the curtain is hanging from the curtain trolley, the hanging point being spaced apart laterally relative to from a plane in which the first axis and the second axis lie.

23. The curtain trolley of claim 22, wherein the frame is a unitary piece of sheet metal.
24. The curtain trolley of claim 23, wherein the unitary piece of sheet metal includes a first leg and a second leg extending upward from a lower section of the unitary piece, the first anchor point being on the first leg, and the second anchor point being on the second leg.
25. The curtain trolley of claim 24, wherein the first leg has a first substantially flat face that faces downward, the second leg has a second substantially flat face that faces downward, the first and second substantially flat faces define a pair of planes that intersect along a line proximate the lower section of the unitary piece.
26. The curtain trolley of claim 22, wherein the first axle extends upward from the first anchor point, and the second axle extends upward from the second anchor point.
27. The curtain trolley of claim 22, wherein the first axle and the second axle are tilted out of parallel alignment with each other.
28. The curtain trolley of claim 22, wherein the first axle is a shoulder screw.
29. The curtain trolley of claim 22, further comprising:
a track upon which the first roller and the second roller roll, wherein the track is substantially cylindrical.

FIG. 1

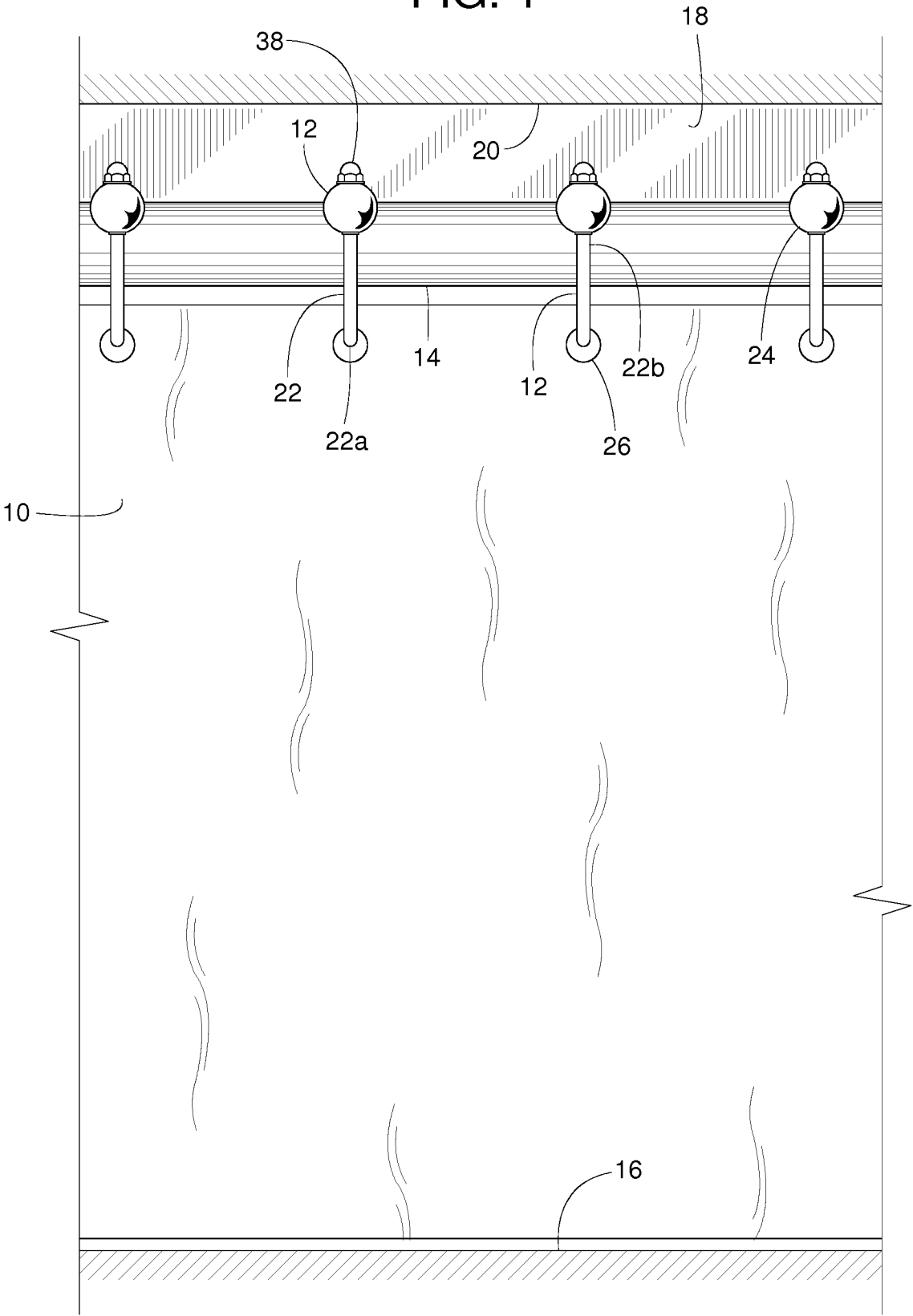


FIG. 2

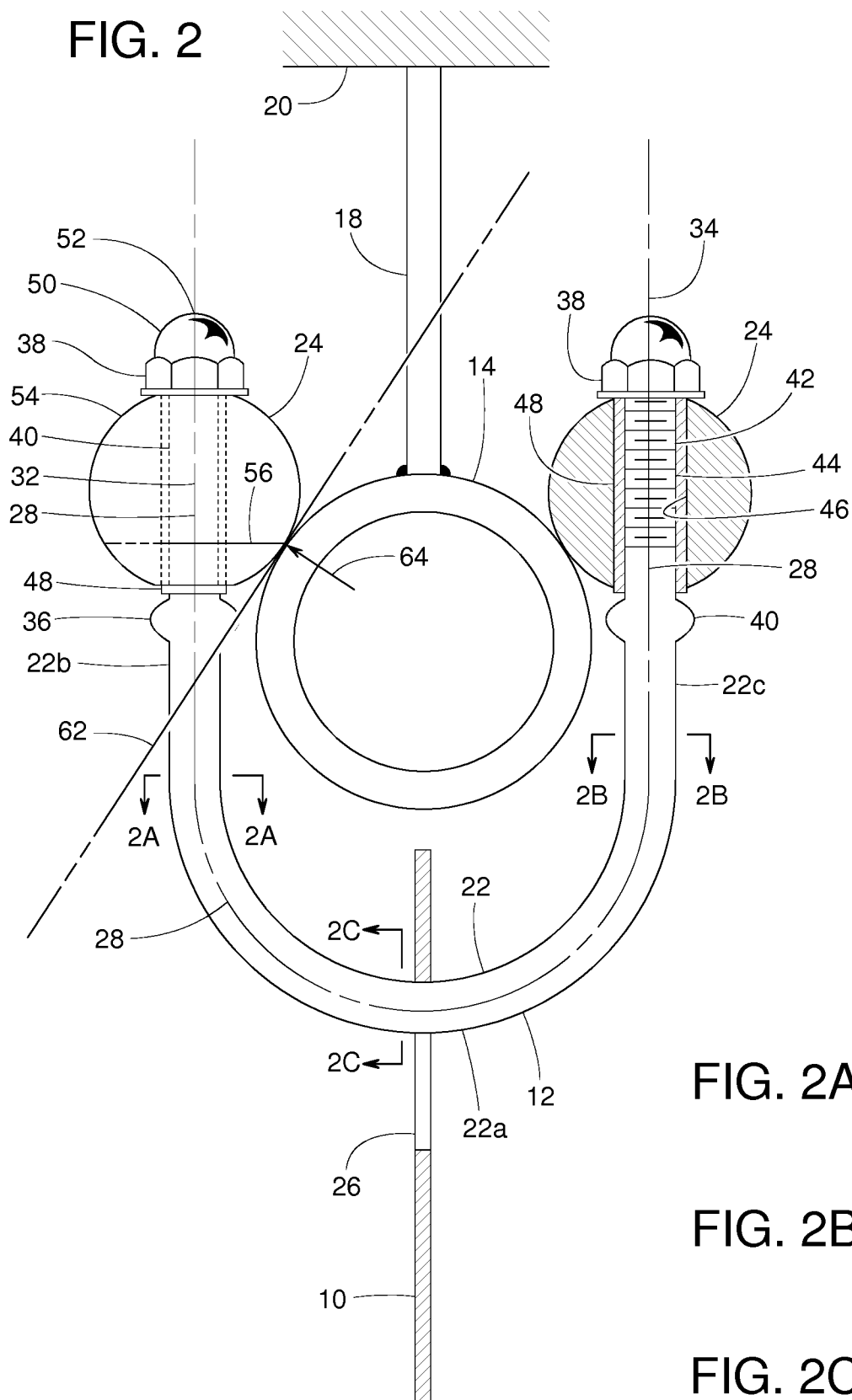


FIG. 3

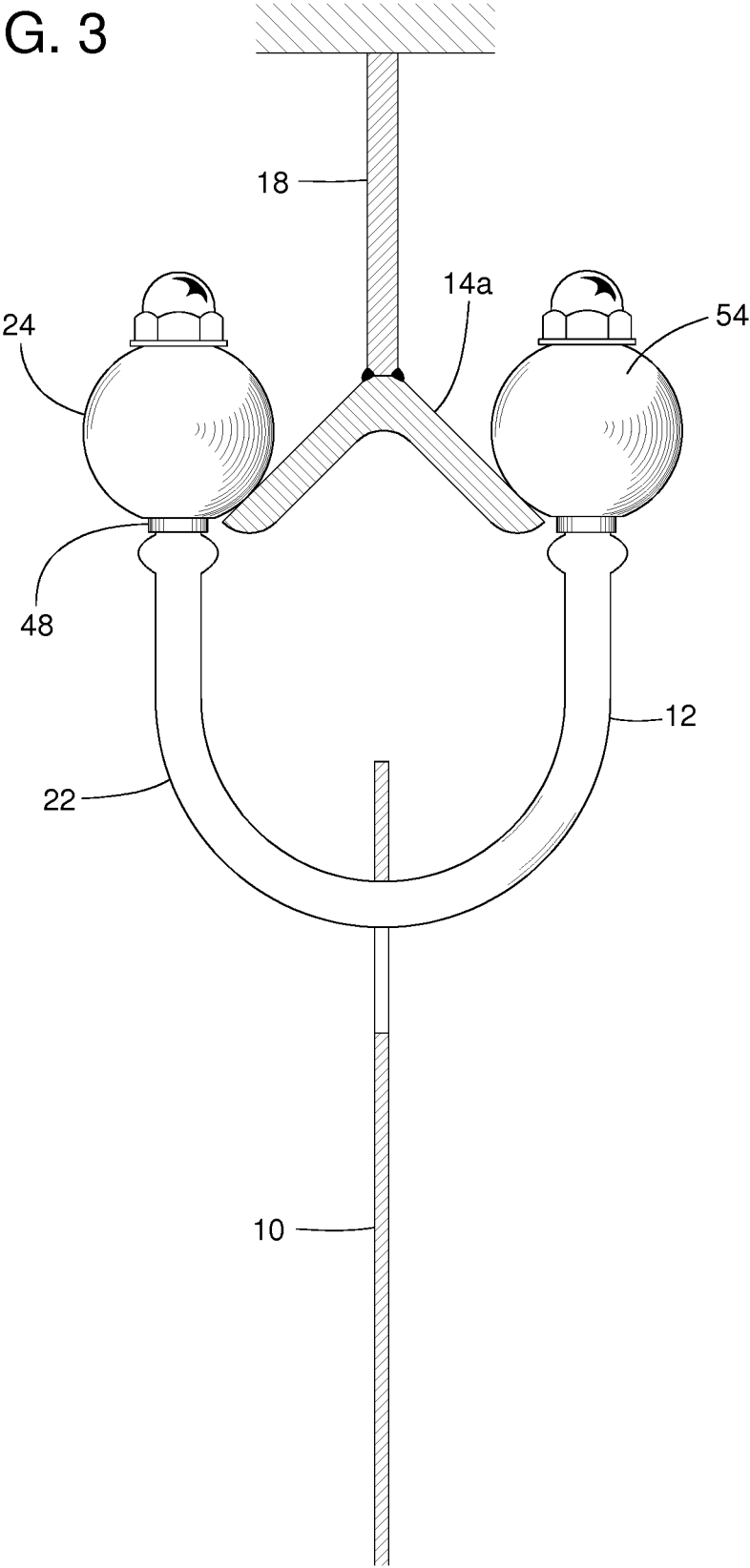
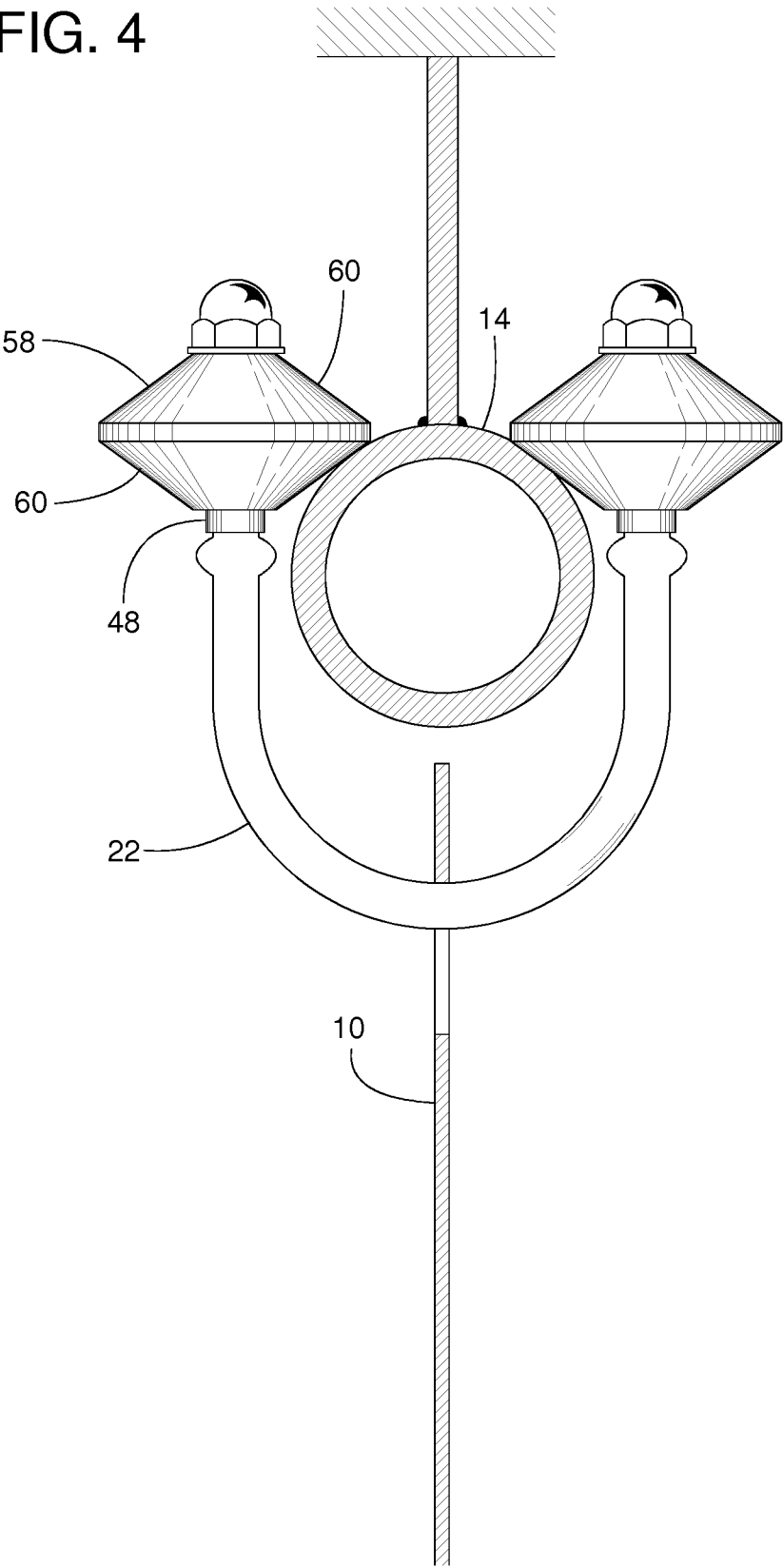


FIG. 4



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FIG. 5

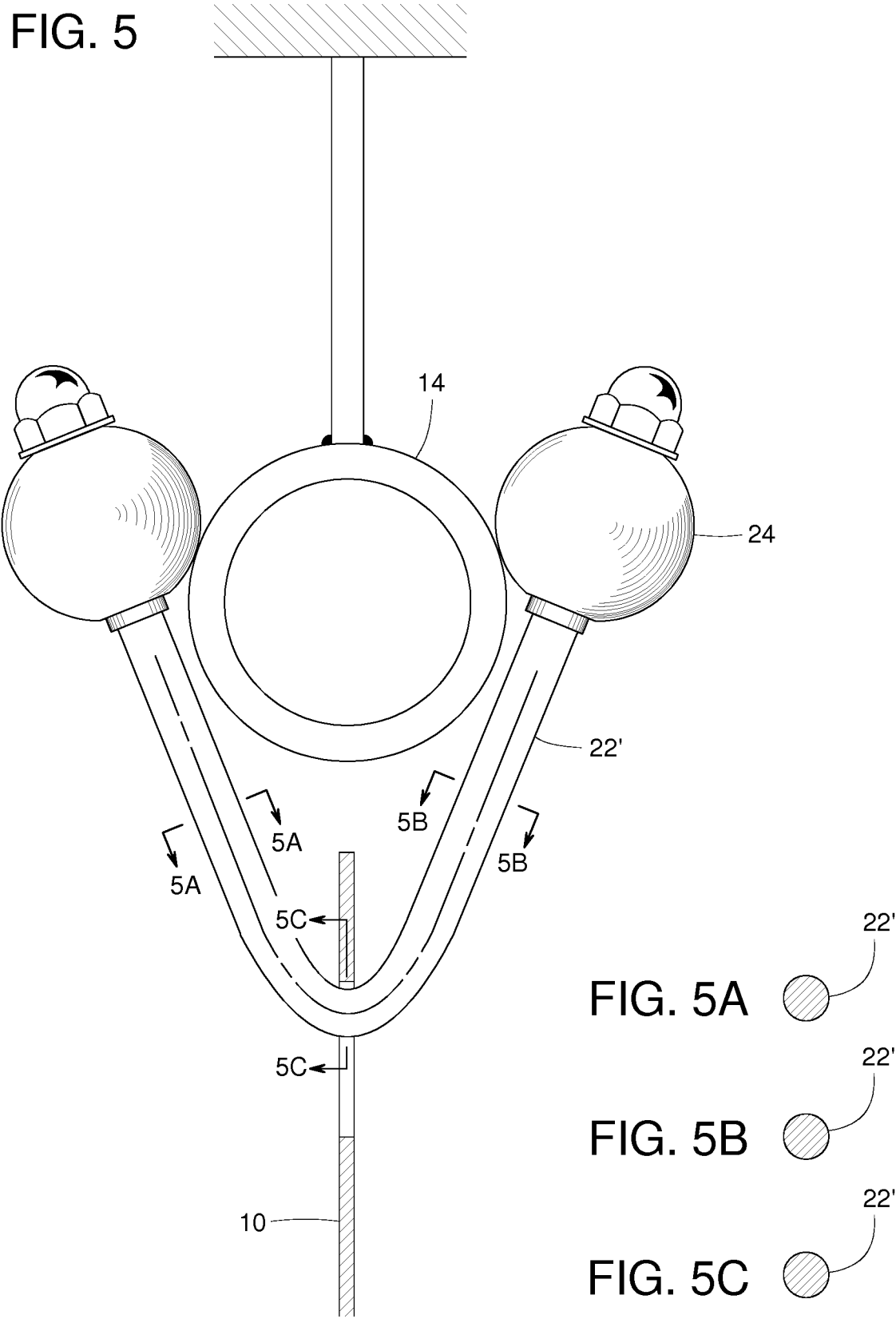


FIG. 6

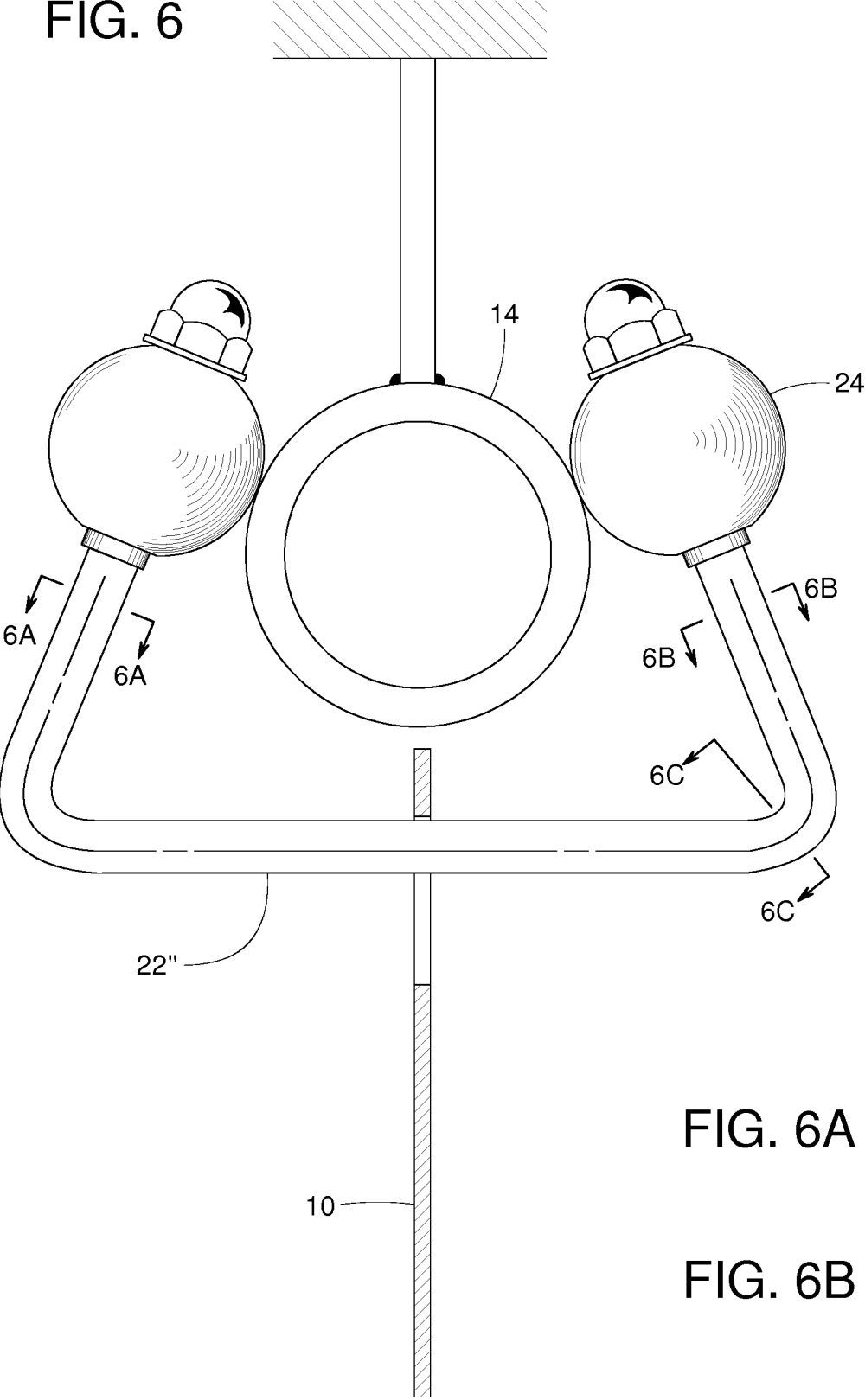


FIG. 7

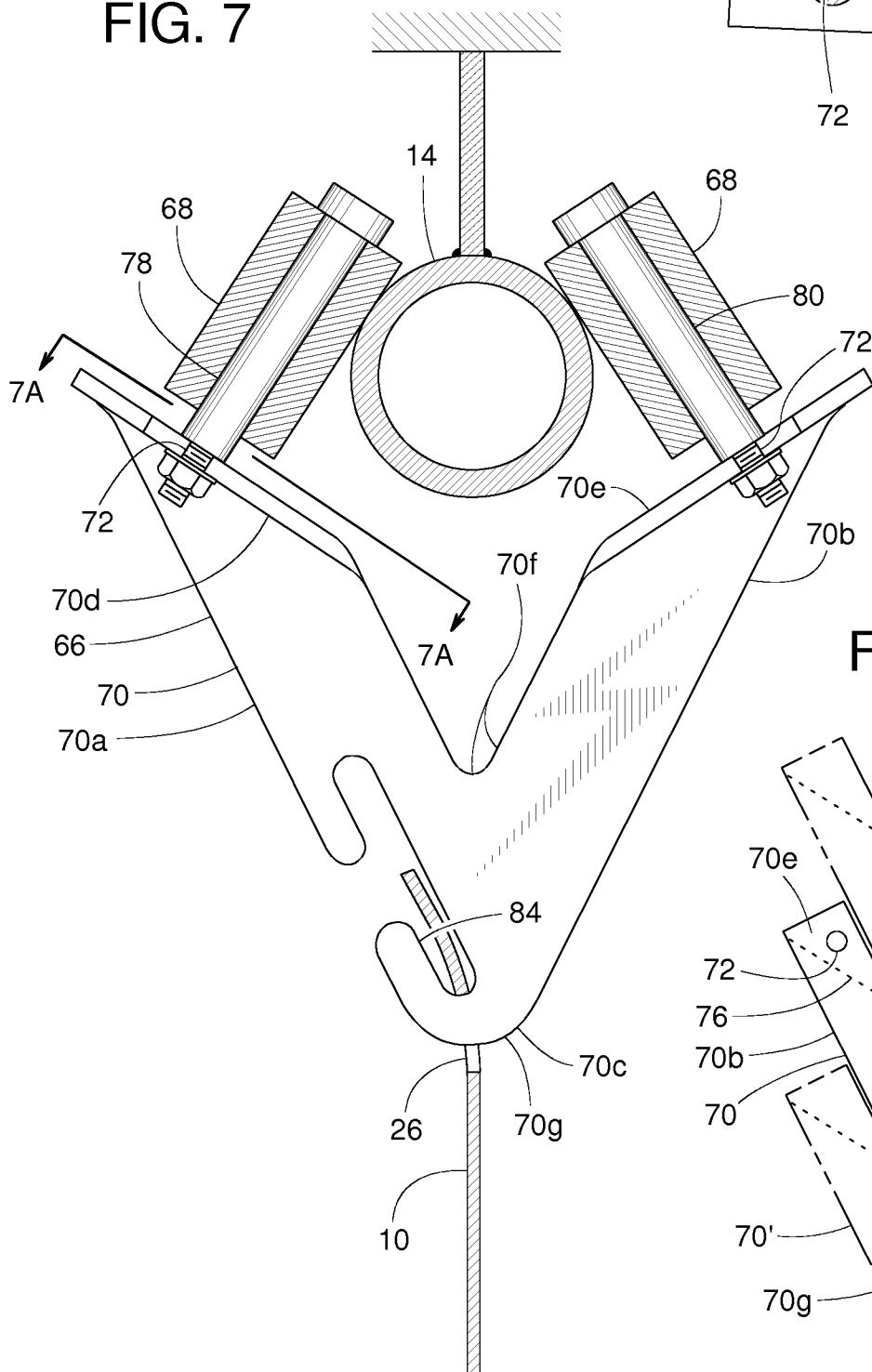


FIG. 7A

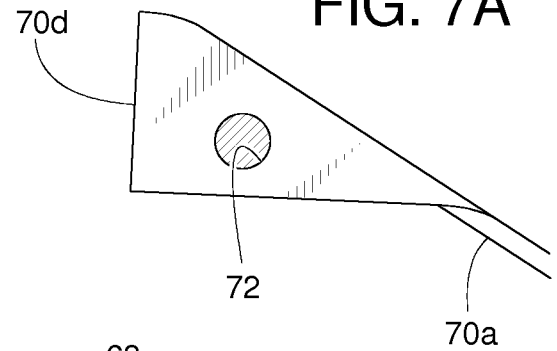


FIG. 7B

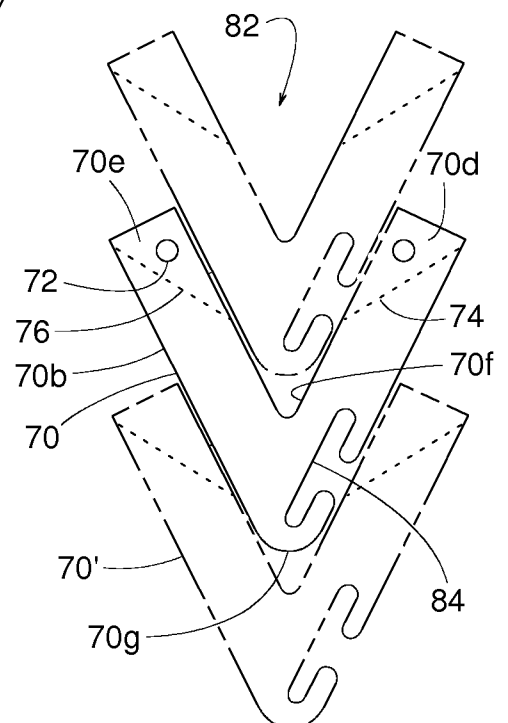


FIG. 8

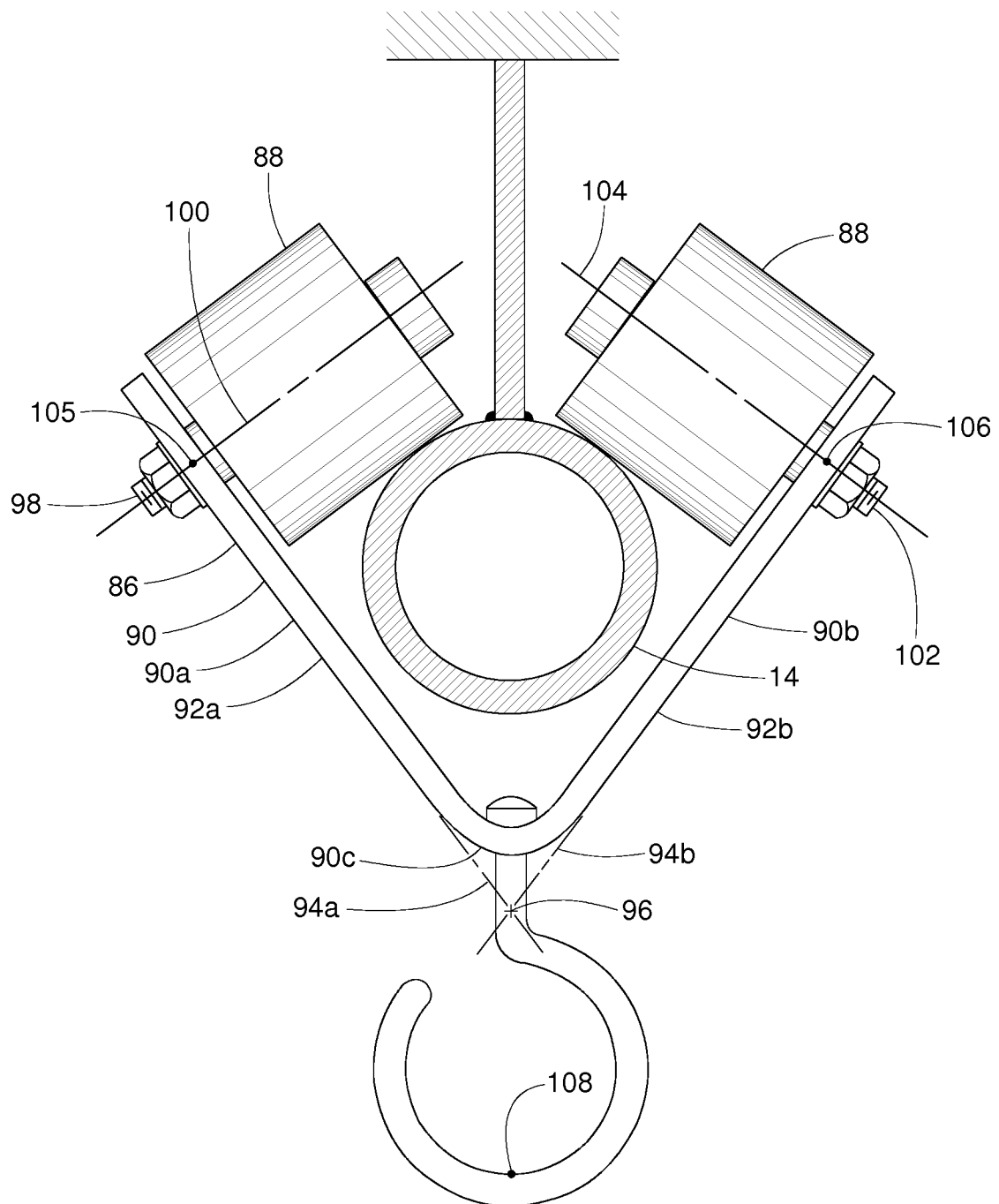
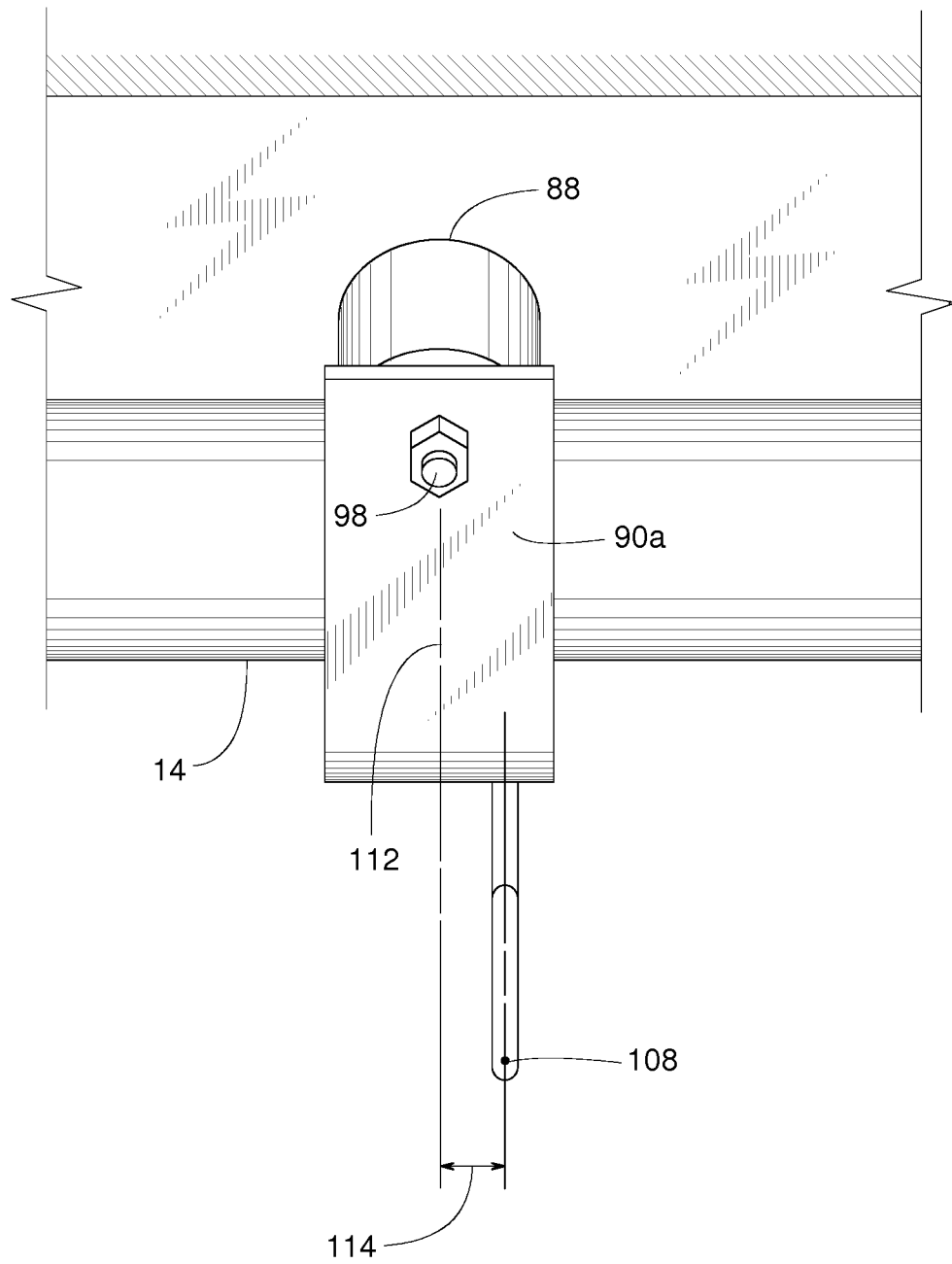


FIG. 9



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FIG. 10

