

June 7, 1955

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2,710,177

BUBBLE CAP ASSEMBLY WITH CHOKE

Filed April 7, 1952

2 Sheets-Sheet 1

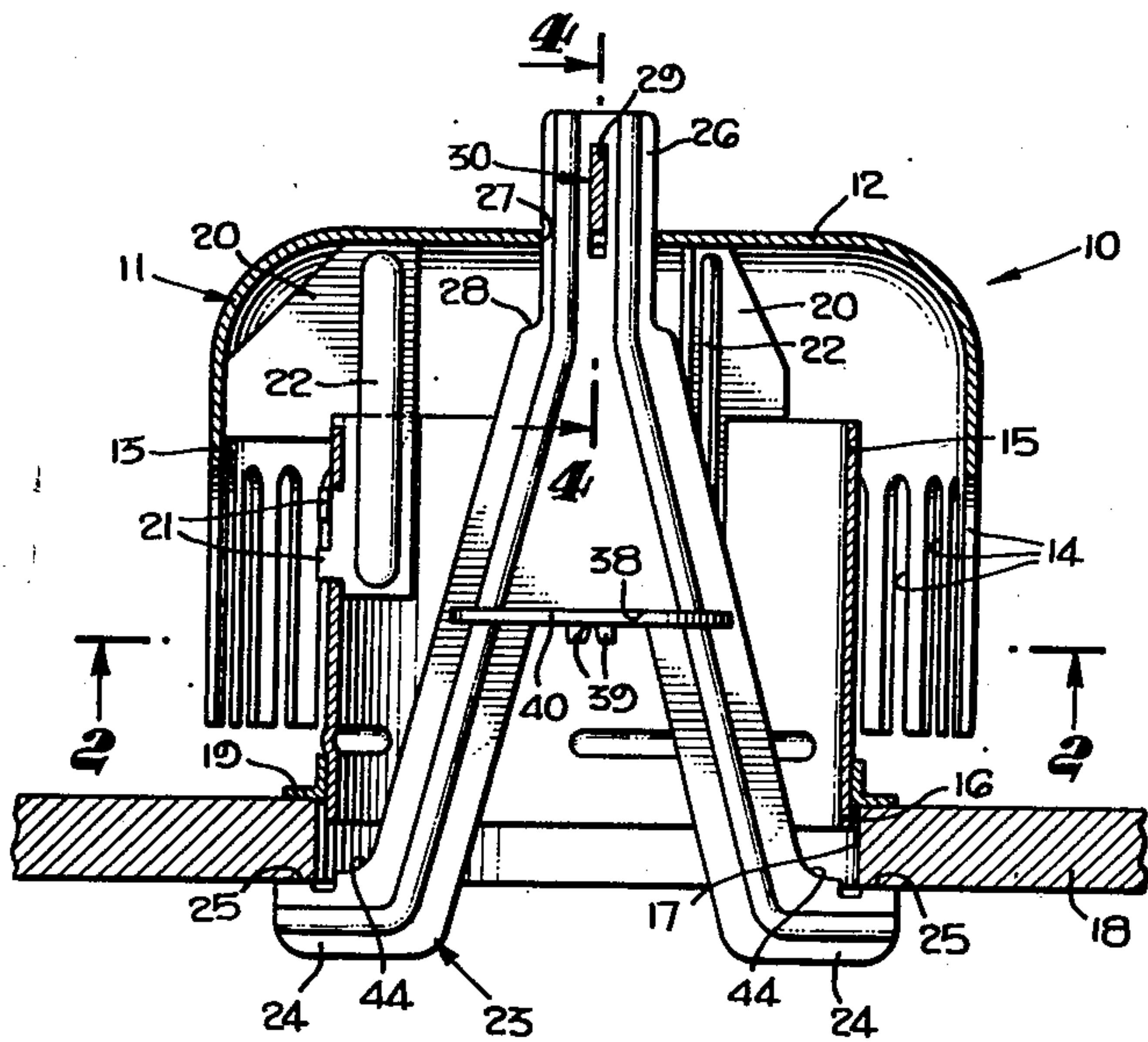


FIG. 1.

FIG. 2.

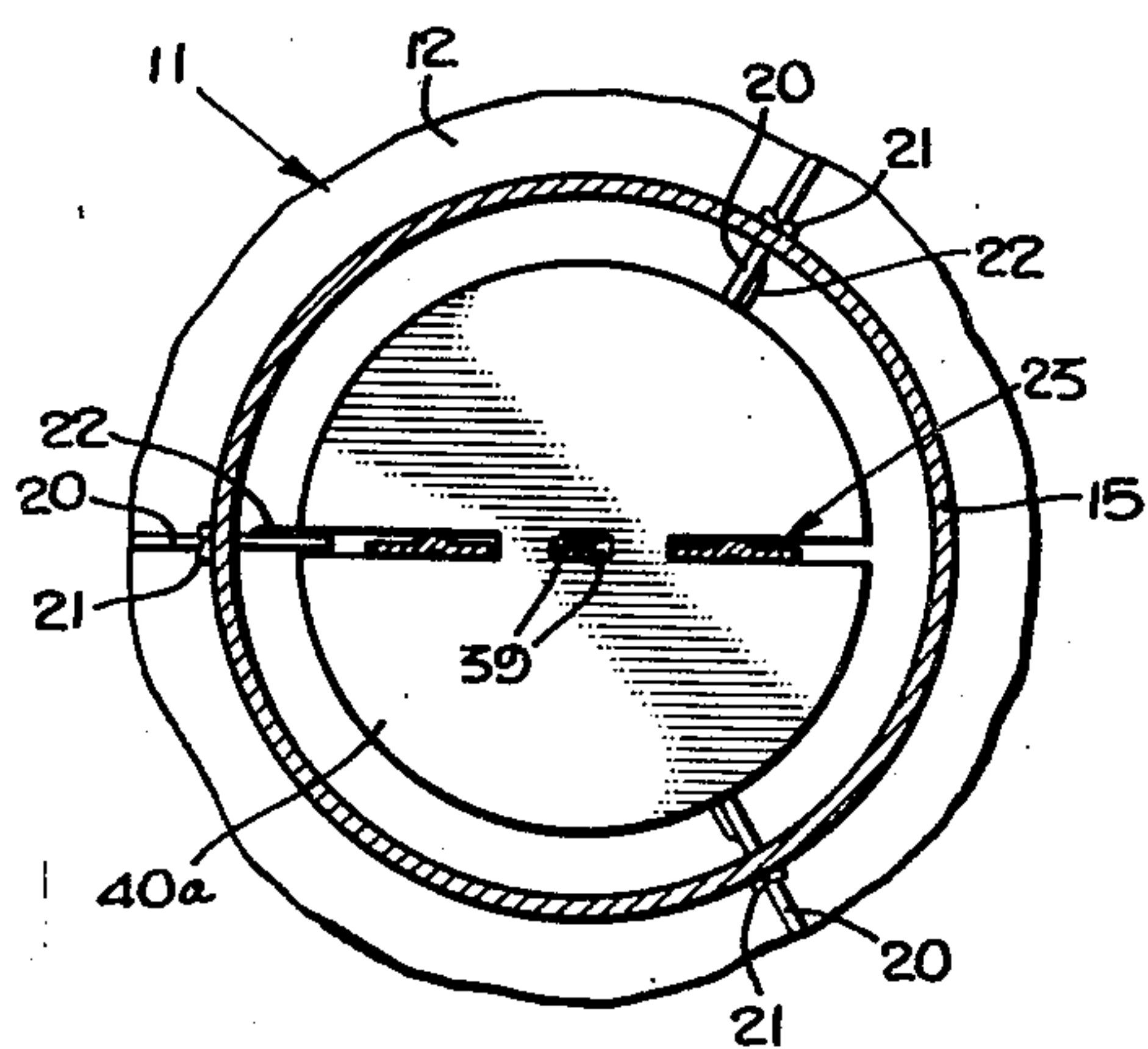
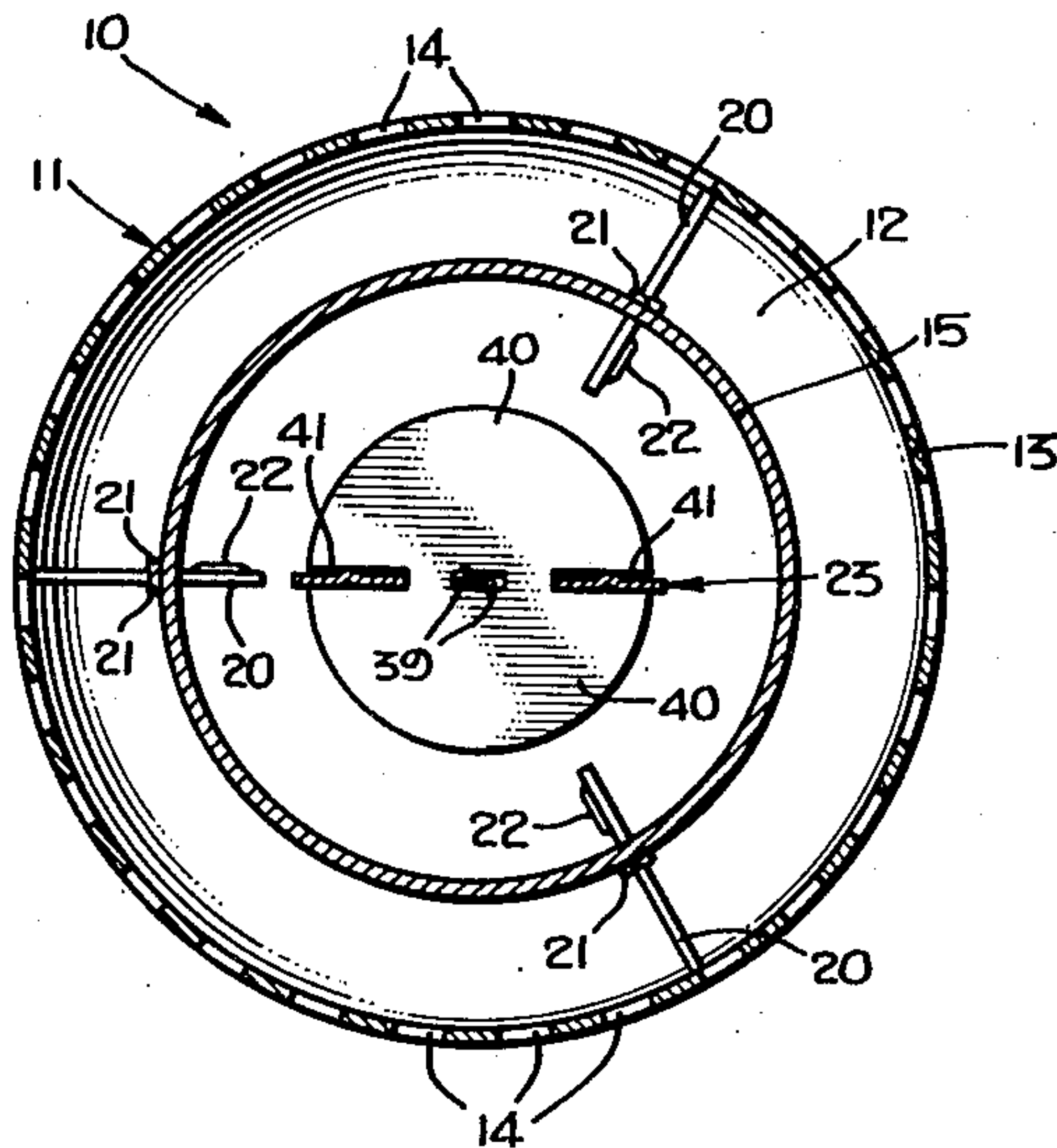


FIG. 7.

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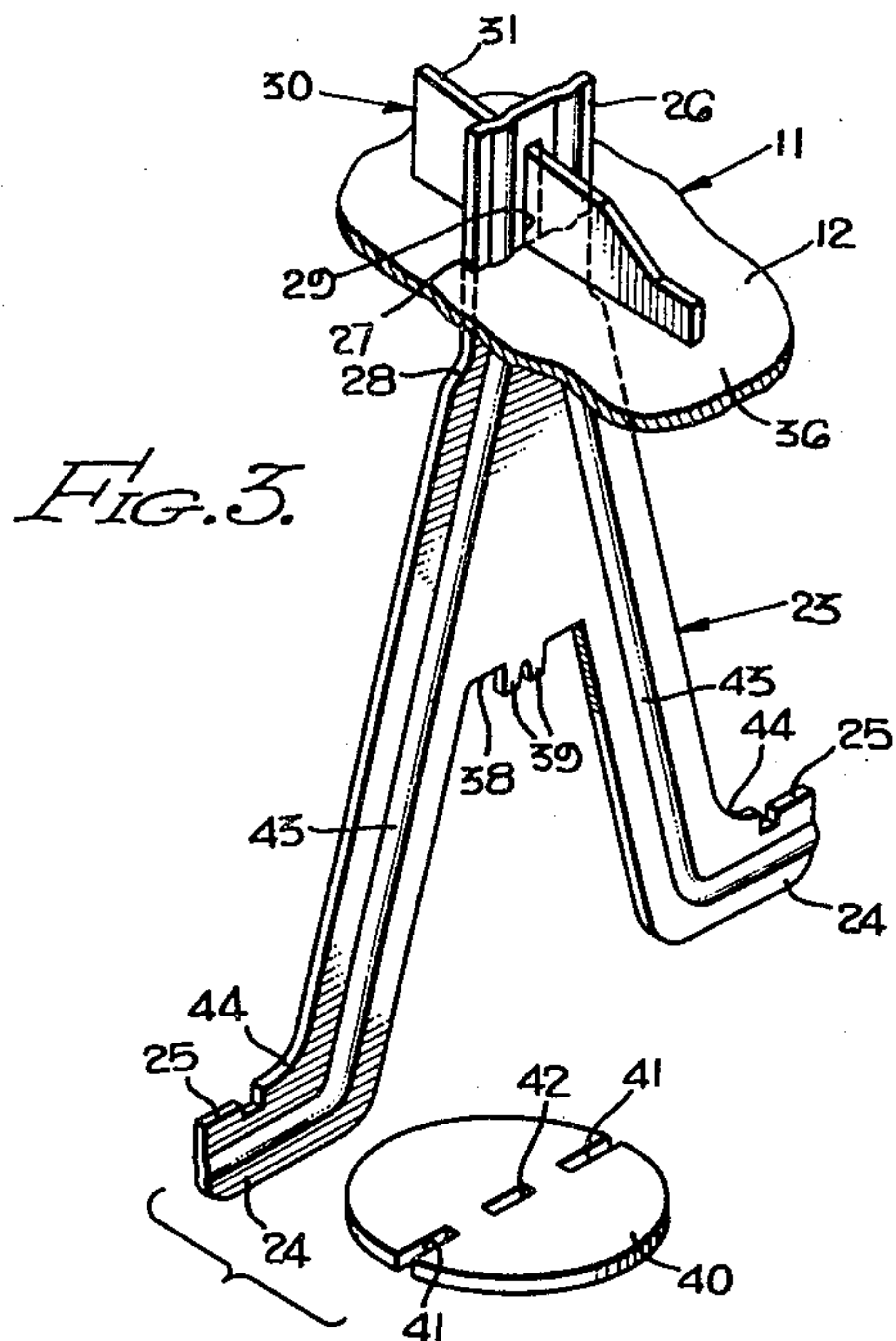


FIG. 3.

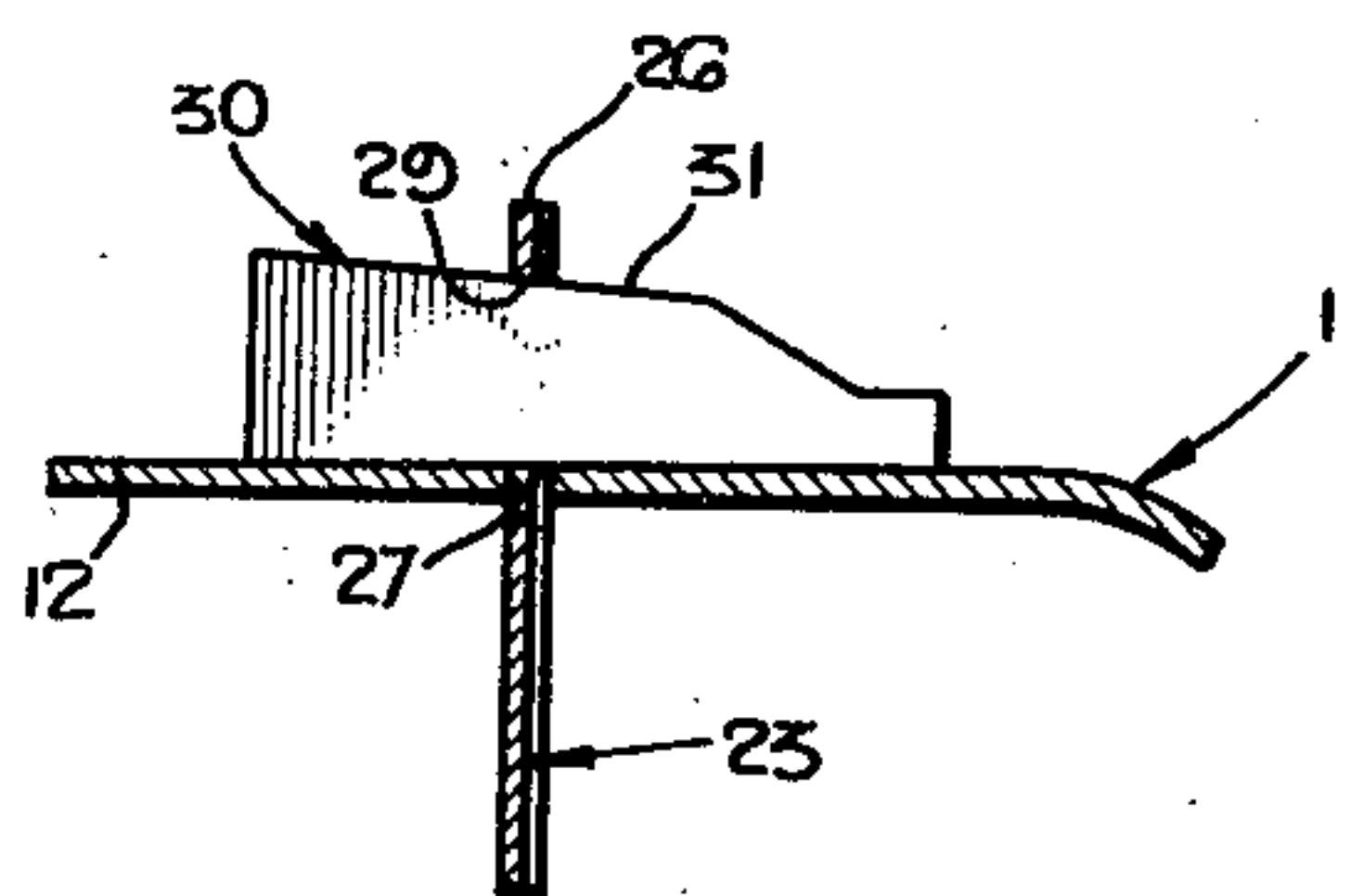


FIG. 4.

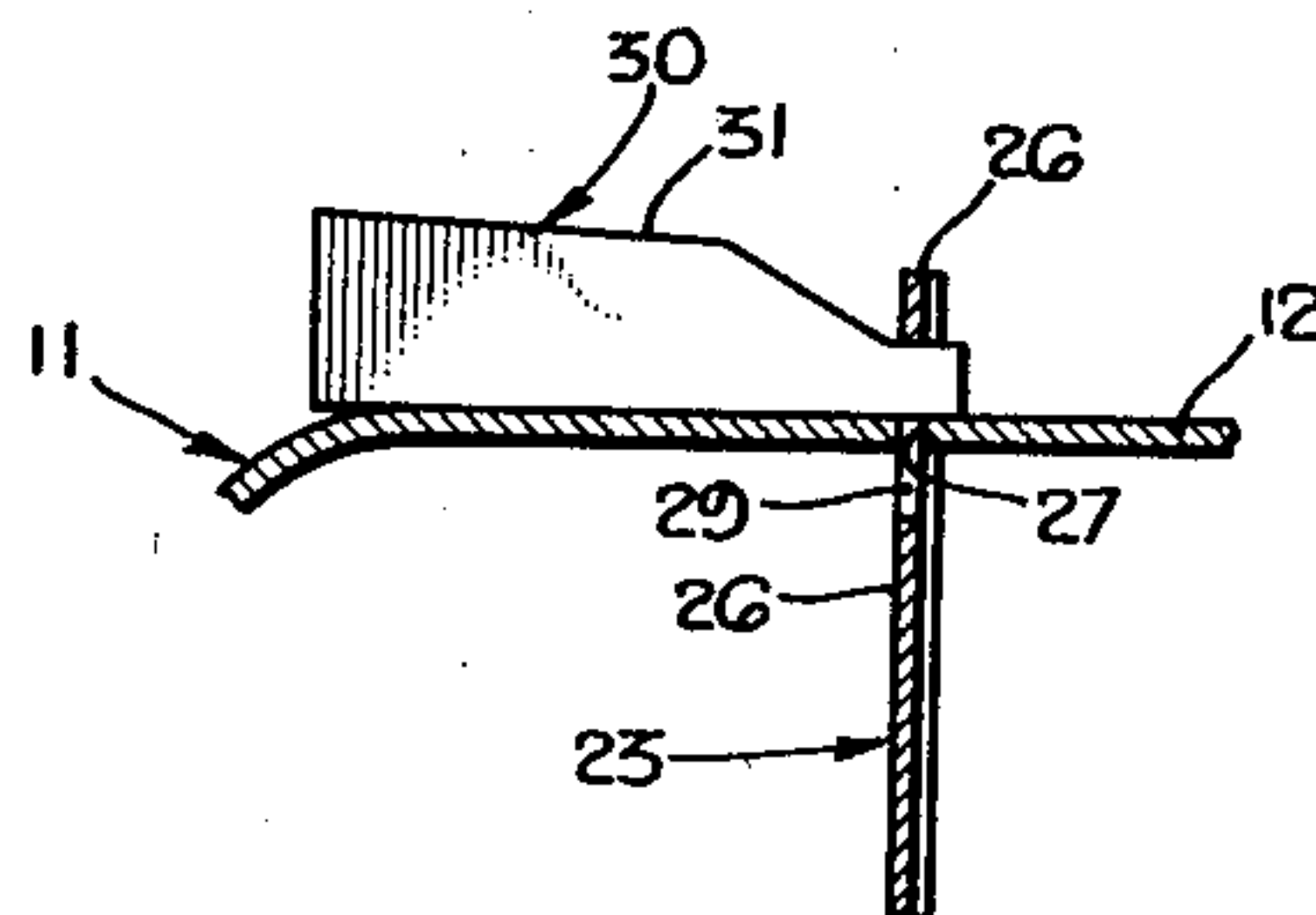


FIG. 5.

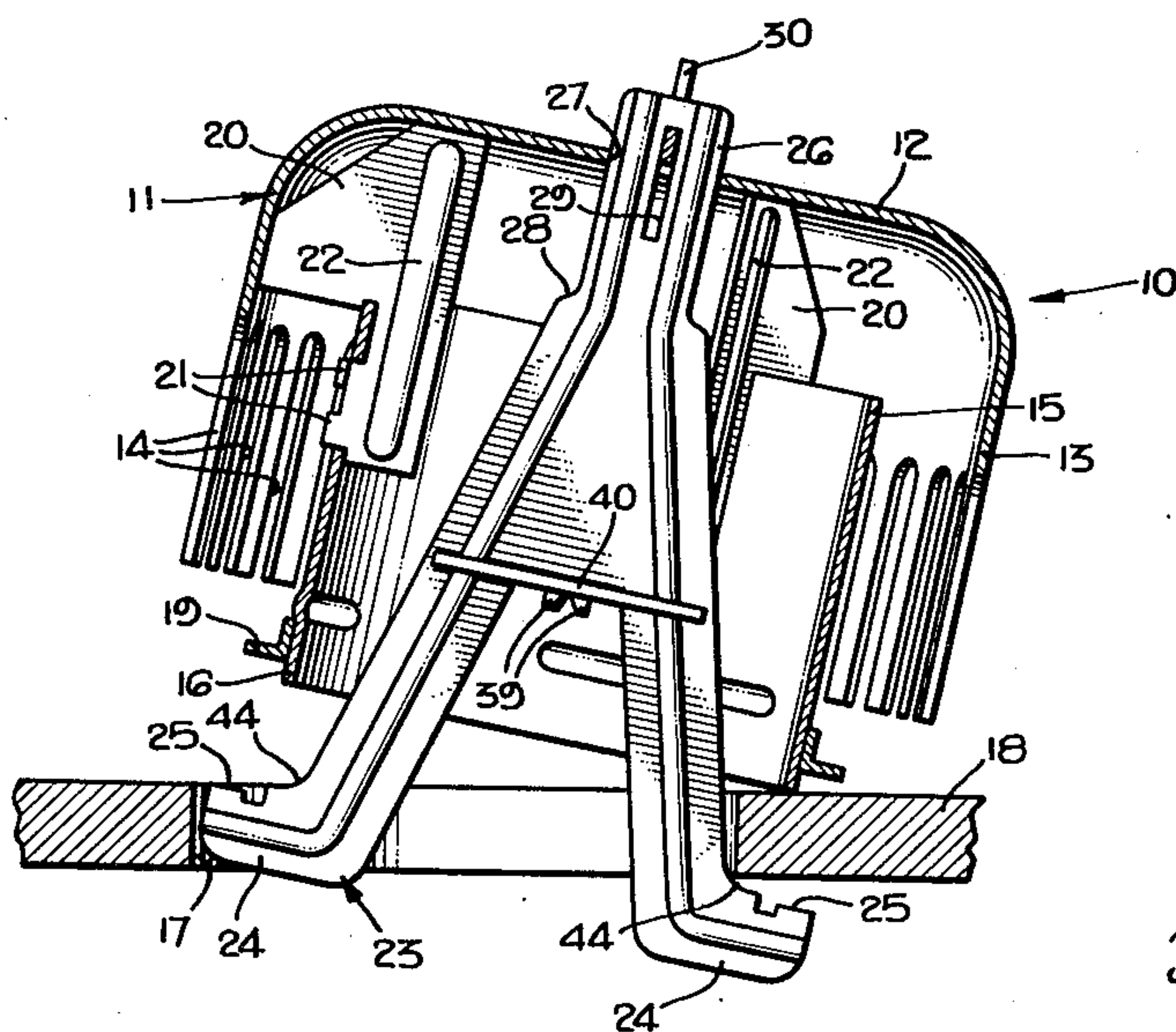


FIG. 6.

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## BUBBLE CAP ASSEMBLY WITH CHOKE

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Application April 7, 1952, Serial No. 281,018

11 Claims. (Cl. 261—114)

This invention relates to bubble cap and riser assemblies of the type employed in liquid-gas contact apparatus commonly used in the processing of hydrocarbons. This invention is particularly directed to an improved form of bubble cap and riser assembly having a flow passage therethrough which may be restricted as desired by means of a novel form of choke.

Bubble cap and riser assemblies are commonly mounted in communication with openings provided on tray plates of liquid-gas contact apparatus. For economy of manufacture and standardization of parts, bubble cap and riser assemblies in any one installation are usually of the same size and design. In conventional installations the number and size of the bubble cap and riser assemblies determines the total passage area for upward flow of gas from the space below a particular tray plate to the space above it. If, for any reason, it should be desired to increase or decrease the total passage area for ascending gas, it is necessary to increase or decrease the number of bubble cap and riser assemblies. This may be difficult to accomplish in an existing installation, because it may require changing of the distribution pattern of the bubble cap and riser assemblies on the tray plate.

In accordance with our invention, we provide a removable choke disk within the central opening of the riser so that the passage area through the riser may be varied as desired. Disks of various diameters may be employed to restrict flow of ascending gas to any degree necessary. Choke disks of this type may be employed in all or part of the bubble cap and riser assemblies on any particular tray plate, and the size of the choke disks may be selected in order to achieve desired characteristics of flow of ascending gas for optimum liquid-gas contact.

Accordingly, it is the principal object of our invention to provide a novel form of bubble cap and riser assembly having an adjustable choke. Another object is to provide a device of this type which may be readily installed and removed from the tray plate of a bubble column by a single operator working on one side of the plate. Another object is to provide a device of this type in which the choke disk is secured to a centrally disposed hold-down yoke. A related object is to provide such a device in which the choke disk does not interfere with ready installation or removal of the bubble cap and riser assembly from one side of the tray plate. A more detailed object is to provide a bubble cap and riser assembly having a hold-down yoke provided with a downward facing shoulder, the hold-down yoke also having means for releasably securing a choke disk in position against said shoulder. Other and related objects and advantages will appear hereinafter.

In the drawings:

Figure 1 is a sectional elevation showing a preferred embodiment of our invention.

Figure 2 is a bottom plan view in section taken substantially on the lines 2—2 shown in Figure 1.

Figure 3 is a perspective view partly broken away showing details of the hold-down yoke, disk choke, and securing wedge.

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Figure 4 is a sectional detail taken substantially on the line 4—4 as shown in Figure 1.

Figure 5 is a view similar to Figure 4 showing the securing wedge in released position.

Figure 6 is a view similar to Figure 1 illustrating the manner of assembly and removal of the bubble cap and riser assembly from the tray plate.

Figure 7 is a view similar to Figure 2 showing a larger choke disk in position.

Referring to the drawings, the bubble cap and riser assembly generally designated 10 includes a cap 11 having a top wall 12 and a skirt 13. The skirt 13 is provided with a plurality of apertures 14 as shown. The assembly 10 also includes a riser 15 which is generally cylindrical in form, and which preferably is provided with lower lip or extension 16 which is received within an opening or aperture 17 in the tray plate 18. The riser 15 may be cut from a length of tubular material or may be rolled from a length of strip stock, as desired. The flange ring 19 is secured to and forms a part of the riser and supports it on the upper surface of the tray plate 18. The flange ring 19 may be attached by press fit, shrink fit, by welding or in any other desirable or preferred manner, or it may be formed as an integral part of the tubular riser 15.

Means are provided for mounting the cap 11 on the riser 15, and as shown in the drawings this means takes the form of supporting clips 20 which may be fastened either to the cap or the riser. As shown, the clips 20 are each provided with tabs 21 which project through apertures provided in the cylindrical riser 15. The tabs 21 are deformed or bent over at opposite directions as shown in Figure 2 to provide a secure attachment for connecting the clips 20 to the riser 15. If desired, each clip 20 may be provided with a stiffening fin or indentation 22. The top wall 12 of the cap 11 rests on the upper ends of the supporting clips 20. The clips 20 extend radially outwardly and engage the cap 11 to center it with respect to the riser 15.

Means are provided for securing the assembly 10 in position on the tray plate 18 in communication with the opening 17. As shown in the drawings, this means includes the hold-down yoke 23 which extends through the interior of the riser 15. The lower end of the yoke 23 is provided with oppositely extending projections 24 and each of these projections has an upwardly facing shoulder 25 which underlies a portion of the tray plate 18. The upper end of the hold-down yoke 23 comprises a stem 26 which is slidably received within an opening 27 located in the center of the wall 12 of the cap 11. Shoulders 28 at the lower end of the stem 26 limit the extent of upward movement of the hold-down yoke 23 with respect to the cap 11 when the assembly is not in position on the tray plate 18.

Vertical slot 29 is provided in the stem 26 for reception of a securing wedge member 30. The wedge member 30 is formed of sheet or strip material and has an upper inclined surface 31.

The hold-down yoke 23 is provided with a downwardly facing shoulder 38 which is located between the level of the feet 24 and the stem 26. Tabs 39 project downward from the central portion of the shoulder 38. A choke disk 40 which is circular in shape is provided with a central opening 42 and radial slots 41 which extend to the outer circumference of the disk. The slots 41 are wide enough to receive the diverging legs of the hold-down yoke 23 including the increased thickness occasioned by the presence of the stiffening fins or indentations 43. The upper surface of the disk 40 engages the downwardly facing shoulder 38 and the tabs 39 project through the opening 42. When the disk 40 is in place the tabs 39 may be bent in opposite directions by means of a screw driver or other suitable tool to secure the disk 40 to the hold-down yoke



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23. When the bubble cap 11, riser 15, holddown yoke 23, wedge member 30 and choke disk 40 are assembled as shown in Figure 1, the choke disk 40 is located substantially midway between the top and bottom of the riser 15 and is concentrically positioned therein. The choke disk 40 is thus firmly secured against tilting or lateral shifting.

The choke disk 40 restricts the passage area through the interior of the riser 15 and the size of the choke disk determines the degree of restriction. Figure 7 shows a choke disk 40a of larger diameter but of the same design and configuration secured on the holddown yoke 23 within the riser 15. The larger choke disk 40a leaves a smaller annular passage area for ascending gas within the riser 15, as will be readily understood.

The choke disk 40 is preferably installed on the holddown yoke 23 before the bubble cap assembly 10 is placed in position on the tray plate 18. The bubble cap assembly 10 may be removed as a unit from the tray plate to facilitate change in size of the choke disk. If the maximum passage area for ascending gas is desired for a particular bubble cap assembly the choke disk 40 is entirely omitted. In such case the passage area through the riser 15 is not restricted by any attachment means for the choke disk, since the resistance caused by the tabs 39 to the flow of ascending gas is negligible. Figures 2 and 7 show that the thicknesses of the yoke 23 and clips 20 are very small and offer a minimum of resistance to flow. The passage area available through the riser 15 therefore varies from substantially unrestricted flow to any desired degree of restriction through the use of choke disks 40 of any desired size.

The presence of the choke disk 40 on the holddown yoke 23 does not interfere with installation and removal of the bubble cap assembly 10 as a unit from the upper side of the tray plate. Figures 5 and 6 show how the unitary installation and removal of the bubble cap assembly 10 may be accomplished by a single workman above the tray plate 18. Each of the lateral projections 24 on the holddown yoke 23 is provided with a clearance radius portion 44 which may engage an edge of the circular opening 17 in the tray plate 18 and permit the opposite projection 24 to swing down into the opening. When both of the projections 24 are located beneath the tray plate 18 the assembly 10 is shifted laterally to allow the lower end 16 of the riser 15 to enter the opening 17. The flange 19 then supports the assembly 10 on the tray plate 18.

During installation of the assembly 10 the wedge member occupies the position shown in Figure 5. The holddown yoke 23 is then at its lowest position with respect to the cap 11. After the lower end 16 of the riser 15 is in place within the opening 17, the stem 26 is raised and the assembly 10 clamped in position by driving the wedge member 30 into the slot 29 to the position shown in Figures 3 and 4.

Having fully described our invention, it is to be understood that we do not wish to be limited to the details herein set forth, but our invention is of the full scope of the appended claims.

We claim:

1. In a bubble cap and riser assembly, the combination of: a riser, a bubble cap encompassing the upper end of the riser, a holddown member extending through the interior of the riser for securing the assembly in position, a choke disk, and means releasably securing said choke disk to the holddown member at a position between the ends of the riser for restricting the passage area through the riser, said choke disk extending laterally of said holddown member at said position.

2. In a bubble cap and riser assembly, the combination of: a riser, a bubble cap encompassing the upper end of the riser, a holddown member extending through the interior of the riser for securing the assembly in position, said member having a downwardly facing shoulder, and a choke disk releasably secured on the holddown mem-

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ber against said shoulder for restricting passage area through the riser.

3. In a bubble cap and riser assembly, the combination of: a riser, a bubble cap encompassing the upper end of the riser, a holddown member extending through the interior of the riser for securing the assembly in position, a choke disk for restricting passage area through the riser, the holddown member having diverging legs and a downwardly facing shoulder, and the choke disk being releasably secured against the shoulder and having slots receiving the diverging legs.

4. In a bubble cap and riser assembly, the combination of: a riser, a bubble cap encompassing the upper end of the riser, a holddown member extending through the interior of the riser for securing the assembly in position, a choke disk for restricting passage area through the riser, the holddown member having diverging legs and a downwardly facing shoulder, securing means on the holddown member projecting downward from the shoulder, and the choke disk having a central opening to receive the securing means and having slots to receive the diverging legs.

5. In a bubble cap and riser assembly, the combination of: a riser, a bubble cap encompassing the upper end of the riser, a holddown member extending through the interior of the riser for securing the assembly in position, the holddown member having a transverse shoulder positioned between the ends of the riser, a choke disk, and releasable means on the holddown member for securing said choke disk to said shoulder for restricting the passage area through the riser.

6. In a bubble cap and riser assembly for an apertured tray plate, the combination of: a riser adapted to rest on a tray plate and communicate with an aperture formed therein, a bubble cap encompassing the upper end of the riser and having a central opening, a holddown yoke extending through the bubble cap opening and having portions shaped to extend through said aperture and engage the underside of the tray plate, the holddown yoke having a downwardly facing shoulder located between the upper and lower ends of the riser, a choke disk releasably secured to said shoulder, and means engaging the upper end of the holddown yoke to draw the yoke upwardly to clamp the assembly to said tray plate.

7. In a bubble cap and riser assembly for an apertured tray plate, the combination of: a riser adapted to rest on a tray plate and communicate with an aperture formed therein, a bubble cap encompassing the upper end of the riser and having a central opening, a holddown yoke having downwardly diverging legs and an upwardly extending stem, the stem extending through the bubble cap opening and projecting above said bubble cap, the holddown yoke having a downwardly facing shoulder located between the upper and lower ends of the riser, a choke disk releasably secured to said shoulder, the lower ends of the legs being shaped to extend through said aperture and engage the underside of the tray plate, and means engaging the stem above the bubble cap to draw the yoke upwardly to clamp the assembly to said tray plate.

8. In a bubble cap and riser assembly for an apertured tray plate, the combination of: a riser adapted to rest on a tray plate and communicate with an aperture formed therein, a bubble cap supported on the riser and having a central opening, a holddown yoke having downwardly diverging legs and an upwardly extending stem, the stem extending through the bubble cap opening and projecting above said bubble cap, the holddown yoke having a downwardly facing shoulder located between the upper and lower ends of the riser, a choke disk releasably secured to said shoulder for restricting passage area through the riser, the lower ends of the legs being shaped to extend through said aperture and engage the underside of the tray plate, and wedge means en-



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gaging the stem above the bubble cap to draw the yoke upwardly to clamp the assembly to said tray plate.

9. A holddown yoke for securing a bubble cap and riser assembly to an apertured tray plate, comprising: an upwardly projecting stem joined integrally with a pair of downwardly diverging legs, the legs each having an outwardly directed projection at the lower end thereof, the yoke having a downwardly facing shoulder located between said diverging legs, a choke element, and releasable means on the yoke adjacent said shoulder whereby said choke element may be secured thereto.

10. A holddown yoke for securing a bubble cap and riser assembly to an apertured tray plate, comprising: an upwardly projecting stem joined integrally with a pair of downwardly extending diverging legs, the legs each having an outwardly directed projection at the lower end thereof, the yoke having a downwardly facing shoulder located between said diverging legs, a choke disk, and releasable means on the yoke adjacent said shoulder for securing said choke disk to said shoulder.

11. A holddown yoke for securing a bubble cap and

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riser assembly to an apertured tray plate, comprising: an upwardly projecting stem joined integrally with a pair of downwardly extending diverging legs, the legs each having an outwardly directed projection at the lower end thereof, the yoke having a downwardly facing shoulder located between said diverging legs, a circular choke disk having slots in its periphery to receive said diverging legs, and cooperating means on the yoke and choke disk for releasably securing the choke disk against said shoulder.

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