

[54] **ECCENTRICALLY LOCKING APPARATUS HOLDER**
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 [58] **Field of Search**..24/81 CC, 243 S, 248 B, 248 E, 24/248 L, 249 LL, 250, 263 B, 263 DL, DIG. 22, 279; 285/365, 407, 409; 138/99

[57] **ABSTRACT**

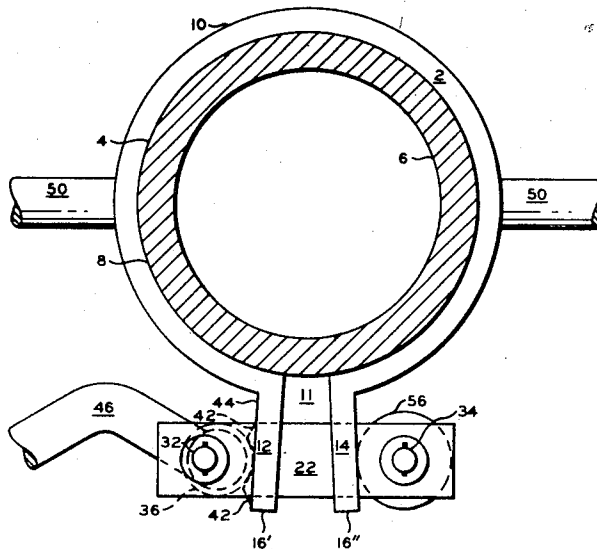
An eccentrically locking apparatus holder for attachment of a body thereof about a pipe, said apparatus having first and second flanges, a cam surface, and a rotatable eccentric bushing for movement of the bushing along the cam surface for urging the flanges toward one another and forcibly clamping the body about the pipe. At least one holding member is fixedly attached to the body for maintaining associated apparatus positioned relative to the pipe.

[56] **References Cited**

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10 Claims, 4 Drawing Figures



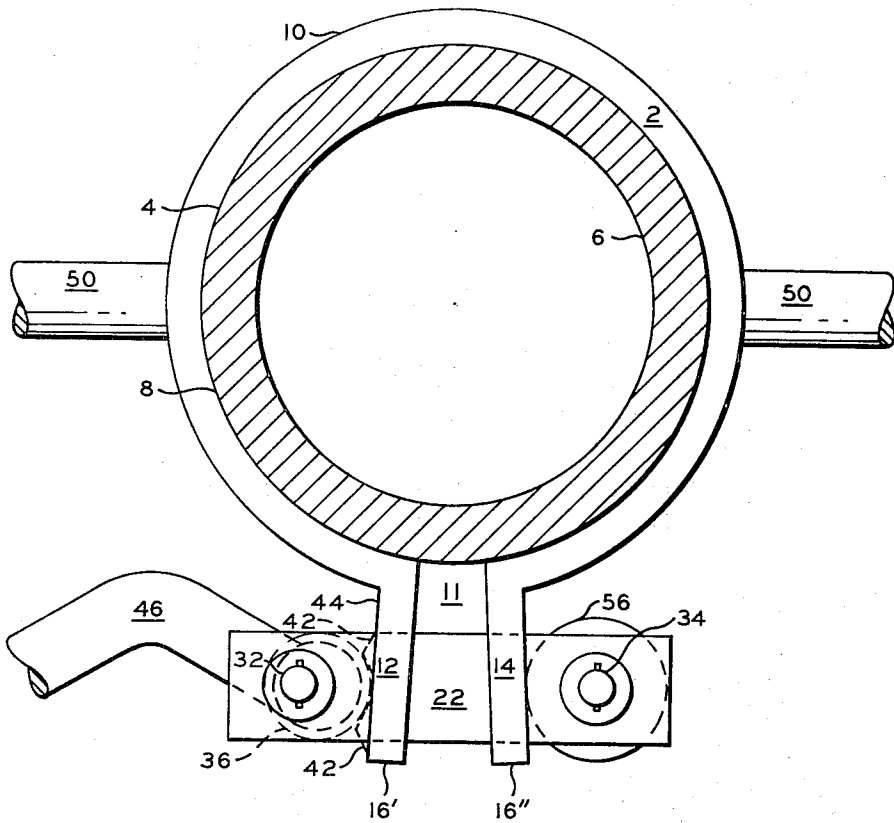


FIG. 1

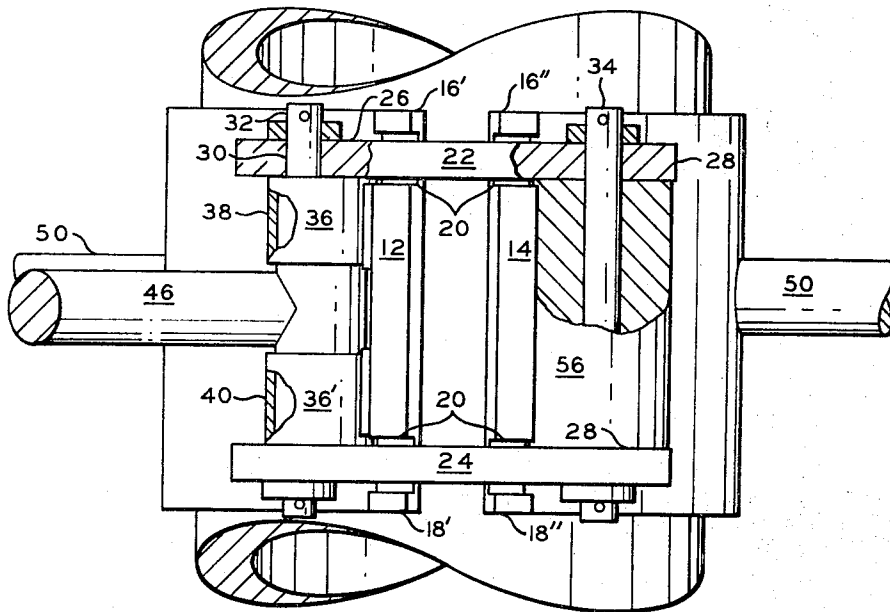


FIG. 2

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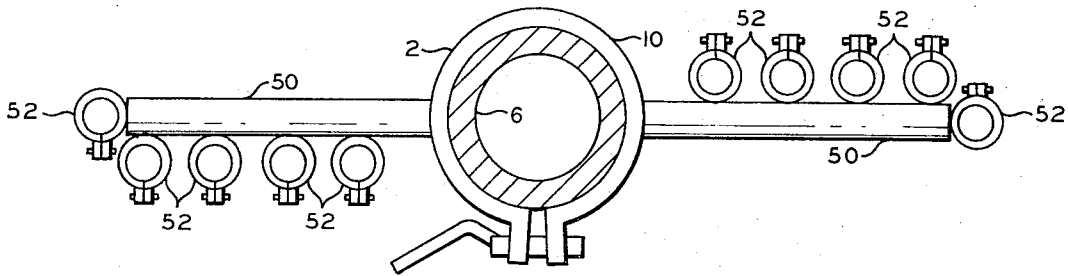


FIG. 3

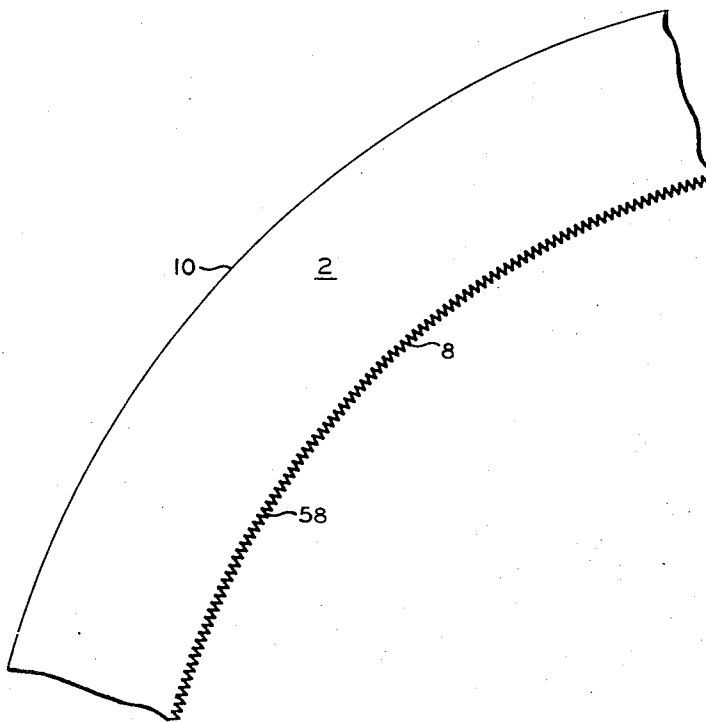


FIG. 4

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ECCENTRICALLY LOCKING APPARATUS HOLDER

It is desirable to provide an eccentrically locking apparatus holder for attaching secondary apparatus to a pipe. It is further desirable to provide an apparatus of the above-described type that is compact, having all portions thereof positioned in near proximity to the pipe, and being of sturdy construction and capable of being closed or locked about the pipe in sufficient securing engagement therewith that said secondary apparatus can be severely impacted without said apparatus holder being displaced along said pipe. One example use where the apparatus of this invention is particularly useful would be for installation about the mud line of an offshore drilling rig form maintaining the multiplicity of kill lines, choke lines, and hydraulic lines in a preselected position relative to said mud line.

The most significant advantages of the holder of this invention are that its unique construction permits quick installation and takedown of the kill, choke, and hydraulic lines and that its construction is such that linear, tangential forces are exerted against the flange portions for urging the body portion in a tighter gripping relationship with the pipe than heretofore utilized arrangements.

Where offshore drilling operations are being erected or dismantled, one relatively average cost per unit time was calculated to be about \$17.00 per minute. The holding members heretofore utilized required about 15 minutes or \$255 each for installation and ten or more holding members were required, thereby representing about \$2,550 for control line tiedown operations. Experimental use of the holder of this invention proved that all of said choke, kill, and hydraulic lines could be installed with a labor expenditure of \$17 for each of the ten or more holding members; i.e., \$170 total for 10 units, as opposed to the heretofore \$2,550 expenditure. The holder of this invention also proved to more efficiently maintain said lines without twisting or slipping along the mud line under the severe impact loading placed on the holder by wave action, the lines, and other apparatus during drilling operations.

Other aspects, objects, and advantages of the present invention become apparent from a study of the disclosure, the appended claims, and the drawing.

The drawings are diagrammatic views of the apparatus of this invention:

FIG. 1 shows a top view of the apparatus installed on a pipe,

FIG. 2 shows a frontal view of the apparatus installed on a pipe,

FIG. 3 shows an example of pipe holders of the apparatus of this invention, and

FIG. 4 shows another embodiment of the body of the apparatus.

Referring to FIG. 1, a body 2 having an axis and a generally circular opening 4 extending therethrough is coaxially installed in an encompassing relationship about a pipe 6, such as a mud line of an offshore drilling well. The body 2 has inner and outer walls 8, 10 with a longitudinal opening 11 extending through the body walls 8, 10 over the length of said body 2. First and second spaced-apart flanges 12, 14 are each positioned on opposed sides of the opening 11.

Referring to FIG. 2, the flanges 12, 14 extend along the length of the body 2. Each flange 12, 14 has a first

and a second end portion 16', 16'', 18', 18'' with each end portion of the flanges 12, 14 having a linkage opening 20 extending therethrough with the linkage openings 20 of the first flange 12 being aligned with the linkage openings 20 of the second flange 14.

First and second linear linkage members 22, 24 are removably positioned through associated linkage openings 20 of the flanges 12, 14. Each linkage member has a longitudinal axis, first and second end portions 26, 28 and a retaining pin opening 30 formed through each end of portion 26, 28 normal to the respective axes of said members 22, 24. In the installed position, the retaining pin openings 30 of the first end portions 26 of the first and second linkage members 22, 24 are aligned relative one to the other as are the openings 30 at the opposed end of portions 28 thereof.

First and second retaining pins 32, 34 are removably mounted through the retaining pin openings 30 at respective first and second end portions 26, 28 of the first and second linkage members 22, 24.

These retaining pins 32, 34 can be secured relative to the linkage members 22, 24 by having the ends thereof threaded and a nut placed on each end thereof. Since, however, the forces exerted longitudinally on the pins is minimal, it is preferred that the pins be secured by a washer and an expansion plug arrangement as shown in FIG. 2. Such a connection will permit more rapid replacement of its associated elements as they become worn and is of sufficiently sturdy construction to secure the pins 32, 34. The dimensions of the retaining pins 32, 34 and the opening 30 should be of close tolerance to provide for uniform distribution of forces on the linkage members 22, 24. At least one eccentric locking element 36, preferably a plurality of locking elements, are associated with the first retaining pin 32. The eccentric locking element 36 can be formed on the locking pin or can be an eccentric bushing or protrusion that is fixedly attached to the first retaining pin 32. In another embodiment, the locking element 36 can be rotatably mounted on the first retaining pin 32. It is preferred however that these be two eccentric locking elements as shown in FIG. 1, with each of said elements being positioned adjacent a separate one of the linkage members 22, 24 and between said members 22, 24.

A cam element 42 is positioned on an outer surface 44 of the first flange 12 adjacent each of the eccentric locking elements 36 for receiving said locking elements 36 during rotation thereof. The surface of the cam 42 is generally of a concave configuration and is in contact with each locking element 36 over an arc greater than about 45° at the locked position of the locking elements. At arcs less than about 45°, the bearing surface of the element 36 is not sufficiently large to maintain the pressures exerted thereon, at the locked position, at values sufficiently low to provide smooth operation while maintaining the apparatus compact and of a construction that will provide a desirable gripping force on the conduit upon which installed.

A handle 46 is fixedly attached to the first retaining pin or locking element 36 for rotating said element along its associated cam element 42 for linearly moving the flanges 12, 14 relative one to the other and changing the diameter of the body opening 4.

In order to prevent accidental unlocking of the apparatus and to form a more compact structure, it is

preferred that the handle 46, in the position where the flanges 12, 14 are urged toward one another, its locking position, is immediately adjacent the outer wall 10 of the body and more preferably in contact therewith. A hook can also be connected to the wall 10 for latching over the handle 46 to further maintain the handle at that position.

At least one apparatus holding member 50 is attached to the body 2 and extends outwardly therefrom. Referring to FIG. 3, a plurality of pipe clamps 52 are attached to the holding member 50 for maintaining kill lines, fill lines, hydraulic lines, etc., for example. These pipe clamps 52 can be of any construction known in the art and can preferably be, for example, of similar construction to the apparatus of this invention to form a quick release quick installation arrangement. It should be understood that there can be a plurality of holding members 50 attached to the body 2 and said holding members can extend outwardly therefrom at a plurality of different angles, spaced-apart locations, etc. The relative positioning of course will be dependent upon the type of apparatus that will be attached thereto and the impacts which will be imparted by said apparatus.

In order to provide for replacement parts in order that the apparatus will continue to function smoothly after long use, it is preferred that a removable retaining pin liner 56 be positioned about the second retaining pin 34 with said liner being sized for contacting a second flange 14 and a pin 34 along substantially the entire lengths thereof between the first and second linkage members 22, 24. So sizing the liner will also provide for a more even distribution of forces being placed on the second flange 14 at the locked position. Liner elements 38, 40, for example, can also be provided for installation over the eccentric locking elements 36, 36'.

In order that large forces can be applied to flanges 12, 14 while substantially completely encompassing the pipe 6 with the body 2, it is preferred that each of the flange surfaces adjacent one another be tapered across the width of the flange, best seen in FIG. 1, in a direction away from the associated flange for providing a space between the flanges 12, 14 that is progressively larger in a direction from the opening of the body 2 outwardly therefrom.

Referring to FIG. 4, when impact is expected to be very severe, a plurality of protrusions 58, such as ridges or teeth, can be formed on the inner wall 8 of the body 2. When the apparatus is in the locked position, the forces exerted against the pipe 6 by the inner wall protrusions 58 will be increased per unit area of contacting surface.

Other modifications and alterations of this invention will become apparent to those skilled in the art from the foregoing discussion and accompanying drawing, and it should be understood that this invention is not to be unduly limited thereto.

What is claimed is:

1. An eccentric locking apparatus holder for attaching secondary apparatus to a pipe, comprising:

a body having an axis, an opening extending coaxially therethrough, inner and outer walls, a longitudinal opening extending through the body walls over the length of said body, and first and second spaced-apart flanges each having first and second

end portions and each being positioned on an opposed side of the opening and extending along the length of the body, each end portion of the flanges having a linkage opening extending therethrough with the linkage openings of the first flange being aligned with the linkage openings of the second flange;

first and second linkage members each having first and second end portions, a retaining pin opening formed through each end portion and being removably positioned through associated linkage openings of the flanges;

first and second retaining pins each being mounted through the retaining pin openings of their respective portion of the linkage members;

at least one eccentric locking element positioned on the first retaining pin at a location between the first portions of the first and second linkage members;

a cam element positioned on an outer surface of the first flange adjacent each of the eccentric locking elements for receiving said locking element;

a handle connected to the eccentric locking element for rotating said element, moving said element along the cam element, linearly moving the flanges relative one to the other, and changing the diameter of the body opening in response thereto; and

at least one apparatus holding member being attached to the body and extending outwardly therefrom.

2. An apparatus, as set forth in claim 1, including a removable retaining pin liner positioned about the second retaining pin in contact with the second flange and the pin along substantially the entire length between the first and second linkage members.

3. An apparatus, as set forth in claim 1, wherein the cam element has a surface of a configuration for receiving the associated locking element and being in contact with the eccentric locking bushing over an arc greater than about 45° in said received position.

4. An apparatus, as set forth in claim 1, wherein the inner wall of the body has protrusions formed thereon.

5. An apparatus, as set forth in claim 1, wherein the handle, in the position wherein the flanges are urged toward one another, is immediately adjacent the outer wall of the body.

6. An apparatus, as set forth in claim 1, wherein each of the flange surfaces that are adjacent one another are tapered across the width of the flange in a direction away from the associated flange for providing a space between the flanges that is progressively larger in a direction from the opening of the body outwardly therefrom.

7. An apparatus, as set forth in claim 1, wherein the holding member has a plurality of clamps attached thereto for maintaining a plurality of second conduits positioned relative to the eccentric locking apparatus holder and its associated pipe.

8. An apparatus, as set forth in claim 1, wherein there are two eccentric locking elements with associated cam elements each positioned adjacent one of the linkage members.

9. An apparatus, as set forth in claim 8, wherein the handle is positioned between said locking elements.

10. An apparatus, as set forth in claim 1, including a removable liner positioned about each of the eccentric locking elements.

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