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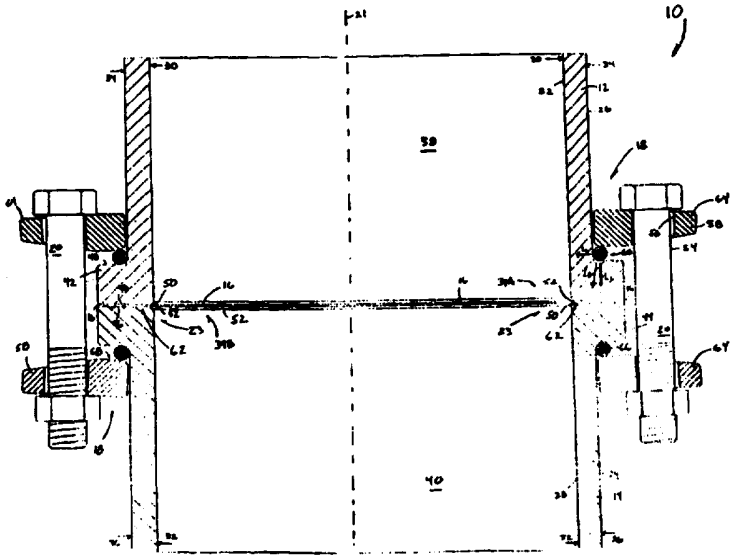

(57) Abstract

A joint assembly (10) for a pipe (12) and a backing mechanism (18) therefor. The joint assembly (10) provides for sealing a pipe (12), the pipe (12) having an elongate axis (21), an inside surface, an outside surface (26) and a flange (42) disposed at one end thereof, the flange(42) having a front surface (46) facing away from the pipe (12), a back surface (48) and an inner periphery (50) defining an outlet of the pipe (12). Sealing material (16) is disposed adjacent the front surface (46) and the inner periphery (50) of the flange (42). A backing member (58) is adapted to engage the flange (42) and to apply a compressive load from the back surface (48) of the flange (42) toward the sealing material (16) adjacent the front surface (46) and the inner periphery (50) of the flange (42) so as to seat the sealing material (16) along the inner periphery (50). Seating is against a surface of a cooperating joint member (14) adjacent the front surface (46) of the flange (42).

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JOINT ASSEMBLY AND BACKING MECHANISM THEREFOR

Background

This invention relates to joint assemblies and backing mechanisms therefor, particularly to joint assemblies employing backing mechanisms in joints formed by a gasket disposed adjacent a flange of a pipe section, the backing mechanism providing for maintaining a seal along the inner periphery of the flange.

In pulp and paper mills, chemical plants, integrated circuit fabrication installations and other industrial facilities, pipe systems generally are employed to convey fluids and fluid-like mixtures. These pipe systems typically include joint assemblies that use pipe sections having flanges disposed at the ends thereof, thereby providing for assembling the sections at joints. The joint assemblies also typically use gaskets or other sealing materials adjacent the flanges so as to form seals in the joints, the seals containing the fluids or fluid-like mixtures within the pipe system.

As is commonly understood in the art, a seal is formed by properly seating the gasket in the joint. Seating of the gasket is generally effected by applying a load to the joint so as to compress the gasket against the flange sufficiently to withstand the pressure of the conveyed fluid or fluid-like mixture. In some conventional joint assemblies, a gasket is seated using a backing ring dimensioned to fit about a flange. The backing ring is drawn against the flange so as, in turn, to draw the flange against the gasket. To do so, conventional backing rings generally employ bolts inserted through apertures in the ring, the apertures being disposed at locations displaced laterally from the inside periphery of the joint. Thence, by tightening the bolts, a laterally-displaced load is applied to the backing ring and a compressive load is applied by the backing ring to the joint.

These conventional joint assemblies, however, are subject to significant problems, particularly as to proper seating of the gasket along the joint's inside periphery. Proper seating can be impeded in such assemblies whenever the effective load along the inside periphery of the joint is diminished relative to the load applied to the joint by the backing ring. A diminished effective load can be attributed to load losses associated with deformation of the flange remote from the joint's inside periphery, as well as to reactive loads applied adjacent that periphery but in direction opposite to the compressive load, each illustrated by arrows in

Figure 1. Load losses and reactive loads, in turn, can be attributed to the laterally-displaced load applied to the backing ring. In particular, once the backing ring is drawn in contact with the flange, the laterally-displaced load causes the backing ring to pivot against the outside edge of the flange, so as to engage the flange and apply the load only along that outside edge. As a result, the flange deforms adjacent that outside edge, generally consuming some portion of the applied load. An additional result is the production of a bending moment along the flange, whereby the load applied along the outside edge produces a reactive load directed away from the gasket adjacent the inside periphery of the joint. Indeed, under high loading, the flange may bow sufficiently to pull away from the gasket adjacent the joint's inside periphery.

When the effective loading is inadequate to seat the gasket properly, the fluids and fluid-like materials conveyed through the pipe system may pass into the joint between the flange and the gasket. In that event, those materials can leak from the joint into the environment. Any such leakage is highly undesirable both as being broadly antithetical to proper performance of a joint assembly, and also as a potential violation of laws regulating environmental releases, particularly where the leaked materials are deemed hazardous.

In addition to leakage, another problem associated with inadequate loading can be the trapping in the joint of the fluids and fluid-like mixtures that pass into the joint. Trapped materials, for example, may accelerate the degradation of the joint, causing premature failure. Trapped materials may also frustrate manufacturing efforts. For example, in the fabrication of integrated circuits, high cleanliness and purity standards must be maintained in order to maintain satisfactory production yields. Nevertheless, relatively contaminated materials generally are used during preparation pressure testing of the pipe system; in particular, test water is used to test the integrity of pipe systems at pressures elevated relative to operating pressures. Once the pipe system is put in operation, an anomalous disturbance in the pipe system, e.g., a pressure transient such as water hammer, can cause test water trapped in the system's joints to be released, such release having the potential to substantially depress yields.

Conventional joint assemblies have not heretofore fully recognized or adequately overcome the above problems. Rogers U.S. Patent No. 3,387,867, for example, proposes a joint assembly that employs a backing ring having an annular bead, together with a gasket having an annular seal-portion of substantially circular cross-section, the bead and seal-portion

forming a line interposed between the common outside diameter of the pipe sections and the outside periphery of a flange. Rogers proposes that a compressive load can be applied through the bead along the above-described line when the backing ring is tightened, so as to compress the seal-portion against a flange while the bending moment exerted on the flange is reduced or eliminated. However, even if that object is accomplished, Rogers is limited to joints having seals displaced laterally from the inner periphery of the respective flange. That is, Rogers fails to address or overcome the problem of directing and maintaining compressive loading adequate to seat properly a gasket or other sealing material along the inner periphery of the flange.

Accordingly, there is a need for an improved joint assembly that fully addresses and adequately overcomes the above problems of conventional joint assemblies which employ a backing ring and gasket. There is also a need for an improved backing mechanism for use in such joint assemblies.

Summary

The present invention fulfills the aforementioned need for an improved joint assembly overcomes the shortcomings of conventional joint assemblies and has advantages not heretofore available in such joint assemblies, by providing a joint assembly employing a backing mechanism in joints formed by a gasket disposed adjacent a flange of a pipe section, the backing mechanism providing for maintaining a seal along the inner periphery of the flange. The present invention also fulfills the need for an improved backing mechanism for use in such joint assemblies by providing a backing mechanism that can so maintain a seal adjacent along the inner periphery of a flange in a joint assembly.

In the joint assembly, a flange is disposed at the end of a pipe section, sealing material is disposed adjacent a joint surface of the flange, and a backing mechanism engages the flange, the backing mechanism receiving a compressive load and directing that load so as to maintain the seating of the sealing material adjacent and along the inside periphery of a joint portion formed by the flange and the sealing material.

The inside periphery of the joint portion is disposed substantially adjacent and along the inner periphery of the joint surface of the flange, which in turn is disposed laterally from the outside surface of the pipe section towards the central axis of the joint. In one preferred

embodiment, the backing mechanism comprises a backing member that receives the compressive load and a directing mechanism engaging the backing ring so as to selectively direct the compressive load toward the inside periphery of the joint portion. The directing mechanism can have various embodiments, including: (i) a rounded surface, the rounded surface having selected curvature or curvatures, and being provided in one case by a collar having a rounded cross-section, the collar disposed between the backing member and a load surface of the flange; and, in another case, by the load surface of the flange, for instance, by a beaded portion thereon; (ii) a beveled washer, such as a spring washer, the washer being disposed between the backing member and the load surface of the flange; (iii) a canted surface, the canted surface being disposed at a selected angle relative to the central axis of the joint assembly, and being provided, in one case, by a collar having a substantially triangular cross-section and which is disposed between the backing member and the load surface of the flange and, in another case, by the load surface of the flange; or (iv) a combination of the above. The backing member preferably has a substantially planar surface, a rounded surface or a rounded bead by which the backing member engages the directing mechanism.

In a preferred embodiment, the backing mechanism comprises a backing member having a top face, a bottom face, an inside face and an outside face, the backing member receiving a compressive load along the top face and directing the compressive load to the joint from the bottom face, the bottom and inside faces meeting in a radiused portion adjacent the load surface of the flange and the outside surface of the pipe section, and the bottom face having a beveled portion extending from the radius portion toward the outside face of the backing member, the beveled portion having a predetermined bevel angle. In this embodiment, the beveled portion is drawn to within a predetermined clearance of the load surface of the flange by application to the backing member of a compressive load having a predetermined value, thereby optimizing the application of the compressive load to the joint by minimizing or eliminating deformation of the flange and reactive loading of the joint.

Accordingly, it is a principle object of the present invention to provide a novel and improved joint assembly.

It is another principle object of the present invention to provide a novel and improved backing mechanism.

It is a further object of the present invention to provide a backing mechanism for use in a joint assembly employing a gasket, wherein the backing mechanism provides for maintaining a seal disposed laterally from the outside surface of a pipe section toward the central axis of the joint.

It is yet another object of the present invention to provide a backing mechanism that receives compressive loading and selectively directs that loading toward the inside periphery of a joint, across a broad loading range.

It is yet a further object of the present invention to provide a backing mechanism that maintains a compressive load adjacent and along the inside periphery of a joint by substantially precluding application of reactive loads adjacent and opposite to the loading along that periphery.

It is yet another object of the present invention to provide a joint assembly that optimizes the application of compressive loading adjacent and along the inside periphery of the joint, the periphery being substantially adjacent the inside surface of a pipe.

The foregoing and other objects, features and advantages of the invention will be more readily understood upon consideration of the following detailed description of the invention, taken in conjunction with the accompanying drawings.

Brief Description of the Drawings

Figure 1 is a cross-sectional view of a conventional joint assembly employing a standard backing ring.

Figure 2 is a cross-sectional view of a preferred embodiment of a joint assembly employing a backing mechanism according to the present invention.

Figure 3 is a cross-sectional view of another preferred embodiment of a joint assembly employing a backing mechanism according to the present invention.

Figure 4 is a cross-sectional view of another preferred embodiment of a joint assembly employing a backing mechanism according to the present invention.

Figure 5 is a cross-sectional view of another preferred embodiment of a joint assembly employing a backing mechanism according to the present invention.

Figure 6 is a cross-sectional view of another preferred embodiment of a joint assembly employing a backing mechanism according to the present invention.

Detailed Description

Referring to Figures 2-6, various embodiments of a joint assembly 10 according to the present invention include a first pipe section 12, a second pipe section 14, sealing material 16, backing mechanisms 18 and fasteners 20. The joint assembly 10 also has a central axis 21. Generally, the joint assembly 10 forms a joint 23 by connecting the first pipe section 12 and the second pipe section 14, with the sealing material 16 disposed therebetween, and applying a compressive load, designated by the legend L_R in Figure 2, to the joint 23 using the backing mechanisms 18 and the fasteners 20 so as to seat the sealing material 16 in the joint 23.

The first and second pipe sections 12 and 14 have respective side surfaces 22 and 24 and outside surfaces 26 and 28. The inside and outside surfaces 22, 24, 26 and 28 typically are annular, in which case they are characterized by respective inside diameters 30 and 32 and outside diameters 34 and 36. It is to be recognized, however, that the surfaces of the pipe sections 12 and 14 may be other than annular and, even if annular, may have inside diameters 30 and 32 that are not equal and outside diameters 34 and 36 that are not equal, all without departing from the principles of the invention. In any case, the inside surfaces 24 and 26 of the pipe sections 12 and 14 define passageways 38 and 40 in those sections for conveying fluid and fluid-like mixtures therethrough.

The first and second pipe sections 12 and 14 have respective flanges 42 and 44 disposed at the adjacent ends thereof, the flanges 42 and 44 extending radially from the central axis 21 of the joint assembly 10. Each flange 42 and 44 preferably defines respective outlets 39A and 39B of the respective pipe sections 12 and 14. Each flange 42 and 44 preferably is integral with and extends continuously and fully around of the respective pipe section 12 and 14. However, it is to be recognized that either flange 42 or 44, or both, may be other than integral and may not so extend, without departing from the principles of the invention.

Each flange 42 and 44 has a joint surface 46 and a load surface 48. Each joint surface 46 has an inner periphery 50 disposed laterally from the outside surface 26 or 28 of the respective pipe section 12 or 14 toward the central axis 21 of the joint assembly 10. Each load surface 48 of the flanges 42 and 44 generally is substantially perpendicular to the central axis 21 of the joint assembly 10. However, as described hereinafter, the load surface 48 may be canted at a selected angle relative to the central axis 21 of the joint assembly 10. Moreover,

the load surface 48 may have selected curvature or curvatures, including being convex or concave.

In the joint assembly 10, the sealing material 16 is disposed adjacent the joint surface 46 of the flanges 42 and 44. The sealing material 16, typically a gasket, may be any of a variety of materials, and may take a variety of forms, without departing from the principles of the invention. Preferably, the sealing material 16 has an inner periphery 52 that is dimensioned to coincide substantially with the inner periphery 50 of the joint surface 46 of the flanges 42 and 44. Where the pipe sections 12 and 14 and the flanges 42 and 44 are annular, the sealing material 52 preferably also is annular. It is to be recognized, however, that the sealing material may have other shapes and may have other dimensions, without departing from the principles of the invention, provided the shape of the sealing material 16 is appropriate to sealing the joint 23 of the joint assembly 10.

The fasteners 20 preferably comprise a plurality of bolts 54 spaced about the joint assembly 10 at substantially regular intervals. As shown in Figures 2-6, the bolts 54 are coupled to the backing mechanisms 18 by insertion in apertures 56 disposed in the mechanisms 18. It is to be recognized, however, that the fasteners 20 may be other than bolts 54 and may be coupled to the backing mechanisms 18 other than through use of apertures 56 without departing from the principles of the invention. The important point is that the fasteners 20 are associated with the backing mechanisms 18 so as to apply the compressive load to such mechanism 18.

Each backing mechanism 18 comprises a backing member 58 and directing mechanism 60. The backing member 58 receives the compressive load from the fasteners 20. The directing mechanism 60 engages the backing member 58 so as to direct the compressive load to the joint 23 and, thereby, seat the sealing material 16 in the joint. Preferably, the directing mechanism 60 selectively directs the compressive load toward the inner periphery 50 of the joint surface 46 of a flange 42 or 44 so as to seat the sealing material 16 in the joint 23, including adjacent the inside periphery 62 of the joint 23, the inside periphery 62 being disposed adjacent and along the inner periphery 50 of the joint surface 46 of a flange 42 or 44. Depending on the compressive load applied to the backing mechanisms 18, the inside periphery 62 may obtain various dispositions, for example, the variations may range from coincidence with the inner periphery 50 outwardly to coincidence with a line formed parallel to

the central axis 21 and passing through a flange 42 or 44 at the point at which the directing mechanism 60 applies the compressive load. It is to be recognized, however, that notwithstanding the direction of the compressive load as selected by the directing mechanism 60, the sealing material 16 preferably seals the joint 23 so that the fluids or fluid-like mixtures conveyed through the passageways 38 and 40 do not pass into the joint 23.

In operation, the fasteners 20 engage the backing member 58 so as to apply a compressive load thereto and, thereby, draw the backing ring 58 against the associated directing mechanism 60 in a direction substantially parallel to the central axis 21 of the joint assembly 10. The directing mechanism 60 directs that compressive load to the joint 23 so as to compress the sealing material 16 against one or both flanges 42 or 44 and, thereby, seats the sealing material 16 in the joint 23. By selectively directing that compressive load, the directing mechanism 60 substantially precludes both the occurrence of load losses in, and the application of reactive loads adjacent and opposite to, the compressive loading necessary to properly seat the sealing material 16. In so operating, the backing member 58 and associated directing mechanism 60 of one pipe section 12 or 14 preferably cooperate with another backing member 58 and directing mechanism 60 of the other pipe section 14 or 12, it being recognized that such cooperation may be absent without departing from the principles of the invention.

Referring to Figure 2, a preferred embodiment of the joint assembly 10 according to the present invention includes a backing member 58 in the form of a backing ring 64, and a directing mechanism 60 in the form of a collar 66 having a rounded cross-section, the collar 66 being disposed between the backing ring 64 and the load surface 48 of a respective flange 42 or 44. Although the collar's cross-section, as shown, is substantially circular, it is to be recognized that other cross-sectional shapes may be used without departing from the principles of the invention, provided they operate to direct the compressive load as described herein. The backing ring 64 has a substantially planar surface 68, along which it engages the collar 66. Preferably the planar surface 68 at its extremities is rounded so as to prolong the useful life of the backing mechanism 18 and, thence, the joint assembly 10. It is to be recognized, however, that the backing ring 64 may have other than rounded extremities without departing from the principles of the invention. It is also to be recognized that the collar 66 may be integral with a flange 42 or 44, for instance being formed by a convex load

surface 48 of selected curvature or curvatures. Where the joint assembly's flanges 42 and 44 and pipe sections 12 and 14 are annular, it is preferred that the backing ring 64 and collar 66 are annular; however, other forms may be used without departing from the principles of the invention.

In operation, when a compressive load is applied to the backing ring 64, the load is transmitted through the radius of the collar 66 from where the backing ring 64 makes contact with the collar 66 to the load surface 48. With increasing compressive load, the backing ring 64 tends to be drawn toward the joint 23 causing the backing ring 64 to move on the collar 64, generally away from the central axis 21 of the joint assembly 10. That movement causes the collar 66 to direct the compressive load at an angle to the central axis 21 so that the load, a vector L_R, has a component L_1 that is substantially perpendicular to the central axis 21 and a component L_2 that is substantially parallel to the central axis 21.

Referring to Figure 3, another preferred embodiment of the joint assembly 10 according to the present invention includes a backing member 58 in the form of a backing ring 70, and a directing mechanism 60 in the form of a beveled washer 72, the washer 72 being disposed between the backing ring 70 and the load surface 48 of a flange 42 or 44. The backing ring 70 is substantially similar to the backing ring 64 described above, except ring 70 is absent an angled surface provided for ease of access to the joint 23. The beveled washer 72 again operates by providing a resultant load L_R having a component that is substantially perpendicular to the central axis 21 of the joint assembly 10. Preferably the beveled washer is a spring washer, such as a BELLEVILLE washer.

Referring to Figures 4 and 5, additional preferred embodiments of the joint assembly 10 according to the present invention include a directing mechanism 60 in the form of a canted surface 80, the canted surface being disposed at a selected angle relative to the central axis 21 of the joint assembly 10. The canted surface 80 preferably is formed by the load surface 48 of a flange 42 or 44, or by a collar 82 having an appropriate cross-section, for example, a substantially triangular cross-section. If the collar 82 is employed, it is preferably disposed between the backing member 58 and the load surface 48 of a flange 42 or 44. The backing member 58 used in conjunction with a directing mechanism 60 formed by a canted surface 80 preferably comprises either, as shown in Figure 4, a backing ring 84 having a rounded bead 86 or, as shown in Figure 5, a backing ring 88 having a rounded surface 90. Backing rings 84

and 88 engage the canted surface 80 along the bead 86 and the rounded surface 90, respectively. As described with respect to Figure 2, rounded surfaces are preferred in order to prolong the useful life of the backing mechanism 18 and, thence, the joint assembly 10.

In operation, the backing rings 84 and 88 engage the canted surface 80 so that a resultant load L_R is applied to the backing rings 84 and 88, the load having a component that is substantially perpendicular to the central axis 21 of the joint assembly 10. The resultant load L_R preferably is directed toward the joint 23 at an angle substantially perpendicular to the canted surface 80 where the load is applied.

Referring further to Figure 4, in another preferred embodiment of the joint assembly 10, the canted surface 80 has a rounded bead 83 disposed thereon. In that embodiment, the backing member 58 preferably comprises a backing ring 85 having a substantially planar surface along which the ring 85 engages the surface 80. The engagement preferably is confined to the surface of the bead 85 when the load is applied to the ring 85.

Referring to Figure 6, another preferred embodiment of the joint assembly 10 according to the present invention includes a backing member 58 in the form of a backing ring 92, the backing ring having a top face 94, a bottom face 96, an inside face 98 and an outside face 100. The backing ring 92 receives a compressive load from the fasteners 20 along the top face 94 and directs that load to the joint 23 from the bottom face 96. The bottom and inside faces 96 and 98 meet to form a radiused portion 102, the radiused portion 102 being disposed adjacent both the load surface 48 of a flange 42 or 44 and the outside surface 26 or 28 of a pipe section 12 or 14. The bottom face 96 has a beveled portion 104 extending from the radiused portion 102 toward the outside face 100 of the backing ring 92, the beveled portion 104 having a predetermined beveled angle 106 relative to the central axis 21of the joint assembly. The beveled angle 106 generally varies from application to application, the angle 106 used in any particular application being a function of various factors, including the materials used in constructing the joint assembly 10, particularly the materials used for the backing mechanism 18. The beveled angle 106 provides that, when a compressive load of a predetermined optimum value is applied to the backing mechanism 18, the beveled portion 106 is drawn to within a predetermined clearance of the load surface 48 of a flange 42 or 44. Under such circumstances, the flange 42 or 44 is minimally deformed, if at all, and reactive

loading adjacent the inside periphery 62 of the joint 23 is minimized or eliminated, thereby optimizing the application of the compressive load to the joint 23.

It is to be recognized that the principles set forth herein with respect to a joint formed by two pipe sections 10 and 12 apply equally to joints formed using a single pipe section 12 or 14. In particular, the principles apply to connect a flanged pipe to a blind flange, i.e., a flange for closing off the end of a pipe section, and to a nozzle, i.e., a flanged outlet from a tank or other container, the term "flange" used herein being intended to comprehend blind flanges, nozzle flanges, flanges disposed at the end of pipe sections, as well as other applications.

The terms and expressions which have been employed in the foregoing specification are used therein as terms of description and not of limitation, and there is no intention in the use of such terms and expressions of excluding equivalents of the features shown and described or portions thereof, it being recognized that the scope of the invention is defined and limited only by the claims which follow.

What is claimed is:

1. A joint assembly for a pipe, the pipe having an elongate axis, an inside surface, an outside surface and a flange disposed at one end thereof, the flange having a front surface facing away from the pipe, a back surface and an inner periphery defining an outlet of the pipe, the joint assembly comprising:

sealing material disposed adjacent the front surface and the inner periphery of the flange; and

a backing member adapted to engage the flange and apply a compressive load from the back surface of the flange toward said sealing material adjacent the front surface and the inner periphery of the flange so as to seat the sealing material adjacent the inner periphery of the flange against a surface of a cooperating joint member.

2. The joint assembly of claim 1, wherein said backing member comprises a backing ring adapted to receive said compressive load, and a directing member engaging said backing ring and said back surface of the flange to direct said compressive load toward said sealing material adjacent the front surface and the inner periphery of the flange.

3. The joint assembly of claim 2, further comprising a plurality of fasteners disposed around said backing member, said fasteners engaging said backing ring and said cooperating joint member to draw said backing ring against said directing member in a direction substantially parallel to the elongate axis of the pipe.

4. The joint assembly of claim 2, wherein said directing member comprises a collar having a rounded cross-section, said collar being disposed between said backing member and the back surface of the flange.

5. The joint assembly of claim 4, wherein said backing member includes a substantially planar surface which engages said collar.

6. The joint assembly of claim 4, wherein said backing member includes a rounded surface which engages said collar.

7. The joint assembly of claim 2, wherein said directing member comprises a beveled washer disposed between said backing member and the back surface of the flange.

8. The joint assembly of claim 2, wherein said directing member includes a canted surface disposed at a selected angle relative to the elongate axis of the pipe.

9. The joint assembly of claim 8, wherein said canted surface is part of a collar having a substantially triangular cross-section, said backing ring comprising said collar.

10. The joint assembly of claim 8, wherein the back surface of the flange forms said canted surface.

11. The joint assembly of claim 8, wherein said backing member includes a substantially planar surface, said backing ring engaging said canted surface along said planar surface.

12. The joint assembly of claim 8, wherein said backing ring includes a rounded surface, said backing ring engaging said canted surface along said rounded surface.

13. The joint assembly of claim 8, wherein said backing ring includes a rounded bead disposed adjacent the outside surface of the pipe so as to engage said canted surface.

14. The joint assembly of claim 1, wherein said backing member comprises a backing ring having a front face, a back face, an inner periphery adjacent the outside surface of the pipe and an outer periphery, said backing ring receiving said compressive load at the back

face thereof and directing said compressive load toward the front face thereof, said front face having a beveled portion extending from said inner periphery toward said outer periphery of said backing ring, said beveled portion having a bevel angle such that said compressive load obtains an optimum value in the joint when said beveled portion is drawn to within a predetermined clearance of said back surface of said flange.

15. The joint assembly of claim 1, wherein said sealing material has an inner periphery substantially coincident with said inner periphery of said flange.

16. The joint assembly of claim 1, wherein said backing member engages the flange on the back surface thereof.

17. The joint assembly of claim 16, wherein the back surface of the flange is substantially perpendicular to the elongate axis of the pipe.

18. The joint assembly of claim 16, wherein the back surface of the flange is canted at a selected angle relative to the elongate axis of the pipe.

19. The joint assembly of claim 16, wherein said sealing material has an inner periphery substantially coincident with said inner periphery of said flange.

20. A backing member for use in a joint between a pipe and a cooperating joint member, the pipe having an elongate axis, an inside surface, an outside surface and a flange disposed at one end thereof, said flange having a front surface facing away from the pipe, a back surface and an inner periphery defining an outlet of the pipe, sealing material being disposed between the front surface of the flange and the cooperating joint member, the backing member comprising:

a backing ring adapted to receive a compressive load; and

a directing member adapted to engage said backing ring so as to direct a load applied from the back surface of the flange toward said sealing material adjacent the front surface and the inner periphery of the flange so as to seat the sealing material adjacent the inner periphery of the flange.

21. The backing mechanism of claim 20, wherein said directing member comprises a collar having a rounded cross-section, said collar being disposed between said backing ring and the back surface of the flange.

22. The backing mechanism of claim 21, wherein said backing ring include a substantially planar surface which engages said collar.

23. The backing mechanism of claim 21, wherein said backing ring includes a rounded surface which engages said collar.

24. The backing mechanism of claim 20, wherein said directing member comprises a beveled washer disposed between said backing ring and the back surface of the flange.

25. The backing mechanism of claim 20, wherein said directing member includes a canted surface disposed at a selected angle relative to the elongate axis of the pipe.

26. The backing mechanism of claim 25, wherein said canted surface is part of a collar having a substantially triangular cross-section, said backing ring comprising said collar.

27. The backing mechanism of claim 25, wherein said backing ring includes a substantially planar surface which engages said canted surface.

28. The backing mechanism of claim 27, wherein said backing ring includes a rounded bead disposed adjacent the outside surface of the pipe so as to engage said canted surface.

29. The backing mechanism of claim 25, wherein said backing ring includes a rounded surface which engages said canted surface.

30. A backing member for use in a joint between a pipe and a cooperating joint member, the pipe having an elongate axis, a front surface facing away from the pipe, a back surface and an inner periphery defining an outlet of the pipe, sealing material being disposed between the front surface of the pipe and the cooperating joint member adjacent the inner periphery of the pipe, the backing member comprising: a backing ring having a front face, a back face, an inner periphery and an outer periphery, said backing ring being adapted to receive a compressive load at said back face thereof and to direct said compressive load toward said sealing material adjacent the front surface and inner periphery of the pipe, said front face of said backing ring having a beveled portion extending from said inner periphery of said backing ring toward said outer periphery of said backing ring, said beveled portion having a bevel angle relative to the elongate axis of the pipe such that said compressive load obtains an optimum value in the joint when said beveled portion is drawn to within a predetermined clearance of said back surface of said pipe.

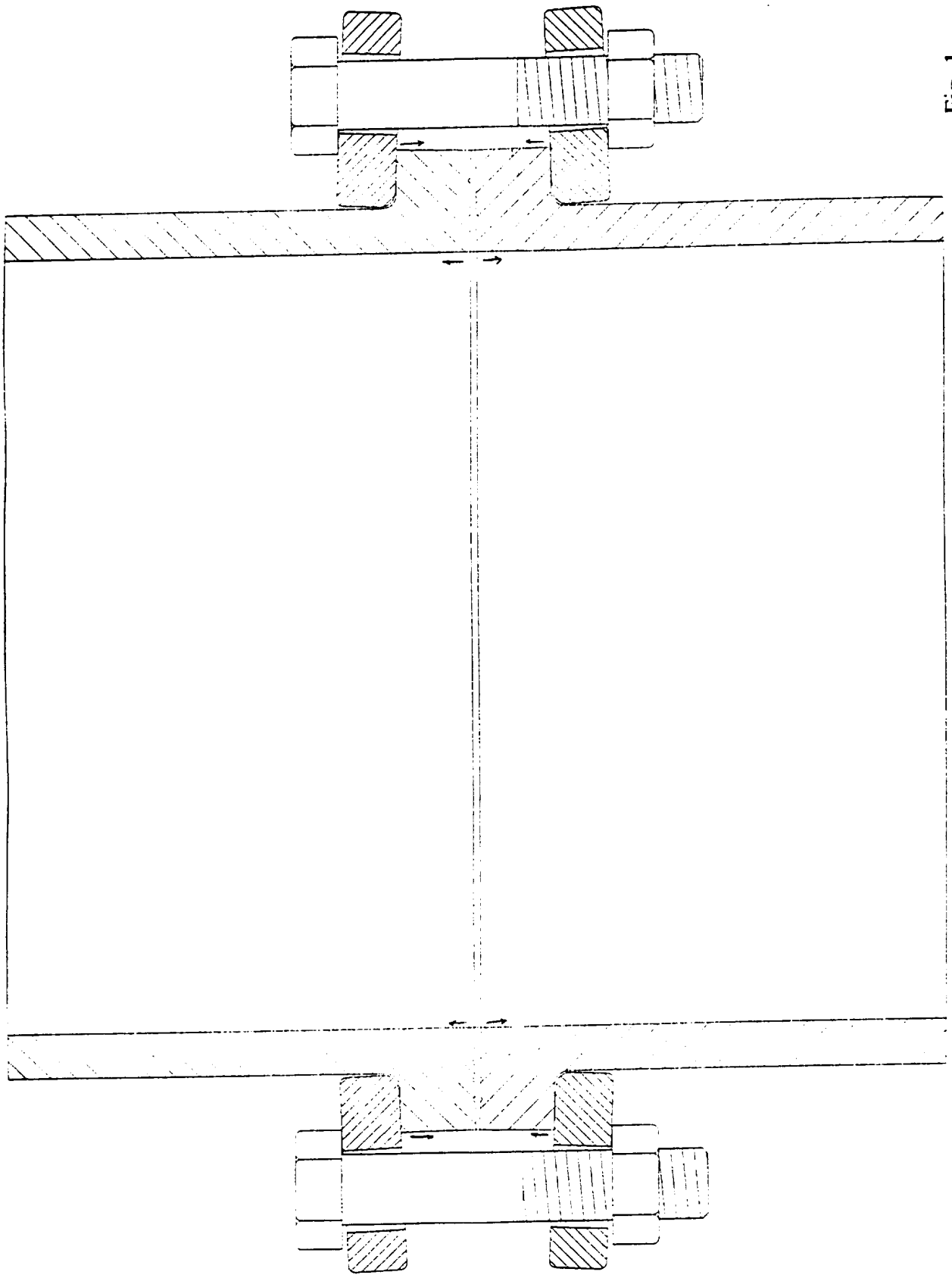

Fig. 1

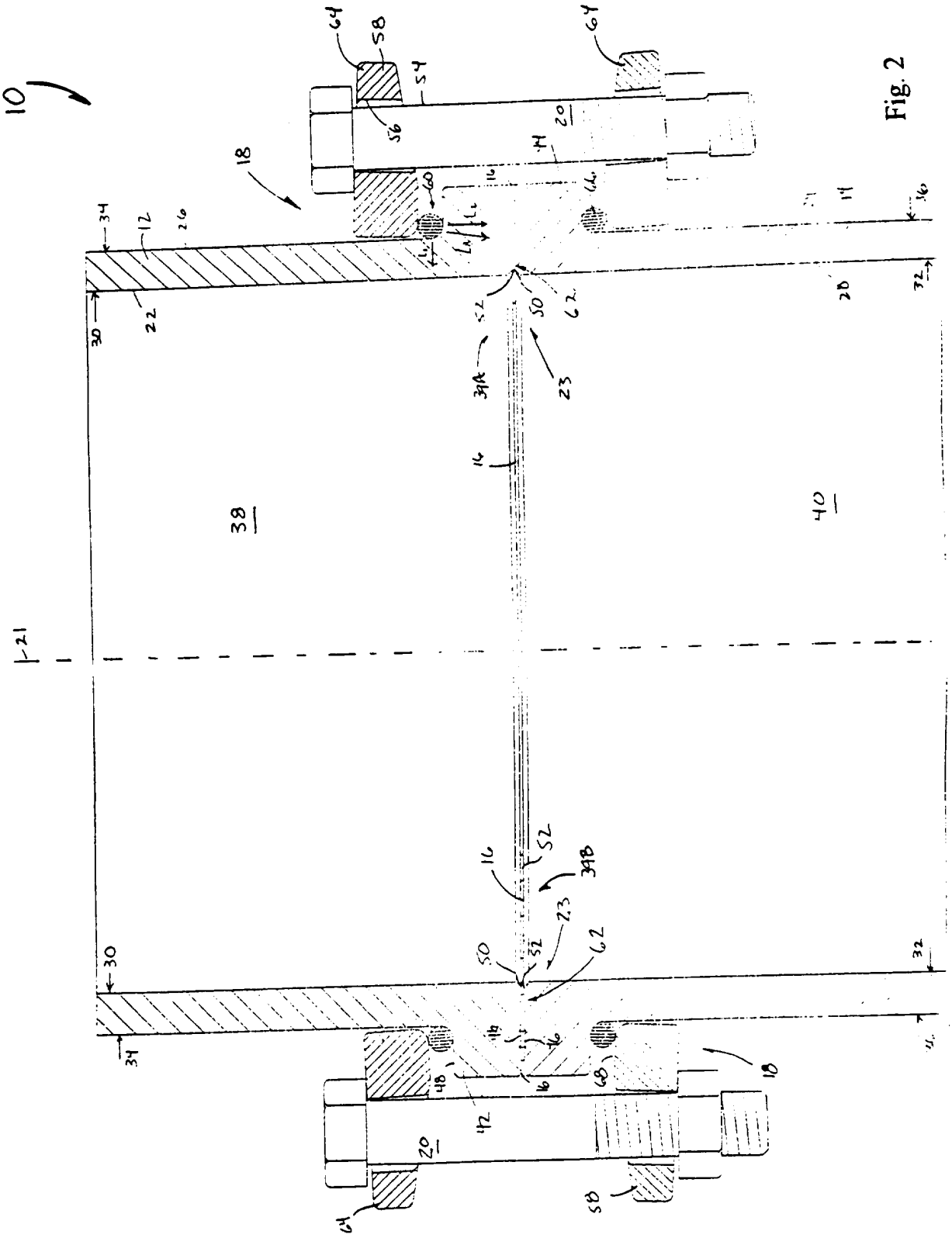

Fig. 2

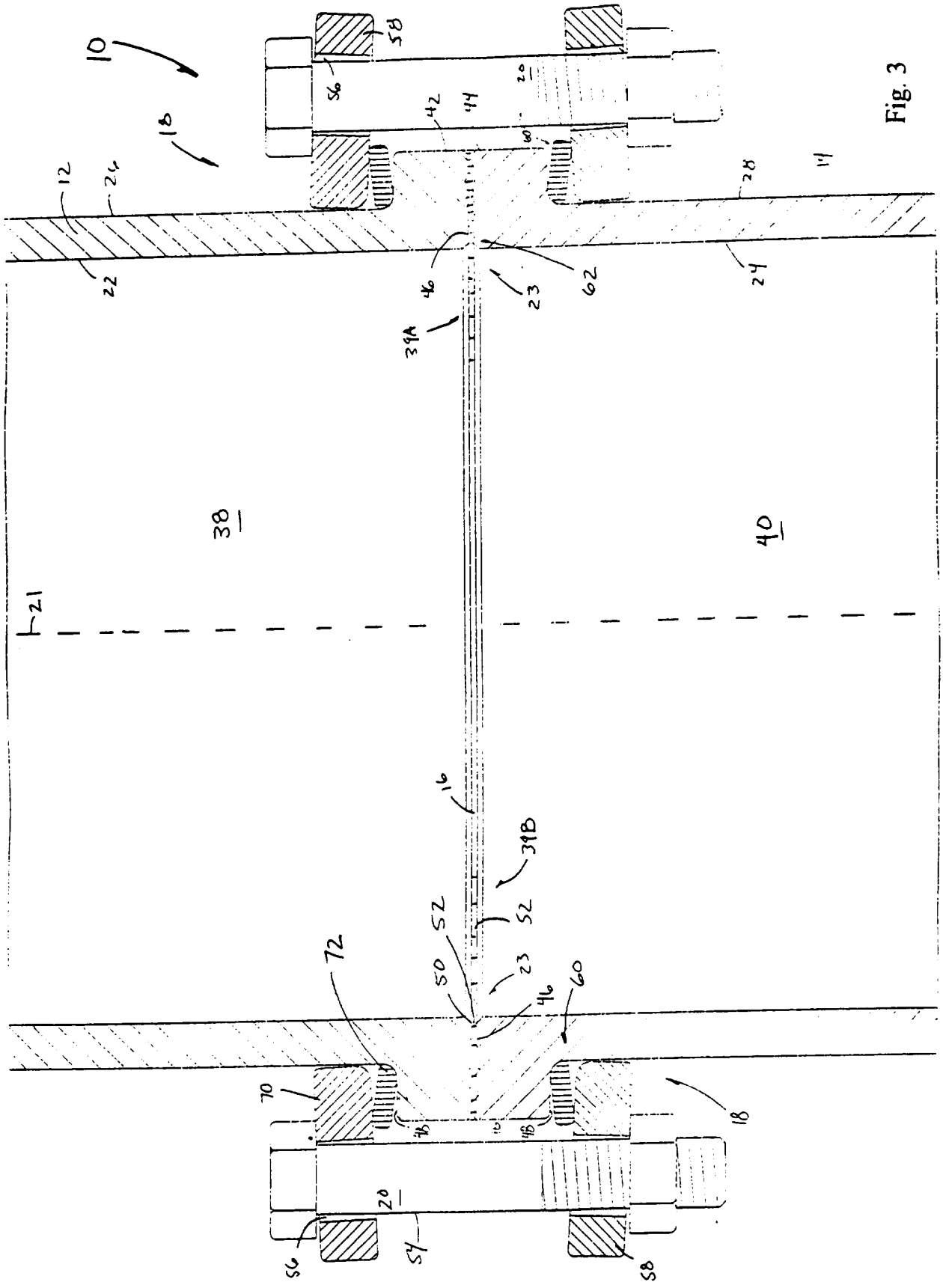
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Fig. 3

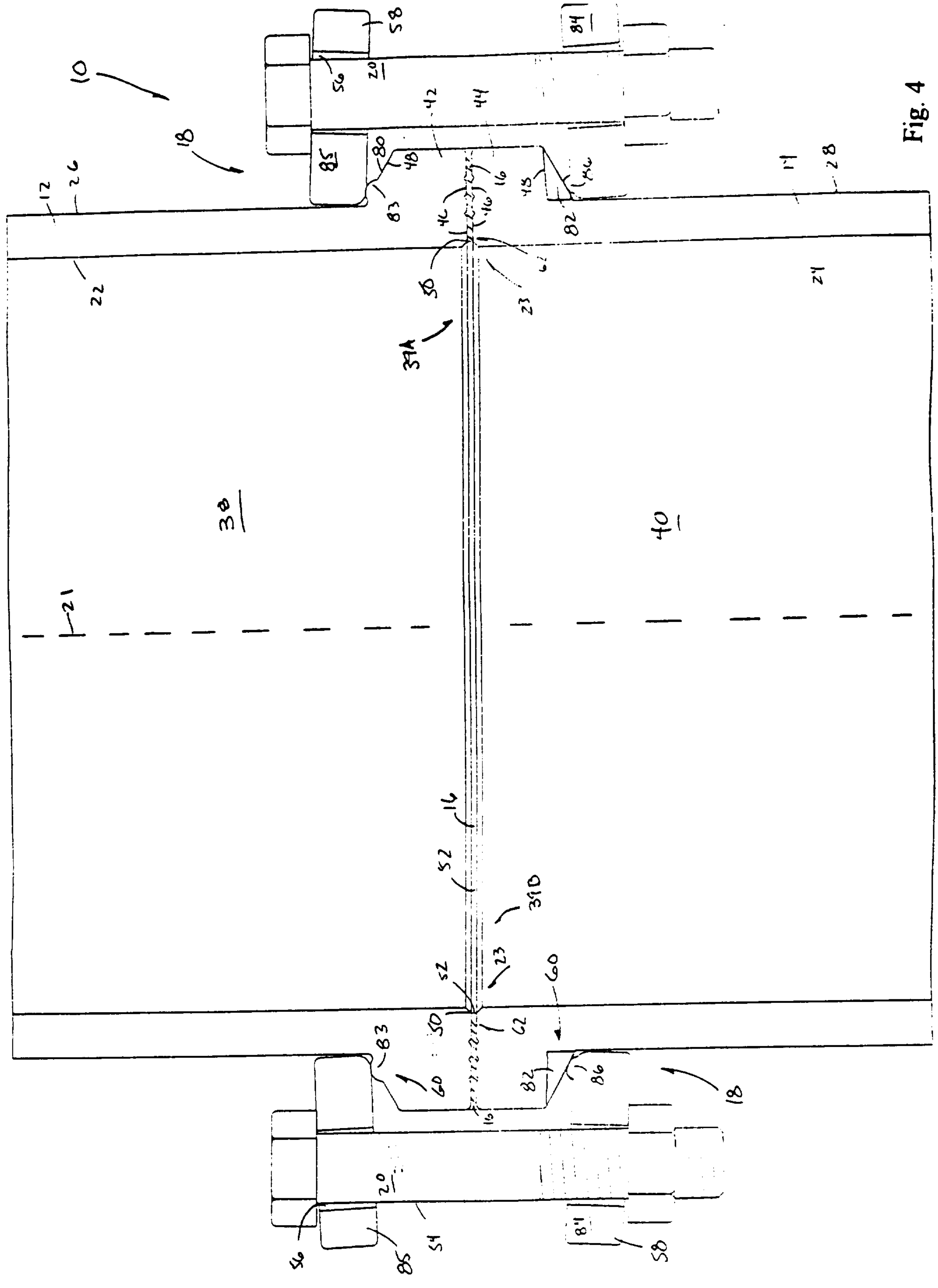
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Fig. 4

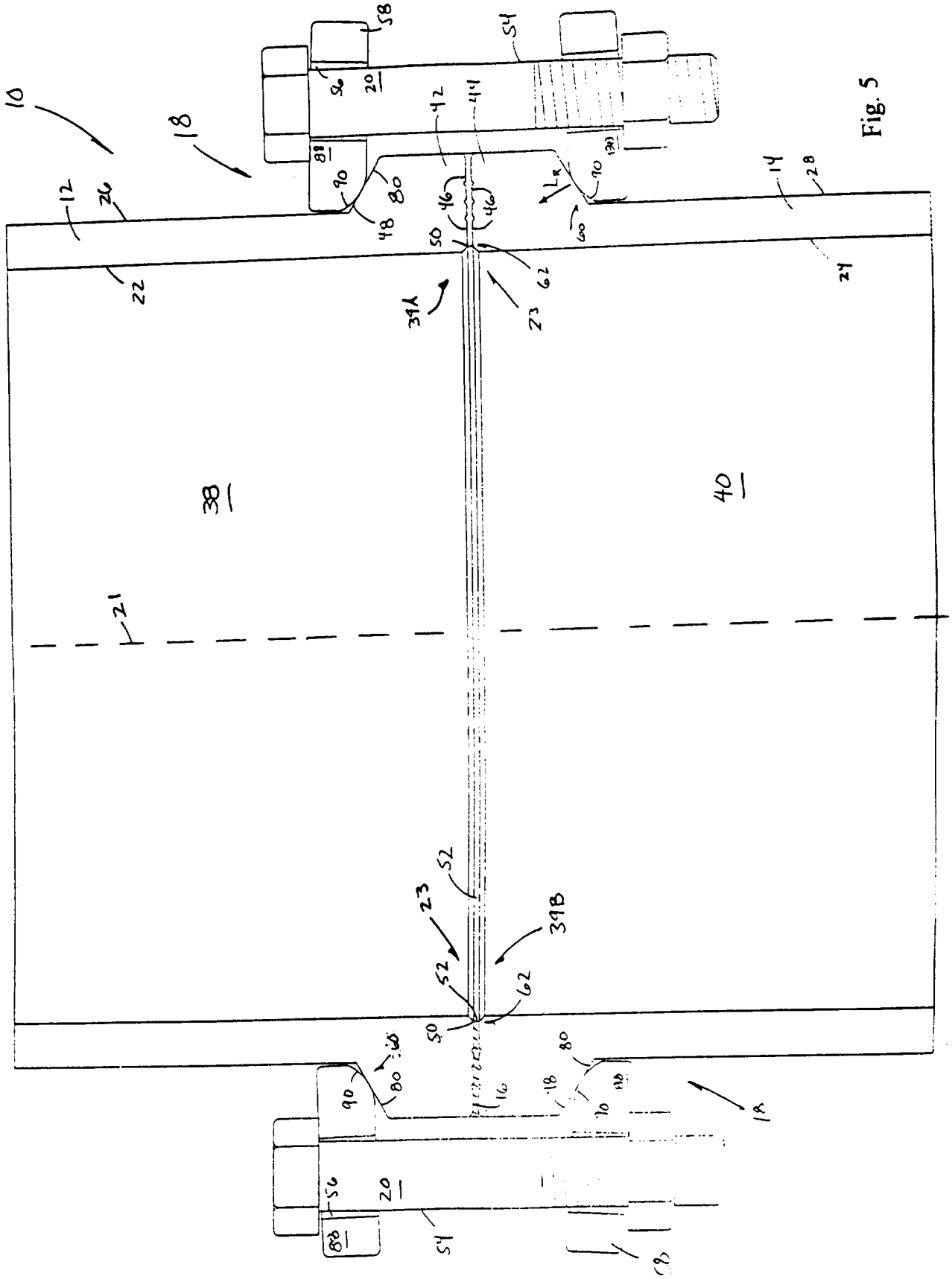
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Fig. 5

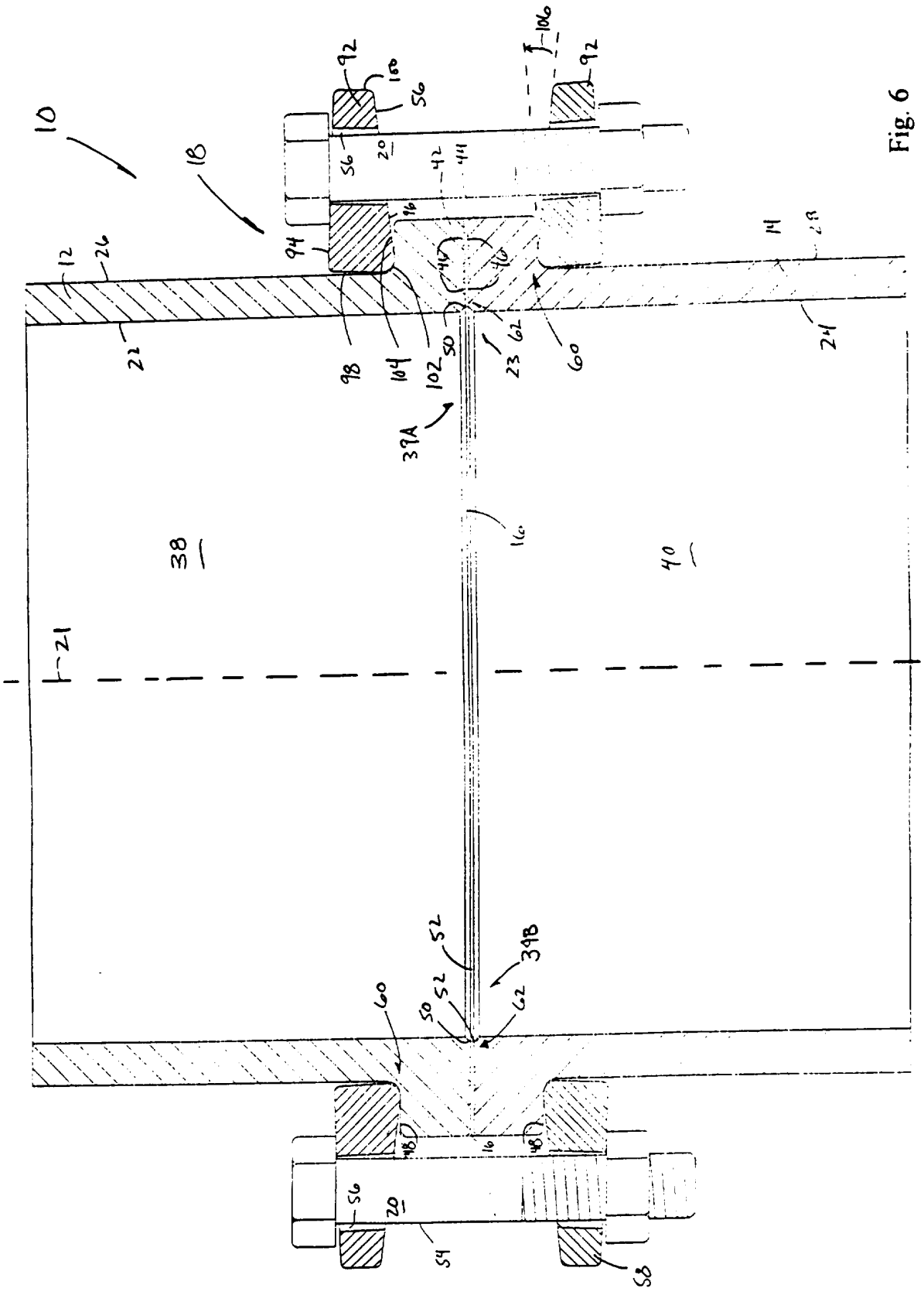
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Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/15302

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :F16L 17/06
US CL : 285/368,412,413

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 285/368,412,413

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR,A, 1,445,449 (Autoclave) 31 May 1966, see entire document.	1-5,15-17, 20-22
X	DE,A, 2,909,923 (HERMANS) 25 September 1980),see entire document.	6 and 23
X	US,A, 3,398,978 (GASCHE) 27 August 1968,see entire document.	7-8,11,24-25,27
X	DE,A, 509,002 (BERGBAU ET AL) 03 October 1930,see entire document	1,15-19,30
X	GB,A, 584,896 (GRIFFTHS) 24 January 1947,see entire document.	1-4,6-12,20-21,23-25, 29-30

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search	Date of mailing of the international search report
04 APRIL 1996	17 APR 1996
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer DAVE W. AROLA Telephone No. (703) 308-2168

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/15302

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A, 4,767,138 (SCHAFBUCH) 30 August 1988,see entire document.	1-6,8,12,15-25,27,29- 30
A	DT,A , 2,807,444 (KIRCHKAMP) 23 August 1979	13,14,26, 2 8
A	US,A, 2,616,946 (SCHEER) 04 November 1952	13-14,26, 28