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(71) Applicant and

(72) Inventor: **AAKRE, Andreas** [NO/NO]; N-6290 Haramsøy (NO).

(74) Agent: **AS BERGEN PATENTKONTOR**; P.O. Box 1998, Nordnes, N-5817 Bergen (NO).

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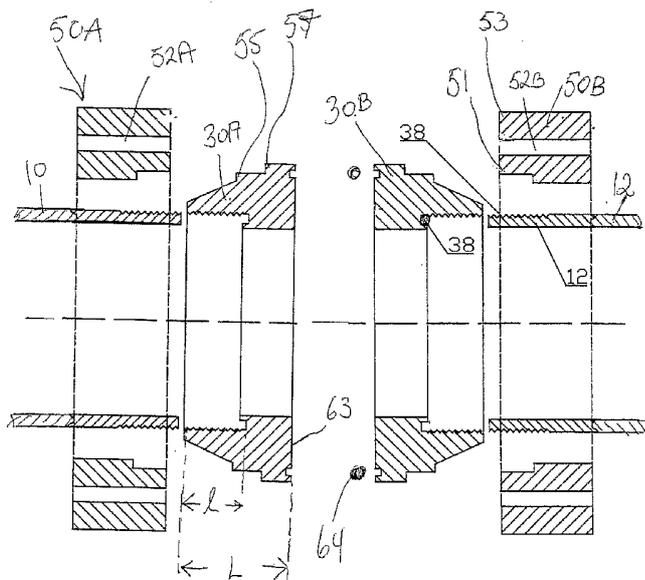
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(54) Title: DEVICE AND METHOD FOR COUPLING OF PIPES



(57) Abstract: A device is described for coupling of segments of pipes (10, 12) to longer pipe sections where each pipe end comprises a flange construction with sealing means and also means for coupling to an adjoining pipe. The device is characterised by the following features: the coupling means comprise ring collars/ring flanges (50A, 50B) that are respectively arranged to grip around the flanges, and which are mutually coupled with the help of tightening bodies, and the sealing means comprise one or more ring gaskets (64) arranged between adjoining flange faces (63). A method is also described.

WO 2004/057225 A1

DEVICE AND METHOD FOR COUPLING OF PIPES

The present invention relates to a device for coupling of segments of pipes to longer pipe sections where each pipe end comprises a flange construction with sealing means, and also means for coupling to an adjoining pipe, as can be
5 seen in the introduction to claim 1.

A method is also described for coupling of segments of pipes to longer pipe sections.
10

In order to join together two or more pipe segments to longer pipe sections that shall carry fluids such as liquids, gases and the like, a flange in the form of a ring-shaped disc is fastened to each pipe end.

15 The flanges are welded to the pipe ends. The ring-shaped flange face that turns towards an adjoining flange face on the neighbouring pipe comprises a recess with space for a sealing ring (gasket) in the form of an O-ring or another suitable gasket type so that a completely tight coupling is achieved between the flanges when the pipes are fitted together. Even if such flanges are primarily used for
20 pipe couplings, they can also be used in other connections where constructions of fluid-carrying, or fluid-containing elements shall be coupled.

During the fitting of longer pipe sections, two pipes are placed next to each other and through-bolts with bolt heads are inserted through the adjoining pipe
25 ends. Corresponding nuts are then screwed onto the bolts and tightened, so that the flanges are squeezed tight against each other between the bolt head and nuts, and form a tight pipe coupling with the help of the gasket.

When old flanges shall be removed and new ones fitted onto pipes, for example
30 on oil platforms, with the use of welding equipment, complex safety measures must be initiated to safeguard against fire and explosions. Therefore, such tasks lead to extra resources in the form of time and costs.

Another considerable disadvantage is when the pipe must be replaced due to damage or the like and be discarded, then the flange can not be used again, but be discarded together with the pipe.

5 It is also known that pipes and flanges can comprise reciprocally formed threaded sections, so that the flange can be screwed into the pipe, and a seal is achieved by the help of different gasket constructions. Bolts are then inserted through the flange and forced against each other to form a seal by the use of nuts. A construction may imply that the pipe end fits into a seat with a ring-
10 gasket in the flange. In this context, reference is made to US Patent 5,611,389, US Patent Application 2001/0001524, JP patent publication and Sandvik product sheet from Sandvik Material technology.

The disadvantage with such solutions is that the flanges on two adjoining pipe
15 ends must be aligned so that the boltholes mutually match up for insertion of the bolts. During an actual fitting, the environment, such as in poor light and the like, can complicate the fitting operation.

Therefore, it is an aim to provide a solution for coupling of pipes that is simple to
20 fit, even in difficult working conditions.

It is a further aim of the invention to provide a new coupling construction which mainly eliminates all the disadvantages that are mentioned above.

25 As the mentioned boltholes can reduce the strength of the flange, it is also desirable to produce a construction that does not include such through holes.

The device according to the invention is characterised by the following features: the coupling means comprises ring collars/ring flanges which are arranged to
30 catch the flanges, and which are mutually coupled with the help of tightening bodies, and the sealing means comprising one or more ring-gaskets arranged between adjoining flange faces. The preferred embodiments of the device are described in the dependent claims 2-9.

35 The method according to the invention is characterised in that: pipe segments and flanges/pipe ends with mutually adapted threaded sections for mutually screwing together, are provided, a ring collar/ring flange for coupling is inserted onto the respective pipes, the flanges/pipe ends are screwed onto the

respective pipe segments and the mentioned ring collar/ring flange on adjoining pipes are put together with the corresponding flanges/pipe ends lying between them, and the ring collars/ring flanges are mutually screwed together with the help of threaded through-bolts with bolt-heads and nuts so that the sealing means, in the form of gasket rings between adjoining flange faces, form a tight coupling between the flange faces.

The preferred embodiments of the method are given in claims 11-18.

10 With the solution according to the invention a pipe end construction or flange construction that can be screwed onto the pipe is used in that the flange and the pipe embrace mutually adapted outer/inner screw threads. The flange/pipe end comprises a seat with a sealing-ring into which the pipe end is fitted so that a seal is formed. The pipe is preferably threaded externally, while the flange is
15 threaded internally.

According to a preferred embodiment, the sealing body is placed in a seat to make contact with a ring-formed pipe end, the contact face of which is perpendicular to the longitudinal axis of the flange. According to another
20 preferred embodiment, the sealing body is placed in a seat to make contact with a ring-formed pipe end, the contact face of which forms a bevel angle with the longitudinal axis of the flange. In this case, when the flange is screwed in the axial direction onto the pipe, the two contact faces form a bevel angle with respect to said axial direction. In the inclined face where the sealing body lies,
25 the recessed seat is also arranged in an inclined position with respect to the axial direction.

According to a further preferred embodiment the axial direction (I) of the threaded section of the flange constitutes at least half of the total axial length (L)
30 of the flange. The advantage with this solution is that a stable screwed coupling of the pipe and the flange is thereby provided.

In the following, the invention shall be explained in more detail with reference to the enclosed figures, in which:

35

Figure 1 shows the principle of previously known couplings of two pipes where each pipe end comprises a flange.

Figure 2 shows an embodiment where flange and pipe end are equipped with reciprocally formed threads for screwing together.

5 Figure 3 shows the elements in the construction according to the invention, in the form of a pipe, flange/pipe end, gasket and mounting collar/swivel flange before the coupling.

Figure 4 shows the construction according to figure 3 after coupling.

10 Figure 5 shows an enlarged section of the placing of the gasket and where the pipe is partially screwed in.

Figure 6 shows a corresponding section where the pipe is screwed in completely.

15

Figure 7 shows a section of a particularly preferred positioning of the gasket-carrying seat.

Reference shall be initially made to figure 1 which illustrates two pipes 10 and
20 12, respectively, which are to be coupled. Each pipe end comprises a welded-on end flange 14, 16, according to the well known solutions, as the pipes are to be screwed together. Through each flange runs a number of axially running bore holes 15, 17 for insertion of screw bolts 18, 20, for example, numbering 6 or 8, around the circumference. To assemble the pipes 10, 12 together, the pipe
25 ends are placed end to end and the nuts 22, 24 are tightened with sufficient torque. In each of the flange faces that turn towards each other, there is one or several ring-gaskets, such as shown by 21, 23 which give the necessary sealing.

According to the present invention, the construction is altered so that one can
30 use a flange which is placed at the pipe end with the help of a screw connection. A basic version of the new construction according to the invention is shown in figure 2. The pipe 12 can be seen on the right and the axial direction is shown by X-X. The end section 26 of the pipe 12 comprises external threads 28 over an axial length. The pipe has an internal diameter d .

35

The flange 30 comprises a main flange part 32 and a pipe coupling part 34. The flange forms an internal circle-shaped opening which is fitted to the internal (flow-) diameter of the pipe 12. In the case shown, the internal part of the pipe

coupling part 34 of the flange is formed with threads 36 that fit the threads 28 on the pipe end part.

5 For the coupling to be tight, a ring-shaped seat is formed innermost in the pipe coupling part 34, where a ring-shaped gasket 40 is inserted. To obtain an overall view reference shall be made to the figures 5, 6 and 7, which show an enlarged diagram of the seat 38 and how the pipe end 26 fits into this for two different embodiments.

10 Furthermore, a gasket ring 6A is indicated in a seat in the flange face shown in figure 2 to form a seal with the adjoining flange face.

15 According to the present invention separate coupling collars, which encircle and bring together the two flanges, are used to couple the flange-carrying pipe ends so that the flanges no longer need the mentioned through bore holes 15,17 for insertion of tightening bolts 18,20.

20 Reference is here made to figure 3 that shows an expanded diagram of pipe 10,12, flange/pipe end, gasket and mounting collar/swivel flange before the parts are assembled.

25 According to the invention, a coupling mounting collar 50A and 50B, respectively, is placed onto each pipe 10,12 in advance, i.e. before the flanges are screwed onto their respective pipe ends. The collars 50A,50B are also ring-formed, and comprise the mentioned bore holes 52A,52B in the axial direction of the pipes for insertion of threaded bolts 18,20 with respective bolt heads, so that the pipes and flanges are coupled and form a seal. As can be seen in the figure, each bolt 18,20 runs radially outside the peripheral extreme side of the flange/pipe end 30A, 30B.

30 When the flanges are screwed onto each pipe end, the collars are pulled back and in towards the reverse side of the respective flanges. As the bore holes in the collars lie radially outside the peripheral extreme edge of the flange, the row of bolts 18,20 can be inserted through a collar and continue through
35 corresponding bore holes in the adjoining collar. The collars are led towards each other by screwing on nuts so that they are clenched between the bolt heads and nuts. Thus, the flanges 30A, 30B are also led towards each other so

that the sealing ring(s) are pressed together and form the seal between the adjoining flange faces 63.

5 The ring-formed front side of the collars has a contour of hook shapes 51,53 which correspond to the contours of shoulder forms 55,57 on the reverse side of the flange/pipe end 30. Thus, the collars encircle the respective flanges/pipe ends 30A, 30B which, radially seen, can be lying partially inside their collar, as shown in figure 4.

10 As can be seen in figures 5 and 6, the seat of the flange is shaped as a ring-formed recess in the bottom end of the internal threaded section 36, in that a ring-formed fold or hook 42 is formed radially inside the seat 38. The end face of the ring hook 42 forms an axially turning edge face 44 that turns towards the pipe 12. When the end 26 on the pipe 12 is screwed all the way into the seat
15 38, the end face 29 will be lying against the edge face 44. As the height of the ring-formed fold or hook 42 is adapted to the pipe end, the inside of the pipe forms a smooth and even transition to the inside of the flange.

20 According to another preferred embodiment, the sealing body is placed in a seat to make contact with a ring-formed pipe end, the contact face of which forms a bevel angle to the longitudinal axis of the flange. In this case, when the flange is screwed onto the pipe in the axial direction, the two contact faces form a bevel angle with respect to said axial direction. In the inclined face where the sealing body is arranged, the recessed seat is also lying in an inclined position
25 with respect to the axial direction. This solution is drawn in figure 7. Both the contact face 50 of the pipe end and the seat end-carrying face 56 of the flange 32 form a ring-formed bevel angle with the axial direction X-X. The seat is shown recessed in the face 52 and comprises the ring-gasket 54.

30 It is preferred that the axial direction (I) of the threaded section of the flange constitutes at least half of the total axial direction (L) of the flange. The advantage with this solution is that a more stable and steady screwed coupling of the pipe and flange is thereby provided.

35 The outlined solution for a new flange construction constitutes a significant step forward with respect to today's solutions. One flange can be used repeatedly even if the pipe in which it is fitted is damaged. The flange can simply be unscrewed from the pipe.

When a new pipe is installed into the circuit, one simply screws the old flange onto it. In this way, one will save large costs during maintenance and replacement of sections of the pipe system.

5

Furthermore, a system is provided with the invention which can be maintained without the use of welding operations. Thus, one avoids costly safety procedures for areas with fire and explosion risks.

PATENT CLAIMS

1. Device for coupling of segments of pipes (10,12) to longer pipe sections
5 where each pipe end comprises a flange construction with sealing means and
also means for coupling to an adjoining pipe, c h a r a c t e r i s e d by the
following features in that:
the coupling means comprise ring collars/ring flanges (50A,50B) which
are respectively arranged to grip the flanges, and which are mutually coupled
10 with the help of tightening means, and
sealing means comprising one or more ring gaskets arranged between
adjoining flange faces.
2. Device in accordance with claim 1,
15 c h a r a c t e r i s e d in that the tightening means comprise a number of bolts
(18,20) that run through bore holes in ring collars/ring flanges (50A,50B), as the
two ring collars/ring flanges are mutually clamped between the heads of the
bolts and screwed-on nuts (22,24).
3. Device in accordance with claims 1-2,
20 c h a r a c t e r i s e d in that the collars extend radially outside the peripheral
ring edges of the flanges, and the row of bolts lie radially outside the peripheral
extreme edge of the flange.
4. Device in accordance with claims 1-3,
25 c h a r a c t e r i s e d in that the ring-formed front side of the collars have a
contour of hook-forms (51,53) which correspond to the shoulder form contours
(55,57) on the reverse side of the flange/pipe end (30).
5. Device in accordance with one of the preceding claims,
30 c h a r a c t e r i s e d in that the collars encircle the respective flanges/pipe
ends (30A,30B) so that, radially seen, they are lying partially inside their collar
(figure 4).
6. Device in accordance with one of the preceding claims,
35 c h a r a c t e r i s e d in that the flanges are screwed onto respective pipes, in
that the flange and the pipe have mutually fitting outer/inner screw threads, and
the pipe is preferably threaded externally, while the flange is threaded internally.

7. Device in accordance with one of the preceding claims, c h a r a c t e r i s e d in that a seal between the pipe and flange/pipe end is provided in that the flange comprises a seat with a sealing body in which the ring-formed pipe end is tightly taken up.
- 5
8. Device in accordance with one of the preceding claims, c h a r a c t e r i s e d in that the sealing body is placed in a seat to make contact with a ring-formed pipe end, the contact face of which is perpendicular to the longitudinal axis of the flange, or forms a bevel angle with the longitudinal axis of the flange.
- 10
9. Device in accordance with one of the preceding claims, c h a r a c t e r i s e d in that the axial length (l) of the threaded section of the flange constitutes at least half of the total axial length (L) of the flange.
- 15
10. Method for coupling segments of pipes (10,12) to longer pipe sections where each pipe end comprises a flange construction with sealing means and also means for coupling to an adjoining pipe, c h a r a c t e r i s e d by the following features in that:
- 20 pipe segments (10,12) and flanges/pipe ends (30A,30B) are provided with mutually fitting threaded sections for mutual coupling together, a ring collar/ring flange (50A and 50B, respectively) for coupling is placed onto the respective pipes (10,12), the flanges/pipe ends (30A,30B) are screwed onto the respective pipe sections (10,12),
- 25 and the mentioned ring collars/pipe ends (50A and 50B, respectively) on adjoining pipes are led together with corresponding flanges/pipe ends (30A,30B) lying in between, and the ring collars/ring flanges (50A,50B) are mutually screwed together with the help of threaded through-bolts with bolt heads and nuts so that the sealing means, in the form of gasket rings between adjoining flange faces, form a tight coupling between the flange faces.
- 30
11. Method in accordance with claim 10, c h a r a c t e r i s e d that collars that extend radially outside the peripheral ring edges of the flanges are used, and the row of bolts radially lie outside the peripheral extreme edge of the flange, is used.
- 35
12. Method in accordance with claims 10-11, c h a r a c t e r i s e d in that a collar shape with a ring-formed front side that

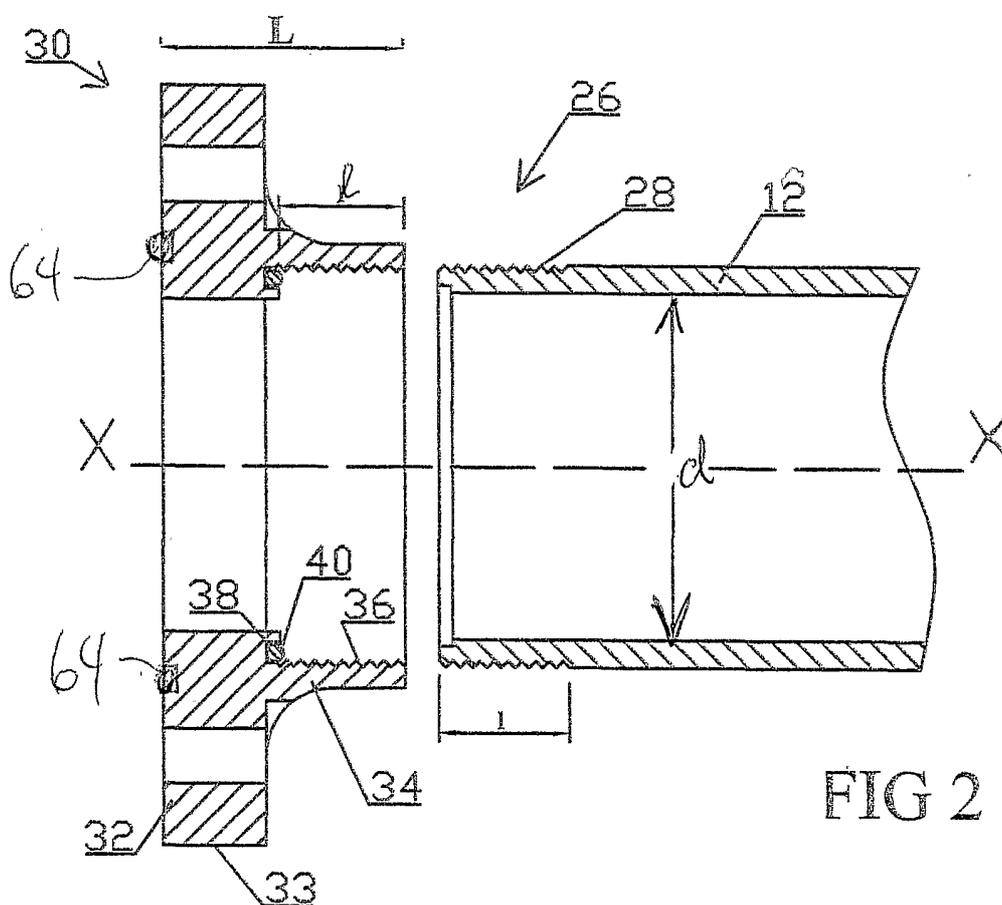
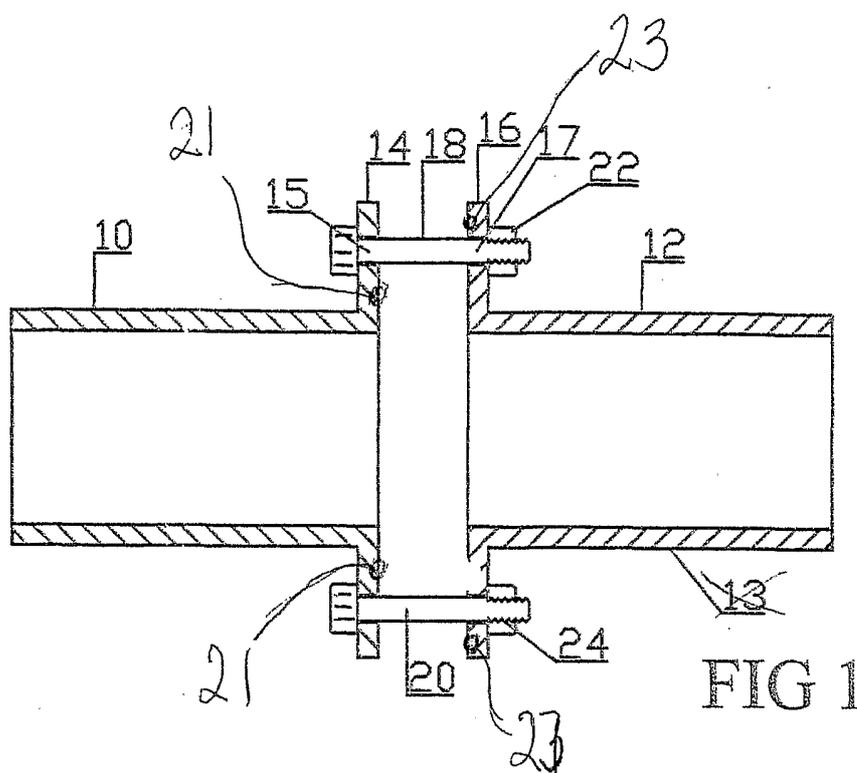
has a contour of hook forms (51,53) that correspond to the contours of shoulder forms (55,57) on the reverse side of the flange/pipe end (30) is used.

14. Method in accordance with one of the preceding claims 10-13, c h a r a c t e r i s e d in that pipes with external threads and flanges with internal threads are used.

15. Method in accordance with one of the preceding claims 10-14, c h a r a c t e r i s e d in that a seal between pipe and flange/pipe end is used in that the flange is screwed onto the pipe until the pipe end is taken up in a sealing body in the flange.

16. Method in accordance with one of the preceding claims 10-15, c h a r a c t e r i s e d in that a sealing body is used which is placed in a seat to make contact with a ring-formed pipe end, the contact face of which is perpendicular to the longitudinal axis of the flange, or forms a bevel angle with the longitudinal axis of the flange, is used.

17. Method in accordance with one of the preceding claims, c h a r a c t e r i s e d in that the axial length (l) of the threaded section of the flange constitutes at least half of the total axial length (L) of the flange.



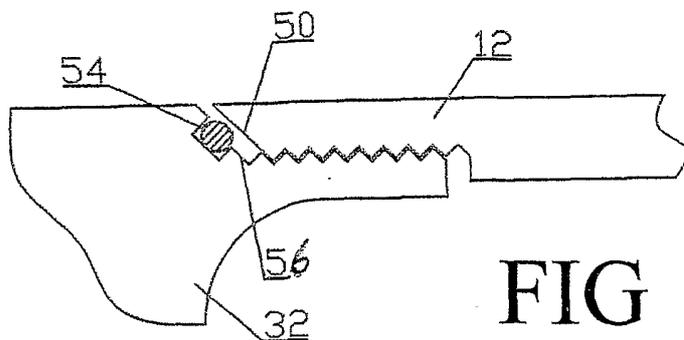


FIG 7

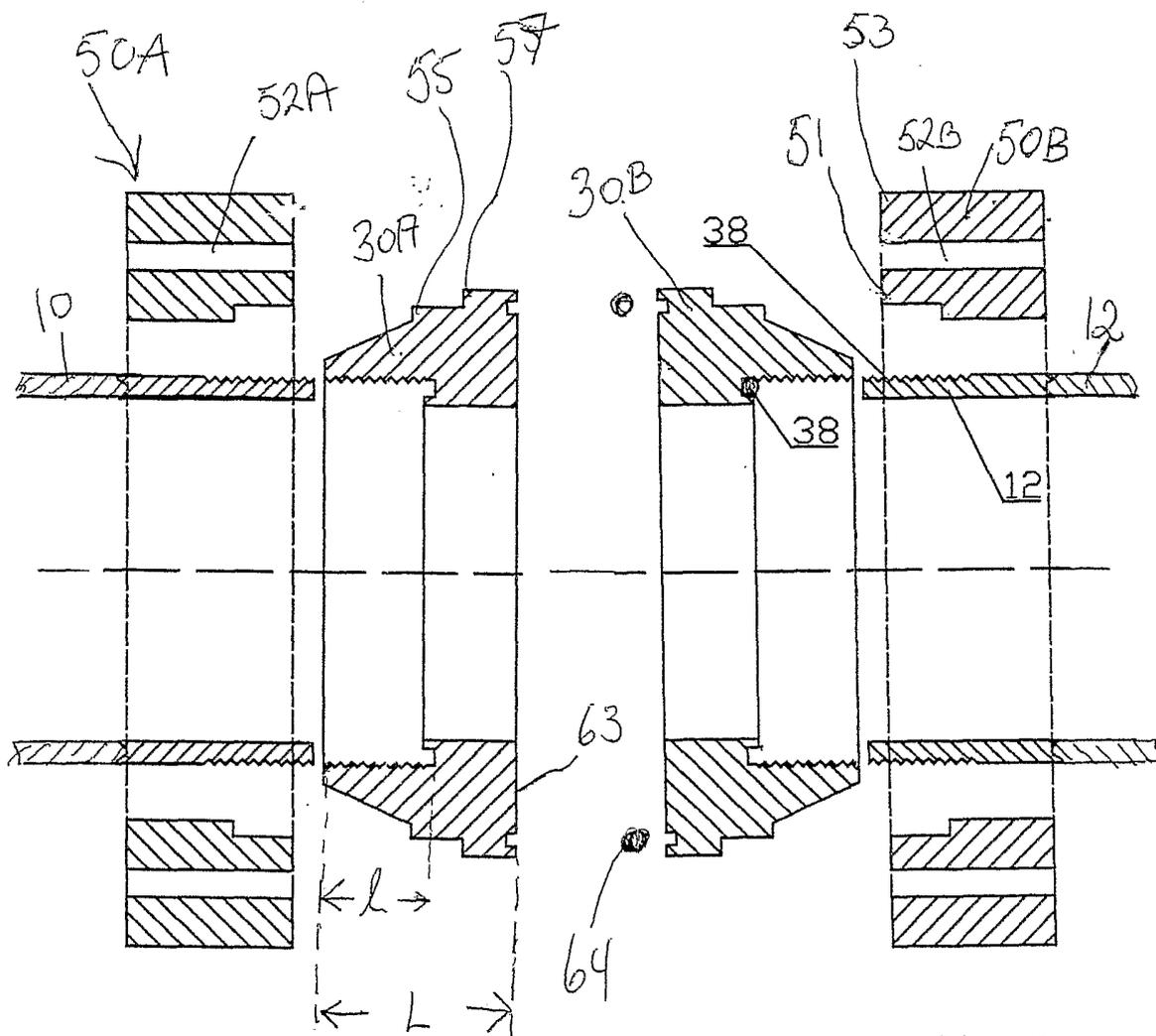
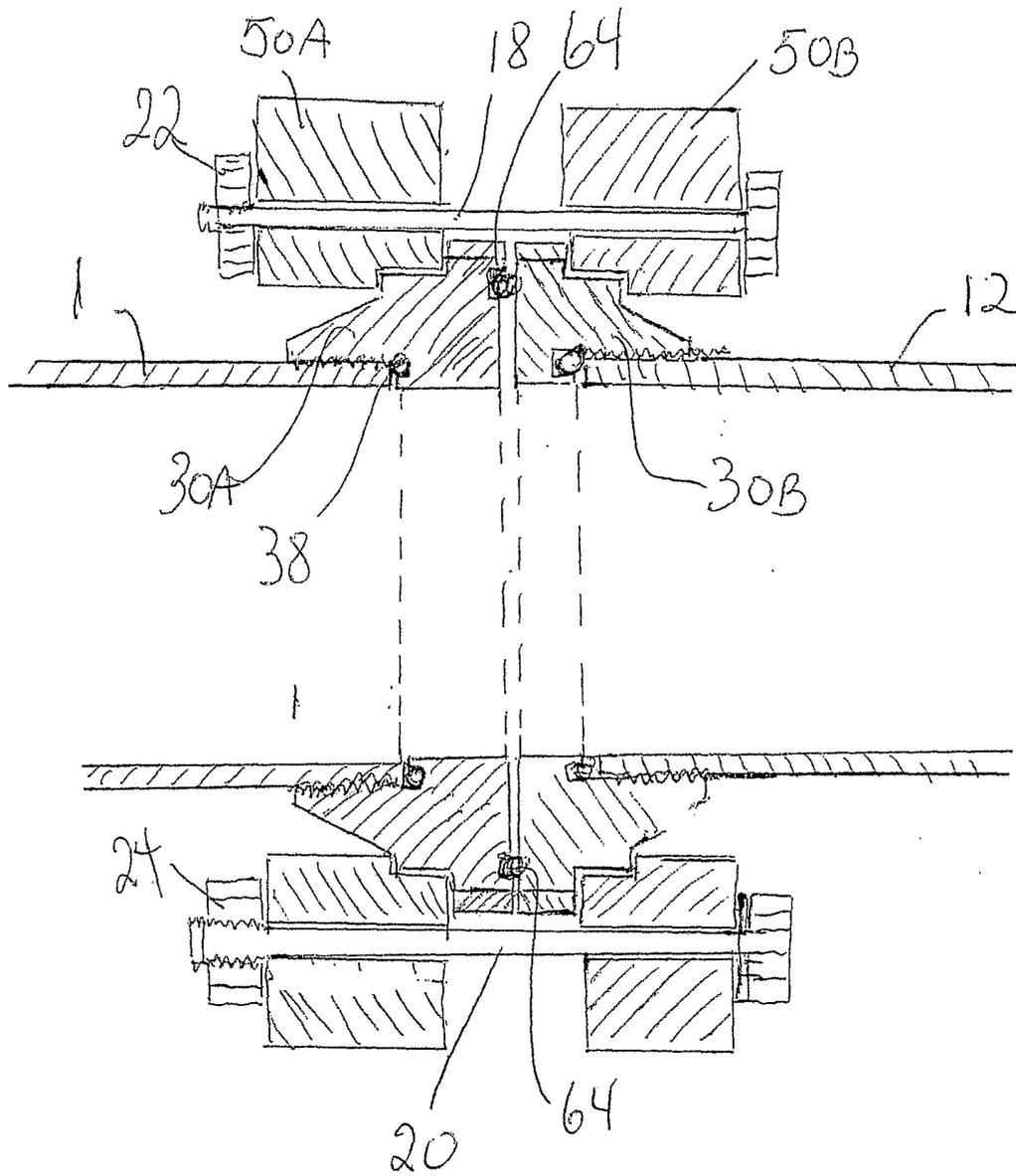


FIG 3



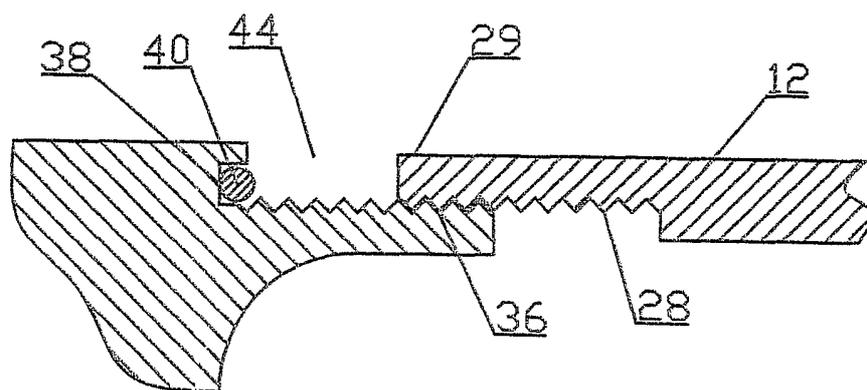


FIG 5

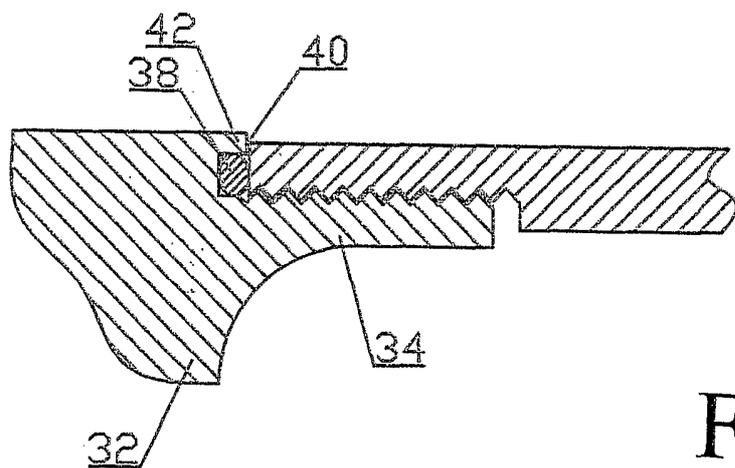


FIG 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 2003/000432

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: F16L 23/028

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)

IPC7: F16L

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

SE,DK,FI,NO classes as above

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

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 9060774 A (NAGASE CHUKO KK), 9 March 1997 (09.03.1997), figure 1 ---	1-17
X	US 3418009 A (ANDREW A. POLLIA), 24 December 1968 (24.12.1968), figure 1 --	1-6,9-14,17
X	DE 315485 A (AKTIENGESELLSCHAFT FERRUM), 6 November 1919 (06.11.1919), figure --	1-5,9-14,17
X	US 2979087 A (LUDWIG VOGT), 11 April 1961 (11.04.1961), figure 7 -- -----	1-3,6,9-11, 14,17

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search

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Authorized officer

Malin Hallmén / JA A
Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

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JP	9060774	A	09/03/1997	NONE
US	3418009	A	24/12/1968	NONE
DE	315485	A	06/11/1919	NONE
US	2979087	A	11/04/1961	NONE