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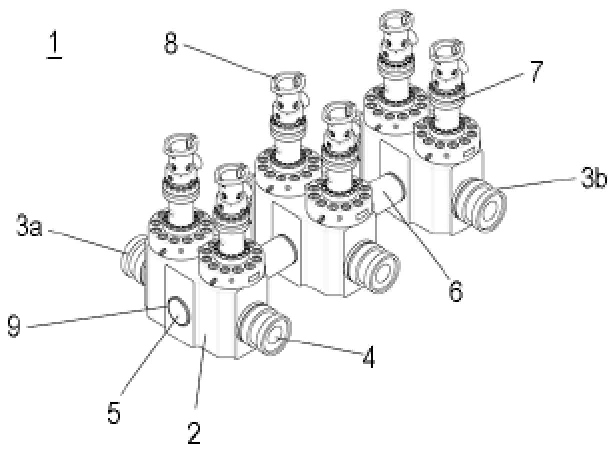
(54) Title **2-slot inline block manifold system**

(56) References Cited: US 2018/0030796 A1, US 2012/0181015 A1, US 2014/0064855 A1, WO 2016/044910 A1

(57) Abstract

The present invention relates to a hub block (2) with two hubs (3a, 3b), each configured for connection with a branch pipe from a well. The two hubs are in line with each other. A flowline bore (12) extends between flowline inlet and exit ports (5, 10). The flowline bore (12) is intersecting and in fluid connection with two branch bores (23a, 23b) extending from the flowline bore (12) and to the hubs (3a, 3b). Two valve bores (11a, 11b) extend across the branch bores (23a, 23b). Furthermore the invention relates to a 2-slot inline block (1) with a hub block (2) and an manifold assembly of a plurality of 2-slot inline blocks (1).



The present invention relates to a hub block, a 2-slot inline block, an assembly of a plurality of 2-slot inline blocks and an inline block manifold system. In particular the invention relates to a 2-slot inline block manifold system for installation on a pipeline conveying hydrocarbon fluids along the seabed.

A typical seabed pipeline laying procedure includes implementing a pipe laying vessel where sections of pipeline are welded together on-board the vessel. The vessel moves at constant speed while welding stations are moving along the vessel at the same speed as the pipeline.

Various elements, such as in-line tees (ILTs), valves etc. must sometimes be welded to the pipeline, and the vessel must then typically be stopped to allow time for installation.

At present cumbersome and complicated structures such as manifolds have a design that prevent installation on the pipeline in the pipeline sections assembly line. This is due both to the weight of the structure and to the large dimensions of a manifold, making it too wide to pass through the conveyors on the pipeline section assembly line. Larger structures such as manifolds are therefore connected to the pipeline structures on the seabed at a later stage. This entails the additional need for connecting spools and related equipment.

However, there is a constant request in the marked for solutions enabling improved efficiency during layout of a production field. There is also a need for simplified field solutions that combine simplicity with flexibility.

Furthermore, if the seabed of the oilfield is made of sand or mud, production equipment is placed on mud mats. Such mud mats are often placed on the seabed before or after lowering the equipment. It would be an advantage if elements installed on the pipeline could be secured to a mud mat during assembly on the vessel. This however is difficult due to the limitations in available space in the production line.

US 2018/030796 discloses a modular manifold with a manifold base at a surface or subsea location. Modular units may be deployed to and/or retrieved from the manifold base according to a desired control of fluid flows with respect to a well or wells. Each modular unit may be coupled or decoupled along the manifold base to adjust the configuration of the manifold for a given job or to accommodate changing conditions.

US 2012/0181015 provides one or more manifolds with manifold portions primarily of fluid conduit and flow components mounted to the manifold portions, such as valves and fluid fittings. The manifold is formed with a uniform bore, so that the manifold portions are the same size along the flow path of the manifold. The valves and fluid fittings have a bore the same size of the bore of the manifold portions.

US 2014/0064855 discloses a method and a connecting apparatus for attaching a pipeline termination assembly to a subsea structure. The pipeline termination assembly has a pivot axis member, and the subsea structure has one or more capture slots to receive it. The pivot axis member is captured in the capture slot. The slot allows vertical movement of the pipeline termination assembly and is rotated about the pivot axis to assume a horizontal position.

WO 2016/044910 discloses a manifold with a block with at least one drilled header hole formed within the block. A plurality of drilled flow inlet holes are formed within the block, and the number of drilled flow inlet holes corresponds to a number of a plurality of external flow lines that supply fluid (e.g., oil/gas) to the manifold. A plurality of isolation valves are coupled to the block. The valve element for each of the isolation valves is positioned within the block.

It is thus a purpose of the present invention to provide a manifold system integrated on a pipeline at an assembly stage that allows at least two parallel branches to be installed while at the same time the manifold system is allowed to be installed and launched through the tensioner system and the stinger on the pipe lying vessel. Furthermore it is a purpose of the present invention to provide a compact system that is simple to adapt to specific needs, that include few parts, that is easy to stock, that is standardized, and that has few seals.

The present invention discloses an inline block manifold system. The inline block manifold system is integrated on a pipeline at an assembly stage and is adapted to be installed and launched from a pipe lying vessel comprising a plurality of hub blocks. Each hub block includes two integrated hubs whereof a first hub is configured for connection with a branch pipe from a first well, and a second hub is configured for connection with a branch pipe from a second well, in line with the first hub and facing in an opposite direction of the first hub. One flowline bore extends between one flowline inlet port and one flowline exit port, intersecting and in fluid connection with a first branch bore extending from the flowline bore and to the first hub. A second branch bore extends from the flowline bore and to the second hub. A first valve bore extends across the first branch bore, and a second valve bore extends across the second branch bore. A centreline through the flowline bore in each hub block of the plurality of hub blocks, a centreline through each of a plurality of flowline spacer pipes provided between hub blocks of the plurality of hub blocks, and a centreline through a portion of a flowline are located in one single plane.

The present invention furthermore relates to a hub block comprising a first hub configured for connection with a branch pipe or jumper from a first well and a second hub configured for connection with a branch pipe or jumper from a second well, in line with the first hub. A flowline bore, extend between a flowline inlet port and a flowline exit port, perpendicular to, and in fluid connection with a first branch bore extending from the flowline bore and to the first hub. A second branch bore extend from the flowline bore and to the second hub across the flowline bore. A first valve bore extend across the first branch bore, and a second valve bore extend across the second branch bore.

The hub block is preferably a single piece metal block.

The hub block may further include a flowline alignment geometry surrounding the flowline inlet port and the flowline exit port. The flowline alignment geometry enables the hub block to be aligned with a flowline as an assembly of one or more hub blocks are welded to the flowline. The flowline alignment geometry is typically a recess with an inner diameter corresponding to the outer diameter of the flowline and the valve spacer pipes, and with an annular end face with a height corresponding to the wall thickness of the flowline and the valve spacer pipes, thus providing a smooth inner bore after assembly of the components.

The first valve bore may be perpendicular to the first branch bore, and the second valve bore may be perpendicular to second branch bore.

A 2-slot inline block of the invention comprise a hub block as described above and includes a cut-off valve in each of the first valve bore and the second valve bore.

An assembly of the invention includes a plurality of 2-slot inline blocks as described above. Flowline spacer pipes connect and stabilize the inline blocks. A first end of a first flowline spacer pipe of a plurality of flowline valve spacer pipes, is welded to the flowline exit port of a first of the plurality of 2-slot inline block manifolds. A second end of the first flowline spacer pipe is welded to the flowline inlet port of a second of the plurality of 2-slot inline block manifolds.

Furthermore, the invention concerns an inline block manifold system comprising an assembly as described above. Each of the plurality of 2-slot inline blocks is secured to a carrier element forming a centre section of a mud mat whereby the plurality of 2-slot inline blocks are in line with each other. The line of a plurality of 2-slot inline blocks include one 2-slot inline block at a first end of the line and a second 2-slot inline block at a second end of the line. The inlet port of the 2-slot inline block at the first end of the line and the exit port of the 2-slot inline block at the second end of the line are connected to the flowline.

The mud mat may include at least two mud mat parts, each hinged to the carrier element forming the centre section of the mud mat. The mud mat may include an installation configuration where the at least two mud mat parts are folded and each carrier surface defines separate carrier planes, and a deployed configuration where the at least two mud mat parts are unfolded, and the two carrier surfaces define a single plane.

When the mud mat parts are unfolded defining a single plane, a set of telescopic arms are extended from the centre part of the inline block manifold system to secure the mud mats in the unfolded position.

The inline block manifold system may further include a flowline stress concentration reducing cocoon connected to each end of the carrier element. A first flowline bend may connect the inlet port of the 2-slot inline block at the first end of the line and the flowline, and a second flowline bend may connect the exit port of the 2-slot inline block at the second end of the line and the flowline.

Short description of the enclosed drawings:

Fig. 1 is a perspective view of three 2-slot inline blocks of the invention;

Fig. 2 is a perspective view of the three 2-slot inline blocks of fig. 1, spaced apart to show flowline spacer pipes;

Fig. 3 is a cross section in perspective view of a hub block of the invention;

Fig. 4 is a perspective view of an inline block manifold system of the invention;

Fig. 5 is a side elevation of the inline block manifold system shown in fig. 4, in an unfolded operating configuration;

Fig. 6 is a side elevation of the inline block manifold system shown in fig. 4, in a folded installation configuration;

Fig. 7 a front view of the inline block manifold system shown in fig. 4, in a folded installation configuration; and

Fig. 8 a top view of the inline block manifold system shown in fig. 4, in a folded installation configuration.

Fig. 1 shows three 2-slot inline block manifolds 1 of the invention. The three manifolds 1 are provided to allow six jumpers/branch pipes to be connected to a flowline. The three block manifolds 1 are connected with flowline spacer pipes 6 to provide sufficient space between each manifold to allow jumpers to be connected with clamp connectors. The flowline spacer pipes 6 are welded to hub blocks 2 either onshore in a workshop prior to being shipped out or on a pipe laying ship during pipe laying operations. Two hubs 3a, 3b with jumper / branch ports 4 are integrated in each manifold housing block along with an inlet port 5 aligned with an exit port 10 (at an opposite side of the inlet port 5. The side not shown is a mirror image of the shown side and is thus disclosed). Each jumper port 4 can be closed with a valve 7 with a torque tool bucket 8 allowing a ROV to open or close the valve. Alternatively, the torque tool bucket 8 could be substituted with an integrated, powered actuator. A flowline alignment geometry 9 surrounds the inlet port 5 and the exit port 10 and facilitates alignment of the flowline spacer pipes 6 and a flowline when the hub blocks 2 are installed on a flowline and the flowline and spacers are welded to the hub block 2. The flowline alignment geometry 9 is typically a recess with an inner diameter corresponding to the outer diameter of the flowline to avoid a reduction of the flowline inner diameter through the manifold while ensuring proper alignment of the flowlines and to ensure that the flowline not interferes with the bores from the branch ports 4.

Fig. 2 corresponds with fig 1 and shows the flowline spacer pipes 6 in greater detail. The figures show three 2-slot inline block manifolds 1, but more than three can easily be implemented. Fewer than three may also be used, but the advantage with the invention is then less prominent.

Fig. 3 is a perspective view of a cut through hub block 2 for a manifold of the invention. The hub block is machined, cast or printed in one single piece and includes a flowline bore 12, two branch ports 4, two integrated hubs 3a, 3b, and two valve bores 11a, 11b. The hub block is typically a single piece steel block. The flowline bore 12 connects the inlet port 5 and the exit port 10 shown on fig. 2. The two valve bores 11a, 11b intersects the two branch bores 23a, 23b connecting the two branch ports 4 and the flowline bore 12, allowing installation of the cut off valves between the branch ports 4 and the flowline bore 12. The two branch ports 4 are aligned with each other and the two branch bores 23a, 23b meet at the flowline bore 12.

Figs. 4-8 show three manifolds of figs. 1-3 installed on a hinged mud mat 15. In fig. 4, the mud mat 15 is in a deployed configuration where the at least two mud mat parts are unfolded and each carrier surface define a single plane. This unfolded operating position maintains the inline block manifold system stability while locating the manifolds at a predictable position in relation to the seabed. A telescopic arm 24 below each block is shown in an extended position, and hold the two mud mat parts in the unfolded position. Common linear actuators operated by an ROV, or that are energized by an energy storage in the form of batteries or hydraulic actuators operating electric linear actuators or hydraulic cylinders extend the telescopic arms 24. Wiring can alternatively connect the actuators to a topside. Figures 4 and 5 show three telescopic arms 24, but a higher or lower may clearly be used.

The hinged mud mat 15 is secured to the flowline 14 through flowline reducing cocoons 16 at each side, interconnected by a carrier pipe 20. The flowline reducing cocoons 16 are in-line with the carrier pipe 20 while the flowline exits the carrier pipe 20 through two flowline manifold bends 22, connecting the flow line 14 with the manifolds 1. The carrier pipe 20 maintains the axial loads in the flow line 14 and the reducing cocoons 16 distributes the loads on the flowline 14 and prevent stress concentrations and buckling.

Temporary mud mat locking pins 21 are provided to hold the two, hinged mud mat halves of the mud mat 15 in a folded position prior to installation on a seabed. A clamp connector 13 (six in total) is located on each integrated hub 3 to provide a connection for each jumper. During installation a number of telescopic arms 24 perpendicular to the flowline axis are in a retracted position between the upright mud mat elements. When the mud mat is unfolded, the telescopic arms 24 are extended forming a locking mechanism maintaining the mud mat in an unfolded position on the seabed.

A transponder bucket 17 is installed allowing position measurement during and after installation. A ROV remove the instrument after final measurement.

A metrology receptacle is secured to the carrier pipe 20 to be used for jumper metrology.

The flowline bores of the three 2-slot inline block maniflods 1 are inline and produce a straight flow through the manifold, at least when the valves are closed. The flows from the jumper ports are channelled through the centre of the manifold 1 and further to the flowline 14. Accordingly, the manifolds provide a favourable flow pattern and a low pressure drop across the manifolds. The two flows from the opposing branch ports 4 meet inside the flowline bore of the manifold 1.

Fig. 5 is a view of the three manifolds of figs. 1-3 installed on the hinged mud mat from the side. The flowline manifold bends 22 lead the flowline through the carrier pipe 20 and into the manifold system, while the carrier pipe 20 continues in the elongation of the flow line and the reducing cocoons 16. The mud mat halves are held in place in the open, unfolded operating position by suitable locks and the telescopic arms 24. In fig. 5, the temporary mud mat locking pins 21 are released to allow the two mud mat halves to unfold and to allow the two mud mat halves to define a common plane. Six clamp connectors 13 are located on the integrated hubs to provide a suitable connection with branch pipes/jumpers. Flowline spacer pipes 6 are provided between the manifold blocks.

Fig. 5 and 6 clearly show three telescopic arms 24 in an extended position. In the extended position, the telescopic arms extend above the two mud mat parts and secure the mud mat in the open, unfolded position. The telescopic arms 24 run in a direction parallel to the mud mat parts when these are unfolded and will also contribute to the unfolding of the two mud mat parts in the event the mud mat parts do not unfold completely under the effect of gravity. The telescopic arms 24 have a length that is less than the width of the complete system of blocks, valves and mud mat when the telescopic arms are in a retracted position, as shown in figures 6, 7 and 8.

Figs. 6-8 correspond to figs. 4-5, but show the mud mat 15 in a folded position from the side, from the front, and from above respectively. Figs. 6-8 represent an installation configuration where the at least two mud mat parts are folded and each carrier surface define separate carrier planes. The telescopic arms 24 are retracted and arranged between the mud mats. The folded position is maintained to allow assembly of the manifolds and the mud mat 15 onto a flowline on a pipe laying ship during pipe laying operations. The width of the assembly is less than a maximum width the pipe laying ship allows. The assembly may be installed on the pipeline during ordinary pipe laying operation without stopping the pipe laying ship. The cocoons 16 and the carrier pipe 20 also facilitates the assembly on the flowline assembly line. The locking pins 21 maintains the two halves of the mud mat 15 in the folded position. From figs. 7 and 8 it is clear how the flowline, the flowline valve bends 22, the flowline valve spacer pipes, and the manifold housing block flowline bore are located in the same plane. The centre lines in figures 6 and 8 and a vertical line through the centre of fig. 7 can define this plane.

The configuration of the manifolds in line with each other, and with the jumpers entering the manifold from two opposite directions into the flow line, enables a plurality of manifolds to be installed in-line without any practical limit in the number of manifolds. The distance between each manifold is only limited by the size of the clamp connectors, and the allowable length of each section on the pipe laying ship. This results in a compact and flexible manifold configuration.

1	2-slot inline block manifold
2	Hub block
3a	First integrated hub
3b	Second integrated hub
4	Jumper port
5	Flowline inlet port
6	Flowline valve spacer pipe
7	Valve
8	Torque tool bucket
9	Flowline alignment geometry
10	Exit port
11a	First valve bore
11b	Second valve bore
12	Flowline bore
13	Clamp connector
14	Flow line
15	Hinged mud mat
16	Reducing cocoon
17	Transponder bucket
18	Metrology receptacle
20	Carrier pipe/carrier element
21	Temporary mudmat locking pins

22	Flowline valve bend
23a	First branch bore
23b	Second branch bore
24	Telescopic arms

CLAIMS

1. An inline block manifold system integrated on a pipeline at an assembly stage and adapted to be installed and launched from a pipe lying vessel comprising a plurality of hub blocks (2):

wherein each hub block (2) includes two integrated hubs (3a, 3b) whereof a first hub (3a) configured for connection with a branch pipe from a first well, and a second hub (3b) configured for connection with a branch pipe from a second well, in line with the first hub (3a) and facing in an opposite direction of the first hub (3a), one flowline bore (12), extending between one flowline inlet port (5) and one flowline exit port (10), intersecting and in fluid connection with a first branch bore (23a) extending from the flowline bore (12) and to the first hub (3a) and a second branch bore (23b) extending from the flowline bore (12) and to the second hub (3b), a first valve bore (11a) extending across the first branch bore (23a), and a second valve bore (11b) extending across the second branch bore (23b); and

wherein a centreline through the flowline bore (12) in each hub block (2) of the plurality of hub blocks (2), a centreline through each of a plurality of flowline spacer pipes (6) provided between hub blocks (2) of the plurality of hub blocks (2), and a centreline through a portion of a flowline (14) are located in one single plane.

2. The inline block manifold system of claim 1, wherein each hub block (2), is made of one single block of metal.

3. The inline block manifold system of claim any of claims 1-2, wherein each hub block (2), further includes a flowline alignment geometry (9) surrounding the flowline inlet port (5) and the flowline exit port (10).

4. The inline block manifold system of any of the preceding claims, wherein, in each of the hub blocks (2), the first valve bore (11a) is perpendicular to the first branch bore (23a); and

the second valve bore (11b) is perpendicular to second branch bore (23b).

5. A 2-port inline block manifold (1) in the inline block manifold system of one of the claims 1-4, further including a cut-off valve (7) in each of the first valve bore (11a) and the second valve bore (11b).

6. An assembly of a plurality of 2-port inline block manifolds (1) of claim 5,

wherein a first end of a first flowline spacer pipe (6) of the plurality of flowline spacer pipes (6) is welded to the flowline exit port (10) of a first of the plurality of 2-port inline block manifolds (1); and

a second end of the first flowline spacer pipe (6) is welded to the flowline inlet port (5) of a second of the plurality of 2-port inline block manifolds (1).

7. An inline block manifold system with an assembly of claim 6, wherein each of the plurality of 2-port inline block manifolds (1) is secured to a carrier element (20) forming a centre section of a mud mat (15) whereby the plurality of 2-port inline block manifolds (1) are in line with each other and include one 2-port inline block manifold (1) at a first end of and a second 2-port inline block manifold (1) at a second end; and

wherein the inlet port (5) of the 2-port inline block manifold (1) at the first end and the exit port (10) of the 2-port inline block manifold (1) at the second end are in fluid connection with the flowline (14).

8. The inline block manifold system of one of the claims 7, wherein the mud mat (15) includes at least two mud mat parts, each hinged to the carrier element (20) forming the centre section of the mud mat (15);

wherein the mud mat (15) includes an installation configuration where the at least two mud mat parts are folded, and each mat part defines a carrier surface defining a separate carrier plane; and

wherein the mud mat (15) includes a deployed configuration where the at least two mud mat parts are unfolded and each carrier surface define a single plane, and

wherein the mud mat (15) includes a number of telescopic arms (24) retractable for installation and extendable for stabilising the mud mat (15) when the mud mat (15) is unfolded.

9. The inline block manifold system of one of the claims 7 or 8, further including a flowline stress concentration reducing cocoon (16) connected to each end of the carrier element (20);

wherein a first flowline bend (22) connects the inlet port (5) of the 2-port inline block manifolds (1) at the first end of the line and the flowline (14); and

wherein a second flowline bend (22) connects the exit port (10) of the 2-port inline block manifold (1) at the second end of the line and the flowline (12).

KRAV

1. Inline, blokkmanifold-system integrert på et strømningsrør i et monteringstrinn og som er tilpasset for å bli installert og satt ut fra et rørleggende fartøy, og som omfatter et flertall hub-blokker (2):

hvori hver hub-blokk (2) inkluderer to integrerte hubber (3a, 3b) hvorav en første hub (3a) konfigurert for tilkobling til et grenrør fra en første brønn, og en andre hub (3b), konfigurert for tilkobling til et grenrør fra en andre brønn og på linje med den første hubben (3a) og vendt i motsatt retning av den første hubben (3a), en strømningsrørs-boring (12) som strekker seg mellom en strømningsrørs-innløpsport (5) og en strømningsrørs-utgangsport (10), kryssende og i fluidforbindelse med en første grenboring (23a) som strekker seg fra strømningsrørs-boringen (12) og til den første hubben (3a) og en andre grenboring (23b) som strekker seg fra strømningsrørs-boringen (12) og til den andre hub (3b), en første ventilboring (11a) som strekker seg over den første grenboringen (23a), og en andre ventilboring (11b) som strekker seg over den andre grenboringen (23b); og

hvori en senterlinje gjennom strømningsrørs-boringen (12) i hver hub-blokk (2) av flertallet av hub-blokker (2), en senterlinje gjennom hvert av et flertall strømningsrørs-avstandsrør (6) anordnet mellom hub-blokkene (2) til flere hub-blokker (2), og en senterlinje gjennom en del av et strømningsrør (14) er plassert i ett enkelt plan.

2. Inline, blokkmanifold-system ifølge krav 1, hvori hver hub-blokk (2) er laget av en enkelt metallblokk.

3. Inline, blokkmanifold-system ifølge krav 1-2, hvori hver hub-blokk (2) videre inkluderer en strømningsrør-innrettingsgeometri (9) som omgir strømningsrørs-innløpsporten (5) og strømningsrørets utløpsport (10).

4. Inline, blokkmanifold-system ifølge hvilket som helst av de foregående kravene, hvori, i hver av hub-blokkene (2), den første ventilboringen (11a) er vinkelrett på den første grenboringen (23a); og

den andre ventilboringen (11b) er vinkelrett på den andre grenboringen (23b).

5. 2-ports, inline, blokkmanifold (1) med hub-blokk i henhold til ett av kravene 1-4 videre omfattende en avskjæringsventil (7) i hver av den første ventilboringen (11a) og den andre ventilboringen (11b).

6. Sammenstilling av et flertall av 2-ports inline, blokkmanifolder (1) ifølge krav 5,

hvori en første ende av et første strømningsrør-avstandsrør (6) av flertallet av strømningsrørs-avstandsrør (6) er sveiset til strømningsrørs-utløpsporten (10) til en første av flertallet av 2-ports, inline, blokkmanifolder (1); og

en andre ende av det første avstandsrøret for strømningsrøret (6) er sveiset til strømningsrørs-innløpsporten (5) til en andre av flertallet av 2-ports inline blokkmanifolder (1).

7. Inline, blokkmanifold-system med en sammenstilling ifølge krav 6, hvori hver av flertallet av 2-ports inline blokkmanifolder (1) er festet til et bæreelement (20) som danner en midtseksjon av en slammatte (15) hvorved flere 2-ports inline blokkmanifolder (1) er på linje med hverandre og inkluderer en 2-ports inline blokkmanifold (1) ved en første ende og en andre 2-ports inline blokkmanifold (1) ved en andre ende; og

hvori innløpsporten (5) til 2-ports inline-blokkmanifolden (1) ved den første enden og utløpsporten (10) til 2-ports inline-blokkmanifolden (1) i den andre enden er i fluidforbindelse med strømningsrøret (14).

8. Inline, blokkmanifold-system ifølge krav 7, hvori slammatten (15) inkluderer minst to slammattedeler, hver hengslet til bæreelementet (20) som danner senterdelen av slammatten (15);

hvori slammatten (15) inkluderer en installasjons-konfigurasjon hvor de minst to slammattedelene er foldet, og hver mattedel definerer en bæreflate som definerer et separat bæreplan; og

hvori slammatten (15) inkluderer en utplassert konfigurasjon hvor de minst to slammattedelene er utfoldet og hver bæreflate definerer et enkelt plan, og

hvori slammatten (15) inkluderer et antall teleskopiske armer (24) som kan trekkes tilbake for installasjon og som kan trekkes ut for å stabilisere slammatten (15) når slammatten (15) er utfoldet.

9. Inline, blokkmanifold-system ifølge ett av kravene 7 eller 8, videre innbefattende en strømningsrørs-hylse (16) for å redusere spenningskonsentrasjoner i strømningsrøret koblet til hver ende av bæreelementet (20);

hvori et første strømningsrør-bend (22) forbinder innløpsporten (5) til 2-ports inline-blokkmanifolden (1) ved den første enden av røret og strømningsrøret (14); og

hvori et andre strømningsrør-bend (22) forbinder utløpsporten (10) til 2-ports inline-blokkmanifolden (1) ved den andre enden av røret og strømningsrøret (12).

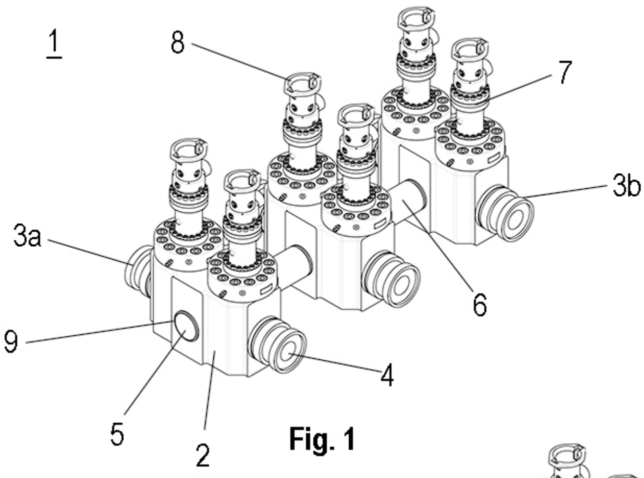


Fig. 1

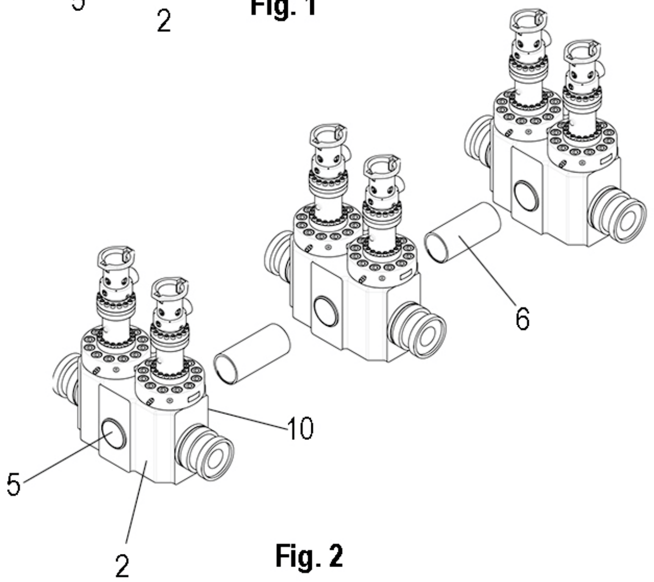


Fig. 2

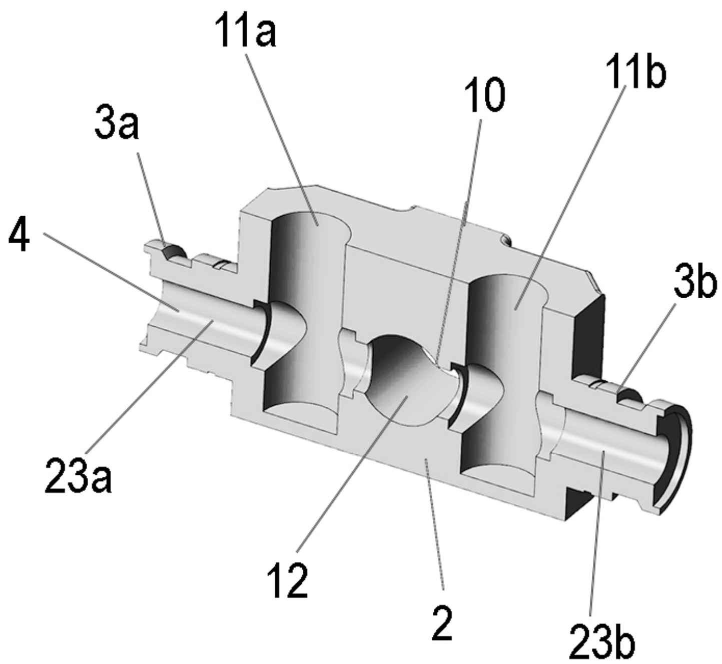


Fig. 3

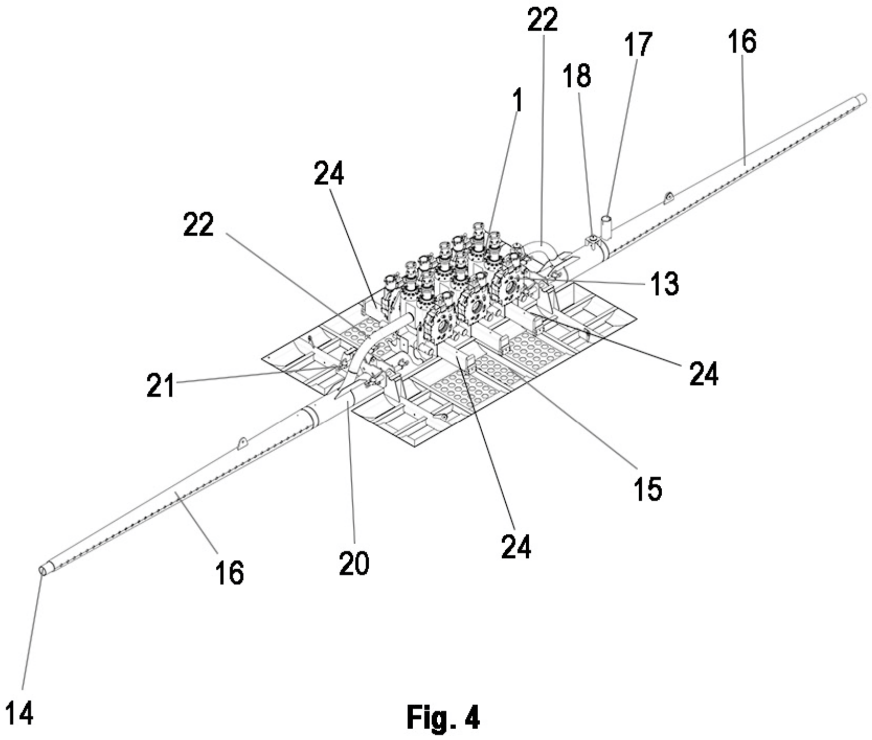


Fig. 4

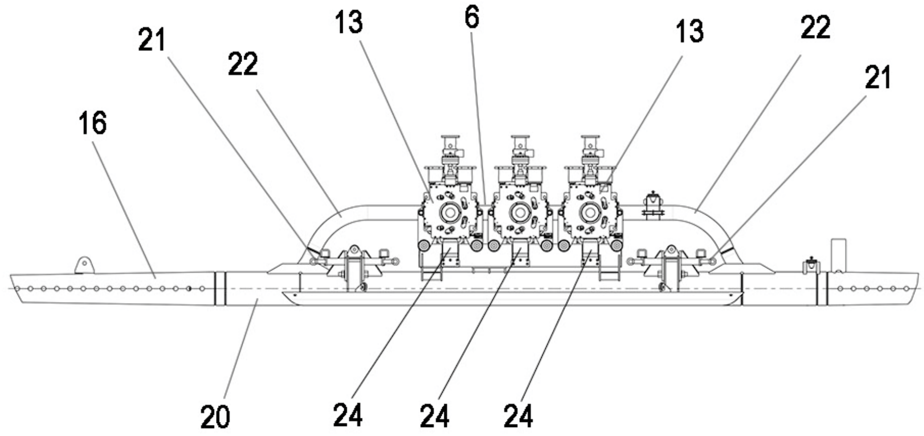


Fig. 5

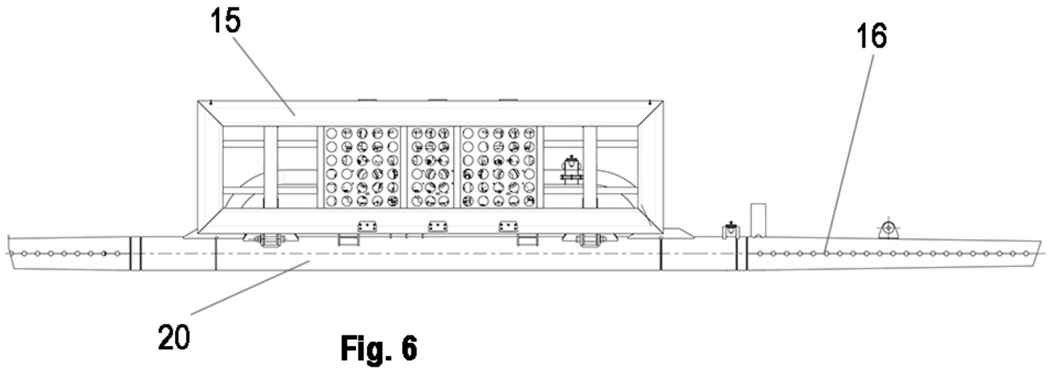


Fig. 6

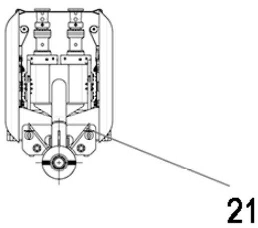


Fig. 7

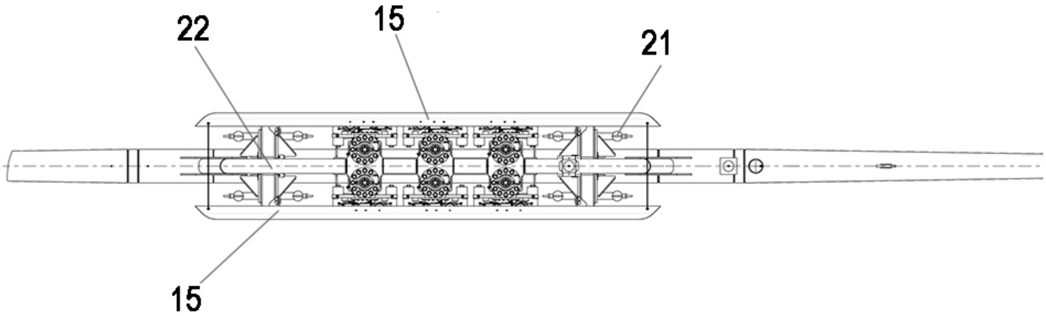


Fig. 8