

19



Octrooi Centrum  
Nederland

11

2021801

12 B1 OCTROOI

21 Aanvraagnummer: **2021801**

51 Int. Cl.:

**B65G 11/14 (2018.01) E02D 15/10 (2018.01) B63B 27/28 (2019.01) B63B 35/30 (2019.01)**

22 Aanvraag ingediend: **12 oktober 2018**

30 Voorrang:

73 Octrooihouder(s):

**IHC Holland IE B.V. te Sliedrecht**

41 Aanvraag ingeschreven:  
**13 mei 2020**

72 Uitvinder(s):

**Alexander Maarten van der Zee te Delft**

43 Aanvraag gepubliceerd:  
-

74 Gemachtigde:

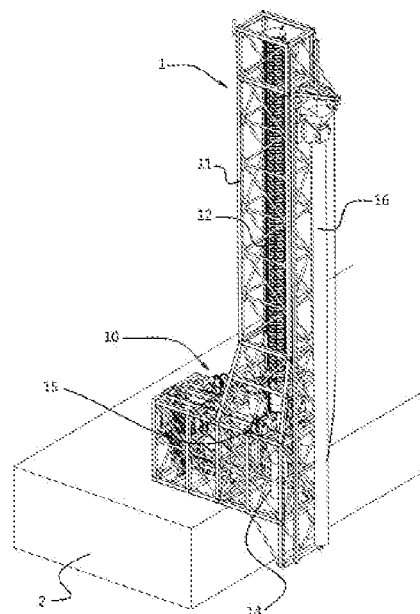
**ir. M.F.J.M. Ketelaars c.s. te Den Haag**

47 Octrooi verleend:  
**13 mei 2020**

45 Octrooischrift uitgegeven:  
**13 mei 2020**

54 **Fall pipe system**

57 A fall pipe system for placing rocks on a seabed from a marine vessel, the fall pipe system comprising:  
a windable elongate support member, adapted to be lowered down from the vessel towards the seabed;  
a plurality of pipe segments, wherein at least one pipe segment comprises a suspension system for releasably connecting the pipe segment to the elongate support member;  
a storage rack, adapted to store the pipe segments;  
wherein the fall pipe system comprises a transportation system for individually transporting from a first position in which they are stored in the storage rack while they are individually disconnected from the elongate support member, to a second position in which they are connected to the elongate support member via the suspension system.



## **Fall pipe system**

### **Field of the invention**

The present invention relates to a fall pipe system for placing rocks on the seabed from a marine vessel and to a marine vessel comprising such fall pipe system. The invention further relates to a method for forming a string of pipe segments and to a method for placing rocks on the seabed from a marine vessel.

### **Background art**

Fall pipe systems are used to place or deposit rocks or stones on the seabed, for instance to protect hydrocarbon pipes, support wind turbine foundations, etc.

Typical fall pipe systems use a plurality of (tapered) pipe segments or bottomless buckets which are attached to a couple of parallel elongate support members such as chains, to form a string of pipe segments. The buckets are fixedly attached, that is inseparable, to the chains. The string of pipe segments is suspended from the vessel and rocks are deposited through the pipe segments. When it is not in use, the string of pipe segments is stored in the hull or on the deck of the vessel. Usually, one end of the string of pipe segments is connected to a deployment system on the deck of the vessel. The other end of the string of pipe segments is connected to lifting wires in order to control the depth of the rock placement.

Such a fall pipe system, or also chute, is known from EP0450675A1 that relates to a vessel provided with tubular means descending from or beside the vessel, said tubular means being intended for depositing material therethrough on the underwater bottom surface, whereby driving means are provided near the bottom end of said tubular means, by which the end of the tubular means is movable transversely to the longitudinal axis of the tubular means, and whereby hoisting cables are attached to the bottom end of the tubular means, which hoisting cables extend between the bottom end of the tubular means and hoisting gear present on the vessel.

A disadvantage of the fall pipe segments of the prior art is that they are not easily adaptable to different needs like e.g. range of depth. For instance, when the depth of the sea varies, it is not easy to adjust the length of the string. Also, when a pipe segment needs to be repaired or exchanged, the entire string of pipe segment will be out of use until the damaged pipe segment is repaired or replaced.

### **Summary of the invention**

It would be desirable to provide a fall pipe system which is more easily adaptable to different needs, and/or which at least partially mitigates the problems of the prior art, and/or to provide an alternative fall pipe system.

Therefore, the invention provides a fall pipe system for placing rocks on a seabed from a marine vessel, the fall pipe system comprising:

a windable elongate support member, adapted to be lowered down from the vessel towards the seabed;

a plurality of pipe segments, wherein at least one pipe segment, in particular all of the pipe segments, comprises a suspension system for releasably connecting the pipe segment to the elongate support member;

a storage rack, adapted to store a plurality of pipe segments; and

5 a transportation system for individually transporting pipe segments from a first position in which they are stored in the storage rack while they are individually disconnected from the elongate support member, to a second position in which they are connected to the elongate support member via the suspension system.

10 The fall pipe system has the advantage that it has a modular design. The pipe segments do not have a fixed link to the elongate support member, but just a suspension system, by which the pipe segments can be connected or clicked onto the elongate support member, and disconnected when not in use.

The releasable connection makes it easy to connect and disconnect pipe segments to and from the elongate support member, such that the length of the string can be easily varied. 15 Releasable connected is to say that a pipe segment can be disconnected from the elongate support member with ease. The connection between the pipe segment and the elongate support member is therefore a form closed type of connection between the bucket and the elongate support member. Because of the form closed connection, no connecting force is required and therefore tooling is unnecessary. In contrast, in existing fall pipe systems, buckets are fixedly attached, that is 20 inseparable, to the chains. Therefore, in existing fall pipe systems the connection between the pipe segment and the elongate support member is either a force closed type of connection and tooling is required. Also, since according to the invention the pipe segments are individually stored in the storage rack when they are not used and thus disconnected, it is relatively easy to take one out and repair or replace it. Also, the system can be easily upgraded, for instance by adding another storage 25 rack with a stack of more pipe segments.

The windable elongate support member may be one of a chain, a wire, a cable or an equivalent component. The elongate support member being windable is to say that the support member is flexible and can be guided around a guide wheel and wound on a reel or a windlass, such that it can be stored and transported and wound/unwound in a convenient manner. It may also 30 be stored in a storage facility such as a chain locker. The elongate support member is preferably made of metal.

The string of pipe segments may be configured to have any desired length depending on the use and purpose. For example the string of pipe segments may have a total length of between 50 to 200 meters. The fall pipe system may comprise a device for supplying rocks to the fall pipe 35 segments, for instance a conveyor belt.

The storage rack comprises a frame and facilities to support a stack of pipe segments within the frame. The storage rack / the stack of pipe segments in the first position has a height depending on the number of pipe segments. For example, the storage rack / the stack of pipe segments may have a height of 30 meters or more.

The pipe segments may have a height of between 1 and 5 meters, preferably between 2 and 3 meters. The pipe segments may have an inner diameter of at least 0.5 meters, preferably between 1 and 2 meters. The pipe segments may be tapered; the inner diameter may range from between 1 and 1.5 meters at the bottom to between 1.5 and 2 meters at the top. The pipe segments  
5 may be made of plastic, such as high-density polyethylene (HDPE). The pipe segments may include steel reinforcements. It is also conceivable that the pipe segments are made of steel.

In an embodiment, the suspension system comprises an attachment member, preferably located at an upper edge of the pipe segment, and wherein the attachment member is adapted to engage with the elongate support member to releasably connect the pipe segment thereto.

10 The attachment member provides a flexible link allowing for mutual movement. The transfer of loads from the pipe segments to the elongate support member is thus less direct, which results in less damage to the elongate support member while using the fall pipe system. At the same time, it lowers the required reinforcements to the pipe segments since they will be subjected to less forces. The attachment member may be made of steel and may have a hook-shape for safe and  
15 secure connection to the elongate support member, or it may alternatively be a straight pin or link of a specific design. In any case, the attachment member engages the elongate support member such that during use of the fall pipe, the pipe segments do not easily loosen or release from the elongate support member.

In an embodiment of the fall pile system, the attachment member engages with the elongate  
20 support member in a form closed manner. This ensures all the more, that no force is required to control or determine the connection between the pipe segment and the elongate support member.

In an embodiment, the fall pipe system comprises two elongate support members, both adapted to be lowered down from the vessel towards the seabed; and the suspension system comprises two attachment members positioned diametrically at either side of the pipe segment,  
25 wherein the attachment members are adapted to engage with the elongate support members to releasably connect the pipe segment thereto. It will be clear that any suitable number of elongate support member may suffice to support the pipe segments in order to form a fall pipe.

With two elongate support members, and attachment members at both side of the pipe segments, the pipe segments can be suspended from the elongate support members in a stable  
30 manner.

In an embodiment, the fall pipe system comprises a linking wheel and the elongate support member is guided downwards from the linking wheel, and the suspension system is adapted to engage with the elongate support member at the linking wheel.

The suspension system can be releasably connected to the elongate support member at  
35 the linking wheel. When unwinding the elongate support member, it is guided by the linking wheel, and the suspension system is used to engage with the elongate support member when the elongate support member is in contact with the linking wheel. Preferably, the elongate support member comprises a horizontal part between its storage facility and the linking wheel, and vertical or extending downwards beyond the linking wheel.

In an embodiment, the linking wheel is adapted to guide at least part of the elongate support member, and the linking wheel comprises at least one cavity in which at least part of the suspension system, preferably at least part of an attachment member of the suspension system, can be accommodated.

5           When the elongate support member is a chain, the linking wheel may comprise a cavity or cavities that overlaps or corresponds to openings in the links of the chain, such that the linking wheel can engage with the chain and the attachment members which may partially extend through the links into a cavity of the linking wheel. It may be conceivable that the elongate support member is a cable and the suspension system is configured for releasably connecting the pipe segment to  
10 the cable, for example by providing number of loops with the cable.

In an embodiment, the transportation system comprises at least one carriage, adapted to hold a pipe segment and transport a pipe segment from the storage rack to the linking wheel.

The carriage may be adapted to roll along a rail, driven by a wheel. Both the rail and the wheel may comprise teeth which are adapted to engage with one another (rack and pinion). It is  
15 also conceivable that the carriage is in sliding engagement with the rail. The carriage may be driven by a cylinder. At the bottom of the carriage, a gripper is placed which can pick-up the pipe segment at the suspension system or at the attachment member. In an embodiment, the number of carriages may be equal to the number of elongate support members. The length of the rail may be about 5 metres. Each carriage may be able to hold about 1 ton of mass. The carriages may be adapted to  
20 travel along the rail at a speed of about 1 metre per second. Alternatively, a transportation band may be used to transport a pipe segment from the storage rack to the linking wheel.

In an embodiment, the storage rack comprises a clamp system, adapted to hold a stack of pipe segments, preferably adapted to hold a lowest pipe segment of a stack of pipe segments.

25           In an embodiment of the fall pile system, the clamp system comprises a static clamp section to hold a majority of the stack of pipe segments and a dynamic clamp section adapted to hold or release the lowest pipe segment in or from the first position in the storage rack. Hold or release is to say that the dynamic clamp section can both hold the lowest pipe segment and release the lowest pipe segment as required. In short, the clamp system can destack a stack pipe segments one by  
30 one. A clamp section can have any suitable number of clamps, like clamp shoes.

In an embodiment of the fall pile system, the dynamic clamp section forms or is part of the transportation system and is moveable in order to transport a pipe segment between the first position and the second position. This way, the clamp system and the transportation system are  
35 highly integrated and a separate system to move the lowest pipe segment from the stack to the linking wheel is not required. The dynamic clamp section therefore has a suitable working range and can be actuated in any suitable manner like using a hydraulic cylinder.

In an embodiment, the pipe segments are tapered, and the pipe segments are stored while being partially accommodated into one another, preferably for at least 80% of the height of the pipe segments, more preferably for at least 90% of the height of the pipe segments.

5 In this way the pipe segments can be stored in an efficient, space-saving manner. The pipe segments may comprise spacers provided just below the upper edge of the pipe segments which avoid clamping together of the pipe segments. The spacers are strong enough such that a lowest pipe segment can support a stack of dozens of pipe segments on top. The spacers may be formed such that they can be held by the clamps.

10 In an embodiment, the storage rack is arranged vertically above the elongate support member.

When the pipe segments are stored above the place where the elongate support member is suspended, they can be stored in an efficient, space-saving manner. Moreover, transportation of the pipe segments to the elongate support member can be advanced by gravity. Alignment of the suspension system of the pipe segments to the elongate support member is in this way relatively  
15 easy since the elongate support member itself is also suspended vertically. In an embodiment, the pipe segments are stored in a vertically oriented stack in the storage rack, such that the orientation of the pipe segments remains substantially the same when stored in the storage rack and when employed under water.

In an embodiment, the storage rack comprises modular storage rack parts which are  
20 adapted to accommodate a stack of pipe segments. A storage rack or parts thereof may be manoeuvrable with respect to the remainder of the fall pipe system to enable filling of the storage rack at any position, like a position remote from the intended position of the fall pipe.

In this way the fall pipe system can be easily modified to allow for depositing rocks in deeper seas. The fall pipe system is thus adapted to cooperate with additional storage rack parts. The  
25 modular storage rack parts comprise a frame, a stack of pipe segments, and facilities to support the stack of pipe segments within the frame. Furthermore, it comprises means to connect different modular storage rack parts to one another.

In an embodiment, the buoyancy of a pipe segment is adjustable as required for a use case. For example, the pipe segments can be adjusted to be substantially neutral buoyant. Neutral  
30 buoyant pipe segments reduce the up- or downward forces on the elongate support member.

In an embodiment, the fall pipe system further may comprise ballast at a lower end of the elongate support member.

In this way floating of the pipe segments is avoided, and thus the verticality of the string of pipe segments is ensured. Also ballast can be useful to limit string deflection by current drift in the  
35 pipe segments in the middle of the string of pipe segments. The ballast may be multiple tons, preferably between 2 and 20 tons, more preferably between 5 and 15 tons. The ballast may be divided over the lowest 10 to 20 pipe segments.

In an embodiment, the fall pipe system further comprises an ROV at a lower end of the elongate support member.

An ROV (Remotely Operated Vehicle) is preferred for precise navigation of the end of the elongate support member, i.e. the end of the string of pipe segments. A more precise navigation improves the deposition of the rocks on the seabed. The ROV may surround the lowest of the string of pipe segments. If two elongate support members are used, the ROV may be connected to the ends of both elongate support members and in that case separate hoisting wires for the ROV are not required. To further improve deposition the ROV can be connected to the lower end of the elongate member using a gland giving rotational freedom to the ROV so that the ROV can be directed in any direction following a path along the subsea surface like a pipe line.

In an embodiment, an end section, possibly a pipe, is provided at the end of the elongate support member. The end section may have a length of about 4 metres and an inner diameter which corresponds to or is slightly larger than the inner diameter of the pipe segments.

In an embodiment, the fall pipe system further comprises a rigid inclined fall pipe, stored along the storage rack and adapted to be lowered into water and place rocks on the seabed, while in an inclined orientation. The fall pipe may have a telescopic configuration that allows operation in deeper waters.

The rigid fall pipe is efficiently stored in a vertical orientation along the storage racks. The rigid fall pipe is convenient in shallow parts of the sea where precise deposition is required. The lower end of the rigid fall pipe can be precisely positioned by controlling its inclination angle and azimuthal angle using winches. The positioning of the rigid fall may comprise motion compensation including heave compensation. The rigid fall pipe may have a length of between 40 and 50 metres.

In an embodiment, the fall pipe system further comprises a locking system for locking the elongate support member such that a vertical length of the elongate support member is fixed.

In this way the length of the string of pipe segments is fixed or adjustable to any required length and therefore also the deposition depth. The locking system may comprise arms connected to a fixed frame, which can engage with the elongate support member to fix its unwinding. When the elongate support member is locked, the string of pipe segments can be used for depositing rocks.

According to an aspect of the invention, and in accordance with the effects and advantages described hereinabove, there is provided a marine vessel comprising a fall pipe system as described herein.

According to an aspect of the invention, and in accordance with the effects and advantages described hereinabove, there is provided a pipe segment for use in the fall pipe system as described herein.

According to an aspect of the invention, and in accordance with the effects and advantages described hereinabove, there is provided a method for forming a string of pipe segments using a fall pipe system as described above, wherein the method comprises;

providing a windable elongate support member, extending downwards from a linking wheel; further comprising multiple times the following steps:

providing a single pipe segment, comprising a suspension system;

transporting the pipe segment from a storage rack to the elongate support member;

releasably attaching the pipe segment to the elongate support member using the suspension system.

Retrieval of the pipe segments from the string of pipe segments, and stacking them on the storage rack, takes place in an opposite order.

5

In an embodiment of the method, the suspension system comprises an attachment member, and wherein the step of releasably attaching the pipe segment to the elongate support member using the suspension system comprises executing a mutual movement pattern of the attachment member and at least a portion of the elongate support member, wherein the movement  
10 pattern comprises tilting at least a portion of the elongate support member with respect to the attachment member. The movement pattern comprising tilting at least a portion of the elongate support member with respect to the attachment member ensures a robust connection between the pipe segment and the elongate support member.

15

In an embodiment of the method the fall pipe system comprises a linking wheel having an wheel axis of rotation wherein the movement pattern comprises tilting of the at least a portion of the elongate member around the wheel axis of rotation. By using the linking wheel, the tilting of at least a portion of the elongate support member with respect to the attachment member is done in a controlled and predictable manner. As an option the movement pattern may comprise tilting the  
20 attachment member around an attachment axis of rotation transverse with respect to the wheel axis of rotation. This even more ensures a robust connection between the pipe segment and the elongate support member.

25

In an embodiment, providing a elongate support member comprises providing two elongate support members, both extending downwards from a linking wheel, and wherein the suspension system comprises two attachment members;

wherein releasably attaching the pipe segment to the elongate support member comprises releasably attaching the attachment members to the elongate support members.

30

According to an aspect of the invention, and in accordance with the effects and advantages described hereinabove, there is provided a method for placing rocks on the seabed from a marine vessel, the method comprising the method for forming a string of pipe segments as described herein, wherein the elongate support members extends downwards from linking wheels;

wherein the method further comprises:

lowering the string of pipe segments towards the seabed;

35

depositing rocks through the string of pipe segments onto the seabed.

### Short description of drawings

The present invention will be discussed in more detail below, with reference to the attached schematic and explanatory drawings, in which

40

Fig. 1 shows a fall pipe system according to an embodiment;



Fig. 2 shows the fall pipe system of Fig. 1 with a partially extended string of pipe segments;

Fig. 3 shows a detail of the fall pipe system of Figs. 1 and 2;

Fig. 4A-F show in more detail how the suspension system engages with the elongate support member in the fall pipe system of Figs 1-3;

5 Fig. 5 shows a detail of the fall pipe system of Figs. 1-4;

Fig. 6 shows another detail of the fall pipe system of Figs 1-5;

Fig. 7 shows a fall pipe system with rigid fall pipe according to an embodiment;

Fig. 8A and 8B show another embodiment of a suspension system that connects a pipe segment with the elongate support member; and

10 Fig. 9 shows a detail similar to fig. 5 of a further embodiment of the fall pipe system according to the invention.

### Description of embodiments

15 Figure 1 shows a fall pipe system 1. The fall pipe system 1 is seafastened to the deck of a (schematically shown) vessel 2, and includes a core system 10 with a storage rack 11 mounted on top of the core system 10. The fall pipe system 1 can be seafastened directly to the deck or through a so-called skidding system (not shown). The storage rack 11 includes a stack of pipe segments 12. In the core system 10, an elongate support member (not shown) is stored in a storage facility 14, and is adapted to be extended downwards from a handling system 15. The fall pipe system 1 further comprises a rigid fall pipe 16 which is stored along the storage rack 11.

20 Figure 2 schematically shows a part of the fall pipe system 1 of Figure 1, but now with the elongate support member 13 and the pipe segments 12 attached to the elongate support member 13 extending downwards from the core system 10. The core system 10 further includes a conveyor belt 17 for transporting rocks towards the uppermost pipe segment 12a. An ROV 9 is mounted at a lower end of the fall pipe, in this case at a lower end of the elongate support member 13.

30 Figure 3 schematically shows a detail of the fall pipe system 1 of Figures 1 and 2. It shows two elongate support members 13, in this case chains, which are partially stored in storage facilities 14, in this case chain lockers. The handling system 15 guides the elongate support members 13 from the storage facilities 14 via windlasses 18 and linking wheels 19 downwards. Pipe segments 12 are connected to the elongate support members 13 via a suspension system in the form of attachment members 20, which are curved metal portions fixedly connected to upper edges 21 of the pipe segments 12. The attachment members 20 are adapted to hook into the elongate support members 13, for instance by openings in the elongate support members 13 such as the links as shown.

40 Figure 4 shows in detail how the attachment member 20 is connected to the elongate support member 13. Figure 4A shows that the elongate support member 13 is guided by a linking wheel 19, which is shaped such that the elongate support member 13 is partially accommodated within a cavity 37 in the interior of the linking wheel 19 as shown in fig. 4D. Accommodating the

elongate support member 13 in the linking wheel 19 facilitates positioning the elongate support member 13 or a section thereof in a predictable position and orientation with respect to the pipe segment 12. When the pipe segment 12 with attachment member 20 is lowered, the attachment member 20 engages with an opening in the elongate support member 13, as shown in Figure 4B.

5 Figures 4C-4E show that rotation of the linking wheel 19 results in further engagement of the attachment member 20 with the elongate support member 13. In this case, the openings are formed by the links of the chain. The attachment members are hook-shaped and are accommodated in the openings, while partially extending into an annular cavity (not shown) in the linking wheel 19. The engagement between the attachment member 20 and the elongate support member 13 is a type of form closed connection. Therefore, no connecting force is required and no tooling to apply a mounting force is required. Instead, the attachment member 20 is connected to the elongate support member 13 by a mutual orientation step or steps of the attachment member 20 and the elongate support member 13. Figure 4F shows that the pipe segment 12 is further lowered by the rotation of the linking wheel 19, such that the elongate support member 13 extends further downwards and the attachment member 20 is stably connected to the elongate support member 13 by the linking wheel 19. Therefore, then the elongate support member 20 supports the attachment member 20 and the corresponding pipe segment 12.

Figure 5 shows a stack of pipe segments 12 in the storage rack 11. The pipe segments 12 support one another by spacers 22 which are formed just below the upper edge 21. Any suitable number of spacers 22 will suffice however, preferably, an even number of spacers 22 like 4 or six spacers 22, are used per pipe segment 12. The spacers 22 are shaped such that they engage with an upper edge of a pipe segment just below it when the pipe segments are stacked. The spacers 22 are strong enough to support a stack of at least dozens of pipe segments on top of it. The spacers 22 also make sure that the pipe segments 12 do not stick or clamp together.

25 The fall pipe system 1 comprises a number of static clamps 23 for supporting the stack of pipe segments 12. It further comprises a moving frame 24 with a number of moving clamps 25, which is movable in a vertical direction. Preferably, two or three static clamps 23 and two or three moving clamps 25 are used. The moving clamps 25 are used when the lowest of the stack of pipe segments 12 is to be connected to the elongate support member 13. In that event, the moving clamps 25 hold the stack of pipe segments 12 except the lowest segment which is held by the static clamps 23. Hereafter, a carriage 28, shown in fig. 6, can take the single supported pipe segment 12 from the static clamp 23. Afterwards, the moving clamps 25 can move downwards together with the stack of pipe segments 12 using actuators 26. Then, the static clamps 23 can be fixed again and support the complete stack. Hereafter the moving clamps 25 are loosened and moved to the pipe segment above. In this way, the entire stack of pipe segments 12 is lowered by a distance of one or more times the distance of an upper edge 21 with spacer 22. When the lowest of the stack of pipe segments 12 is not held by the static clamps, it can be moved downwards to the elongate support member 13.

Figure 6 shows how a pipe segment 12 can be moved from the storage rack to the elongate support member 13. It shows a transportation system 27 comprising a couple of driving

carriages 28, preferably two driving carriages 28, which are movable along a rail 29. The driving carriages 28 are adapted to hold an attachment member 20 and/or an upper edge 21 of a pipe segment 12. It can move along the rail 29 from the storage rack to the linking wheel (not shown) where the attachment member 20 can be engaged with the elongate support member 13.

5           The process described in relation to Figure 5 and 6 can be reversed in order to shorten the string of pipe segments 12 by disconnecting one or more pipe segments 12 from the elongate support member 13 and moving them towards the storage rack.

          Figure 7 shows the fall pipe system 1 when the rigid fall pipe 16 is employed. The rigid fall pipe 16 is slidably mounted on a rail 30 which is connected to the storage rack 11. The rigid fall pipe 16 is lowered until its top part is below the conveyor belt 17. The rigid fall pipe 16 and conveyor belt 17 are arranged such that supplied rocks will fall from the conveyor belt 17 into the rigid fall pipe 16. A first cable 31 is utilized to incline the rigid fall pipe 16 in order to move the end 16a of the rigid fall pipe 16 to a desired location. Second and third cables 32, 33 can be used for manipulation of the azimuthal position of the end 16a of the rigid fall pipe 16.

15

          Fig. 8A and 8B show another embodiment of a suspension system that connects a pipe segment with the elongate support member 13. The pipe segment is not shown here, only the attachment member 20 is shown. The attachment member 20 is connected to the elongate support member 13. The engagement between the attachment member 20 and the elongate support member 13 is a type of form closed connection. In Fig. 8B the attachment member 20 is shown just before detachment from the elongate support member 13. In general only the differences with the attachment member 20 4A-F will be described. The attachment member 20 has an engagement member 41 that rests on a chain-link 36 of the elongate support member 13, in this case a chain. The engagement member 41 is shaped in accordance with a u-section of the chain-link 36. The engagement member 41 is here cup-shaped. The attachment member 20 has a pair of opposite engagement members 41. The engagement members 41 are arranged in order to enable an adjacent chain-link 36 to hinge freely between the engagement members 41 with respect to the chain-link 36 where the attachment member 20 rests on. The attachment member 20 comprises a stop means 40 in the form of a u-section. The stop means 40 is configured to prevent rotation of the attachment member 20 around an attachment axis of rotation 42 transverse with respect to the wheel axis of rotation 35.

          In use, stop means 40 maintain the associated pipe segment in the right position and orientation. In use, the step of releasably attaching the attachment member 20 to the elongate support member 13 using the suspension system comprises tilting at least a portion of the elongate support member 13, a chain-link 36 in this case, with respect to the attachment member 20. In this case, the chain-link 36 tilts around the linking wheel axis of rotation 35. The linking wheel 19 has to plate members 39 in this case. The plate members 39 are arranged to leave a cavity between to enable accommodation of portions of chain links 36 and attachment members 20 in the interior of the linking wheel.

40

Fig. 9 shows a detail similar to fig. 5 of a further embodiment of the fall pipe system according to the invention. In general only the differences with fig. 5 will be described. A dynamic clamp section 24, 25, 43 serves as clamp but also forms or is part of a transportation system. The moving frame 24 of the dynamic clamp section 24, 25, 43 is therefore moveable in order to transport a pipe segment 12 between the first position and the second position wherein the lowest pipe segment 12 is shown in fig. 9. Therefore a separate system, like the transportation system 27 shown in fig. 5 to move the lowest pipe segment from the stack to the linking wheel is not required. The dynamic clamp section therefore has a suitable working range and can be actuated in any suitable manner like using a hydraulic cylinder 26. If required, a beam 43 can offset a dynamic clamp 25 with respect to the frame 24.

The present invention has been described above with reference to a number of exemplary embodiments as shown in the drawings. Modifications and alternative implementations of some parts or elements are possible, and are included in the scope of protection as defined in the appended claims. In particular, when embodiments of the fall pipe system are explained in the context of a single elongate support member, a person skilled in the art will understand that they can also be applied to fall pipe systems with two or more elongate support members and vice versa.

## Conclusies

1. Valpijpsysteem (1) voor het plaatsen van stenen op een zeebodem vanaf een zeevaartuig, waarbij het valpijpsysteem omvat:
  - 5 een opwindbaar langwerpige steunorgaan (13), ingericht om te worden neergelaten uit het vaartuig naar de zeebodem;
  - een aantal pijpsegmenten (12), waarbij ten minste één pijpsegment een ophangstelsel omvat voor het losneembaar verbinden van het pijpsegment met het langwerpige steunorgaan;
  - een opslagrek (11), ingericht voor het opslaan van de veelheid van pijpsegmenten; en
  - 10 een transportsysteem (27) voor het afzonderlijk transporteren van pijpsegmenten vanuit een eerste positie waarin zij zijn opgeslagen in het opslagrek terwijl ze afzonderlijk losgekoppeld zijn van het langwerpige steunorgaan naar een tweede positie waarin zij zijn verbonden met het langwerpige steunorgaan via het ophangstelsel.
- 15 2. Valpijpsysteem volgens conclusie 1, waarbij het ophangstelsel een bevestigingsorgaan (20) omvat, bij voorkeur aan een bovenrand van het pijpsegment, en waarbij het bevestigingsorgaan is ingericht om aan te grijpen op het langwerpige steunorgaan teneinde het pijpsegment losneembaar daaraan te verbinden.
3. Valpijpsysteem volgens conclusie 2, waarbij het bevestigingsorgaan op een
  - 20 vormgesloten wijze met het langwerpige steunorgaan aangrijpt.
4. Valpijpsysteem volgens een van de voorgaande conclusies, omvattende twee langwerpige steunorganen, beide ingericht om naar beneden te worden neergelaten vanaf het vaartuig naar de zeebodem; en waarbij het ophangstelsel twee bevestigingsorganen omvat
  - 25 diametraal aan beide zijden van het pijpsegment, waarbij de bevestigingsdelen zijn ingericht om aan te grijpen op het langwerpige steunorgaan teneinde het pijpsegment losneembaar daaraan te verbinden.
5. Valpijpsysteem volgens een van de voorgaande conclusies, omvattende een koppelwiel en waarbij het langwerpige steunorgaan vanaf het koppelwiel naar beneden is geleid, en waarbij het ophangstelsel is ingericht om aan te grijpen met het langwerpige steunorgaan bij
  - 30 het koppelwiel.
6. Valpijpsysteem volgens conclusie 5, waarbij het koppelwiel is ingericht om ten minste een deel van het langwerpige steunorgaan te leiden, en waarbij het koppelwiel ten minste één holte (37) omvat waarin tenminste een deel van het ophangstelsel, bij voorkeur tenminste een deel van een bevestigingsorgaan van het ophangstelsel, kan worden ondergebracht.
- 35 7. Valpijpsysteem volgens een van de conclusies 5 - 6, waarbij het transportsysteem ten minste één slede omvat, ingericht om een pijpsegment te houden en een pijpsegment van het opslagrek naar het koppelwiel te transporteren.

8. Valpijpsysteem volgens één van de voorgaande conclusies, waarbij het opslagrek een klemsysteem omvat, ingericht om een stapel pijpsegmenten te houden, bij voorkeur ingericht om een onderste pijpsegment van een stapel pijpsegmenten te houden.
9. Valpijpsysteem volgens conclusie 8, waarbij het klemsysteem een statische klemsectie omvat om het grootste deel van de stapel pijpsegmenten te houden en een dynamische klemsectie ingericht om het onderste pijpsegment te houden of vrij te geven in of vanaf de eerste positie in het opslagrek.
10. Valpijpsysteem volgens conclusie 9, waarbij de dynamische klemsectie het transportsysteem vormt of daarvan deel uitmaakt en verplaatsbaar is teneinde een pijpsegment tussen de eerste positie en de tweede positie te transporteren.
11. Valpijpsysteem volgens een van de voorgaande conclusies, waarbij de pijpsegmenten taps zijn, en waarbij de pijpsegmenten worden opgeslagen terwijl ze gedeeltelijk in elkaar zijn ondergebracht, bij voorkeur voor ten minste 80% van de hoogte van de pijpsegmenten, meer bij voorkeur voor minstens 90% van de hoogte van de pijpsegmenten.
12. Valpijpsysteem volgens een van de voorgaande conclusies, waarbij het opslagrek verticaal boven het langwerpige steunorgaan is aangebracht.
13. Valpijpsysteem volgens een van de voorgaande conclusies, waarbij het opslagrek modulaire opslagrekdelen omvat die zijn ingericht om een stapel pijpsegmenten op te nemen.
14. Valpijpsysteem volgens een van de voorgaande conclusies, waarbij het drijfvermogen van een pijpsegment instelbaar is zoals vereist voor een gebruiksgeval, waarbij in het bijzonder de pijpsegmenten in hoofdzaak neutraal drijfvermogen hebben.
15. Valpijpsysteem volgens één van de voorgaande conclusies, verder omvattende ballast aan een ondereinde van het langwerpig steunorgaan.
16. Valpijpsysteem volgens een van de voorgaande conclusies, verder omvattende een ROV aan een ondereinde van het langwerpige steunorgaan.
17. Valpijpsysteem volgens een van de voorgaande conclusies, verder omvattende een stijve valpijp, opgeslagen langs het opslagrek en ingericht om te worden neergelaten in water en om, terwijl in een hellende oriëntatie, stenen op de zeebodem te plaatsen.
18. Valpijpsysteem volgens een van de voorgaande conclusies, verder omvattende een vergrendelsysteem voor het zodanig vergrendelen van het langwerpige steunorgaan dat een verticale lengte van het langwerpige steunorgaan is gefixeerd.
19. Zeevaartuig dat een valpijpsysteem omvat volgens een van de voorgaande conclusies.

20. Pijpsegment voor gebruik in het valpijpsysteem volgens een van de conclusies 1 - 18.
21. Werkwijze voor het vormen van een reeks pijpsegmenten met behulp van een valpijpsysteem volgens een van de voorgaande conclusies 1 - 18, omvattende het verschaffen van een opwindbaar langwerpige steunorgaan dat zich naar beneden uitstrekt vanaf  
5 een koppelwiel;  
verder omvattende meerdere keren de volgende stappen:  
het verschaffen van een enkel pijpsegment, omvattend een ophangstelsel;  
transporteren van het pijpsegment van een opslagrek naar het langwerpige steunorgaan;  
losneembaar bevestigen van het pijpsegment aan het langwerpige steunorgaan onder  
10 gebruikmaking van het ophangstelsel.
22. Werkwijze volgens conclusie 21, waarbij het ophangstelsel een bevestigingsorgaan omvat, en waarbij de stap van het losneembaar bevestigen van het pijpsegment aan het langwerpige steunorgaan met behulp van het ophangstelsel het uitvoeren van een wederzijds bewegingspatroon van het bevestigingsorgaan en ten minste een deel van het langwerpige  
15 steunorgaan omvat, waarbij het bewegingspatroon het kantelen omvat van ten minste een deel van het langwerpige steunorgaan ten opzichte van het bevestigingsorgaan.
23. De werkwijze volgens conclusie 22, waarbij het valpijpsysteem een koppelwiel omvat met een wiel-rotatieas, waarbij het bewegingspatroon kantelen omvat van ten minste een gedeelte van het langwerpige orgaan rond de wiel-rotatieas.
- 20 24. Werkwijze volgens een van de voorgaande conclusies 21-23, waarbij het verschaffen van een langwerpige steunorgaan het verschaffen van twee langwerpige steunorganen omvat, die zich beide naar beneden uitstrekken vanaf een koppelwiel, en waarbij het ophangstelsel twee bevestigingsorganen omvat;  
waarbij het losneembaar bevestigen van het pijpsegment aan het langwerpige steunorgaan  
25 omvat het losneembaar bevestigen van de bevestigingsorganen aan de langwerpige steunorganen.
25. Werkwijze voor het plaatsen van stenen op de zeebodem vanaf een zeevaartuig, waarbij de werkwijze omvat de werkwijze voor het vormen van een reeks van pijpsegmenten  
30 volgens een van de voorgaande conclusies 21-24, waarbij de langwerpige steunorganen zich neerwaarts uitstrekken vanaf koppelwielen; verder omvattend: het neerlaten van de reeks pijpsegmenten naar de zeebodem; het op de zeebodem afzetten van stenen door de reeks pijpsegmenten.

Fig. 1

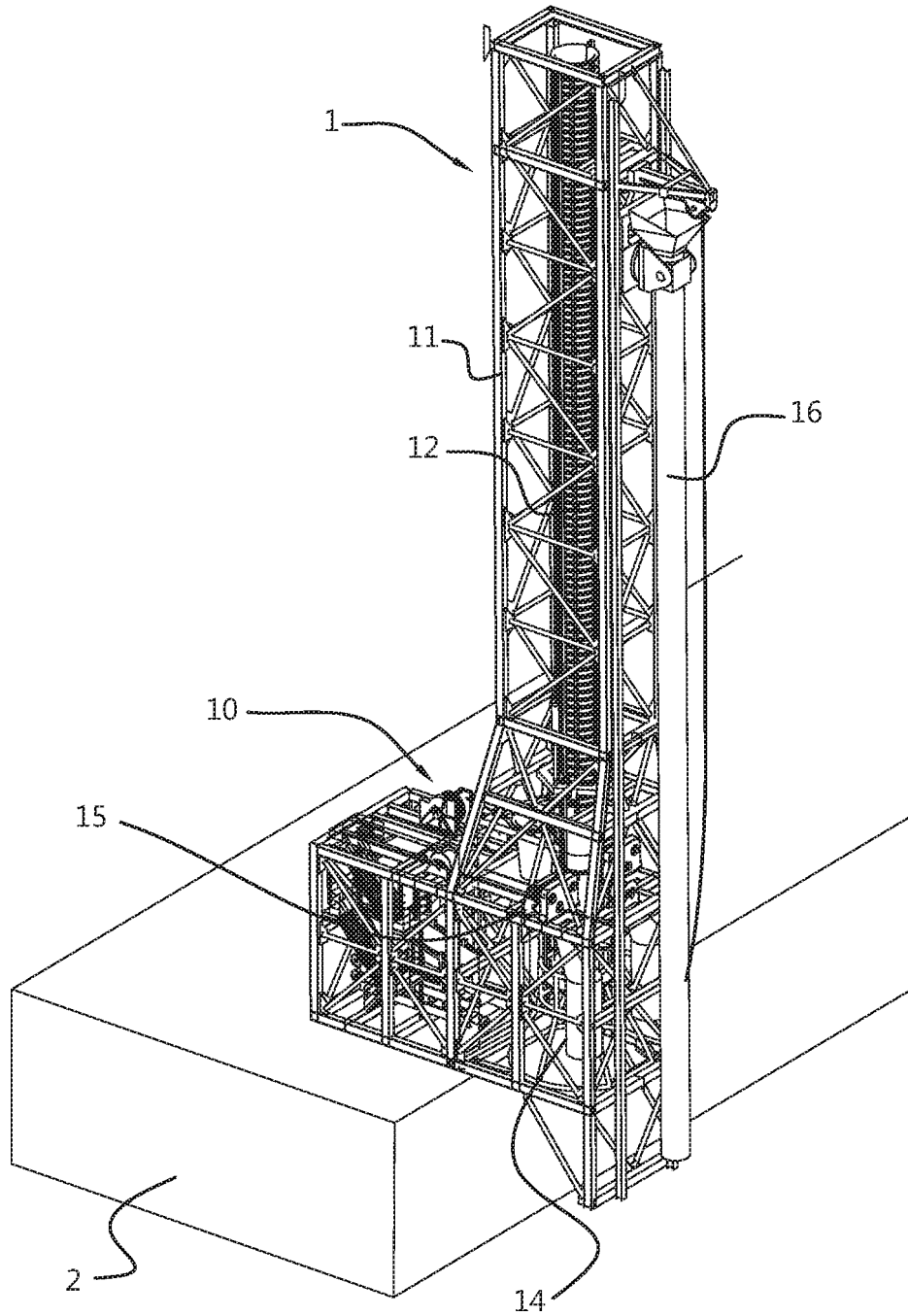




Fig. 2

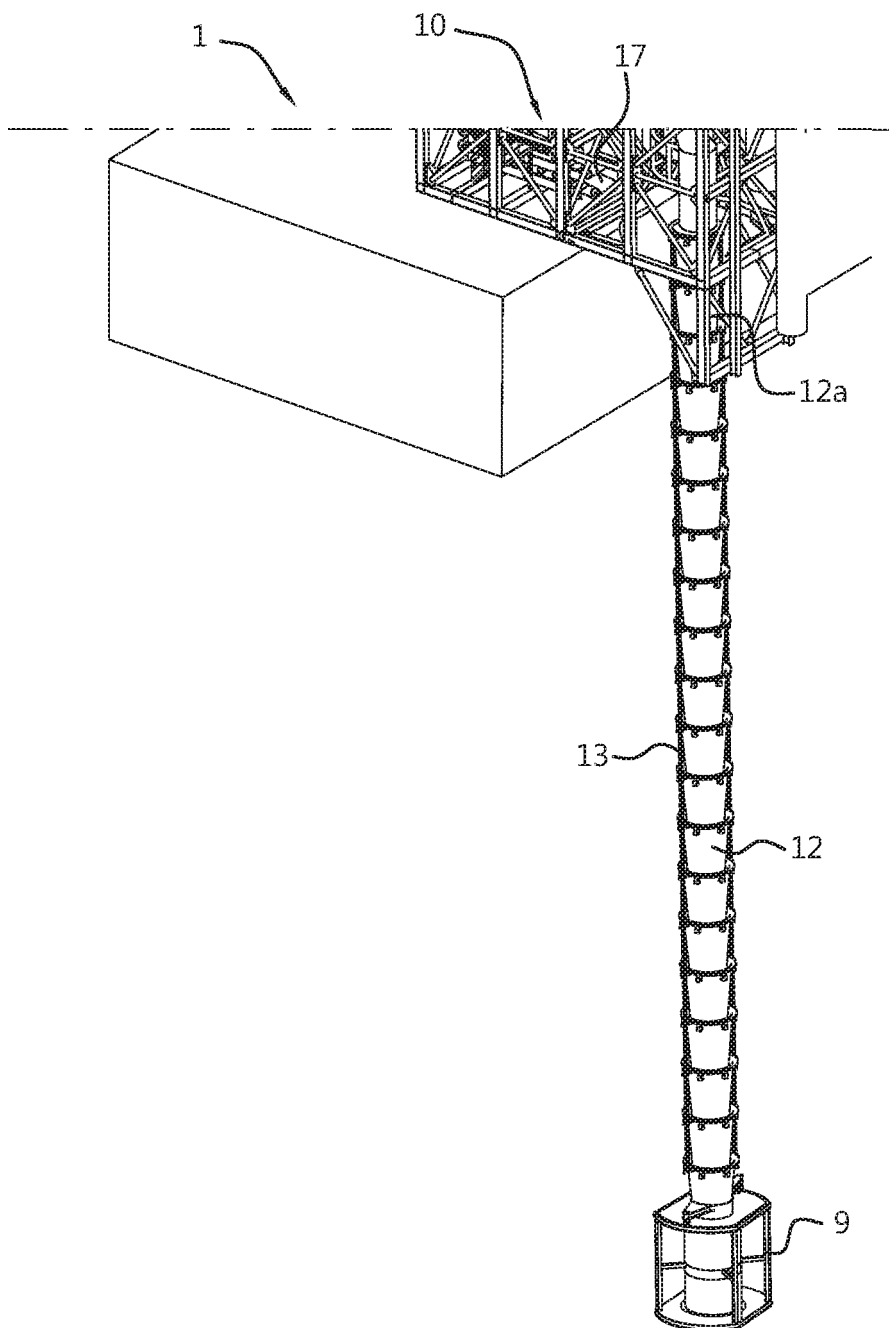


Fig. 3

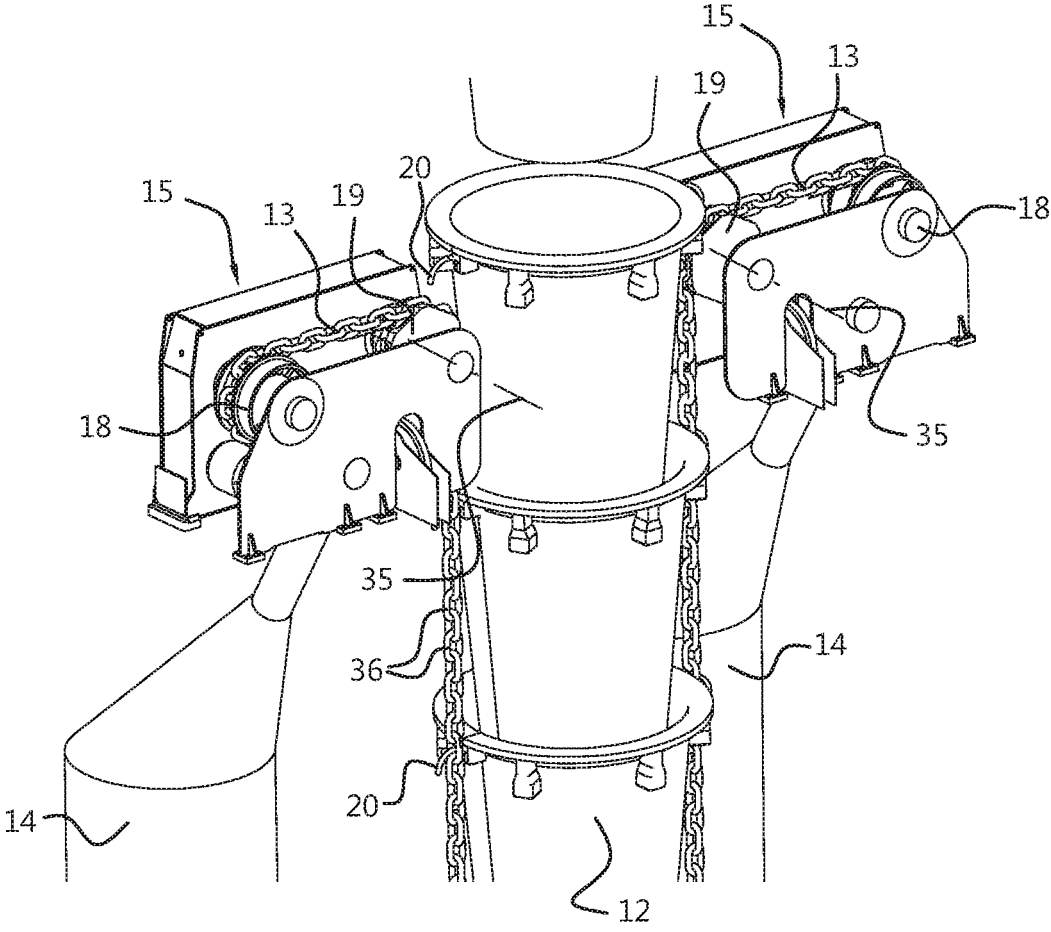


Fig. 4A

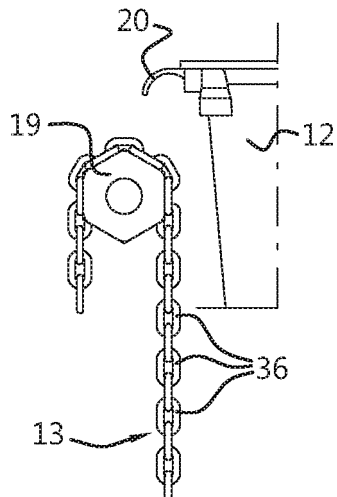


Fig. 4B

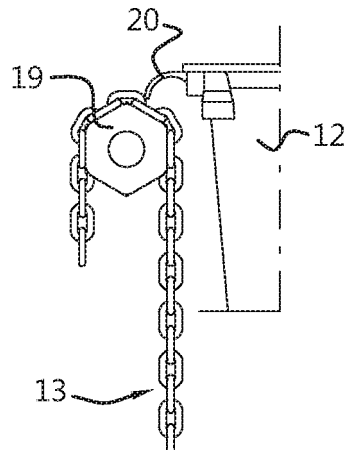


Fig. 4C

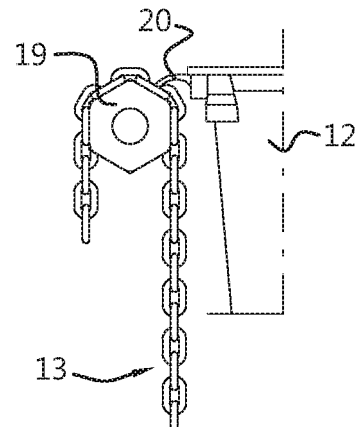


Fig. 4D

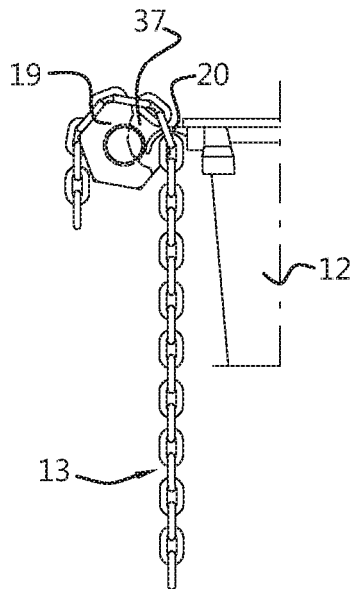


Fig. 4E

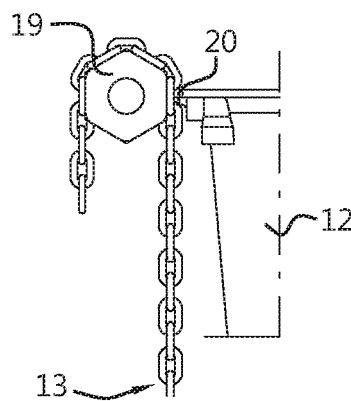


Fig. 4F

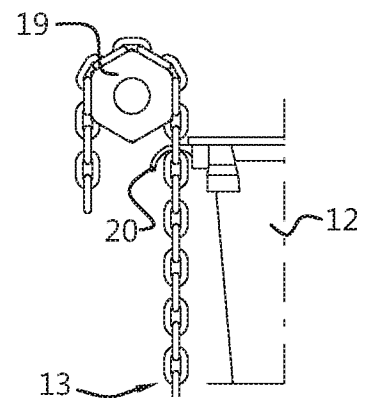


Fig. 5

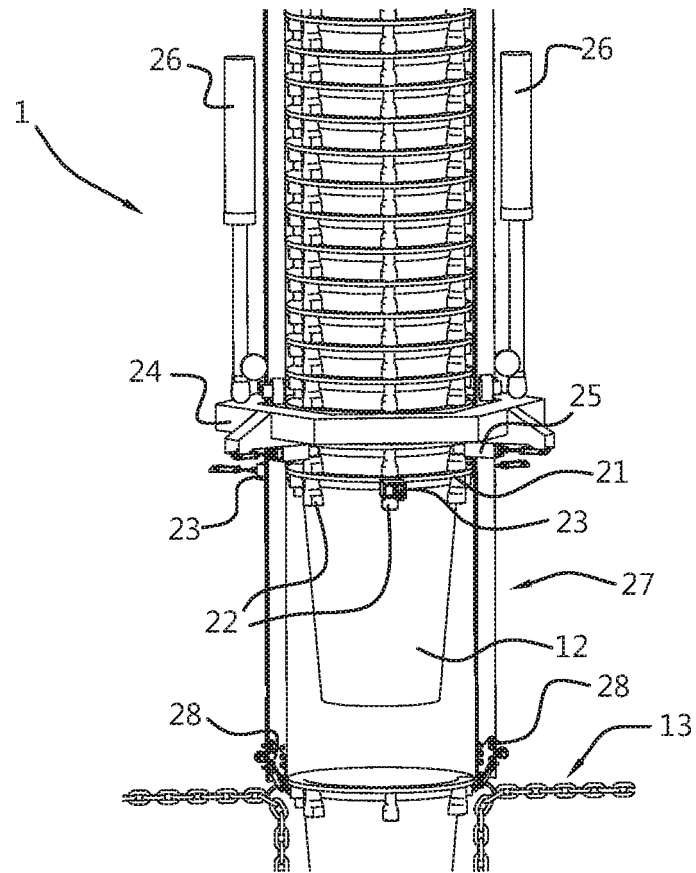


Fig. 6

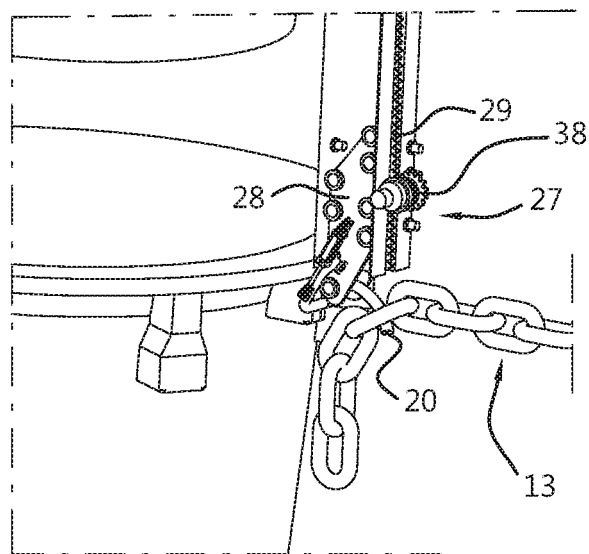


Fig. 7

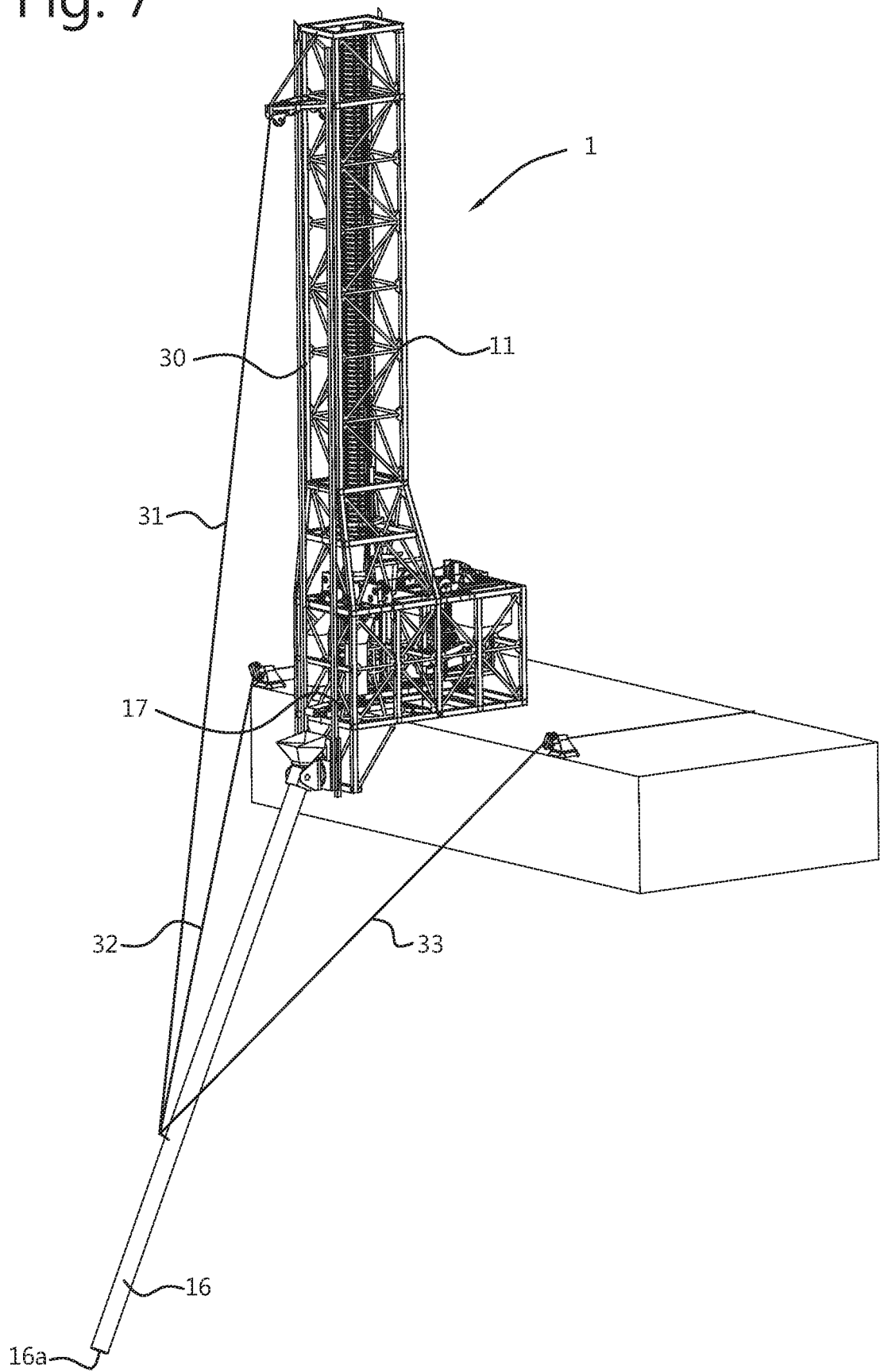


Fig. 8A

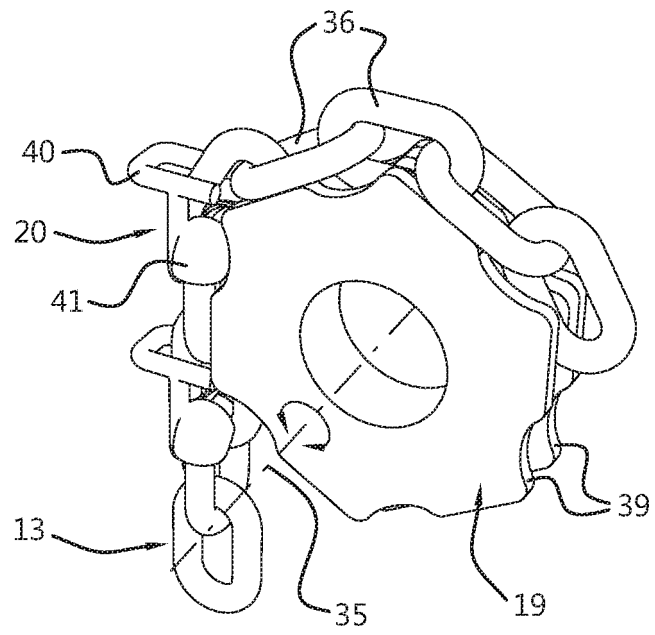


Fig. 8B

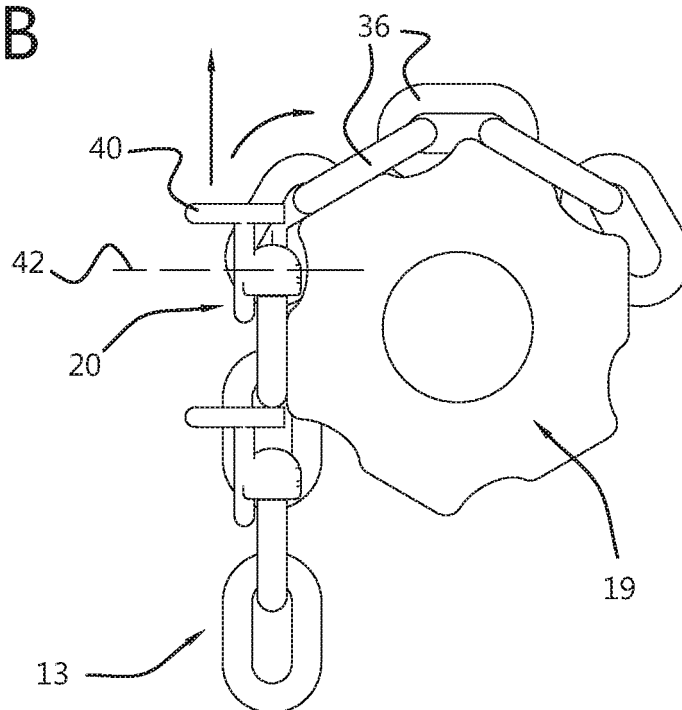
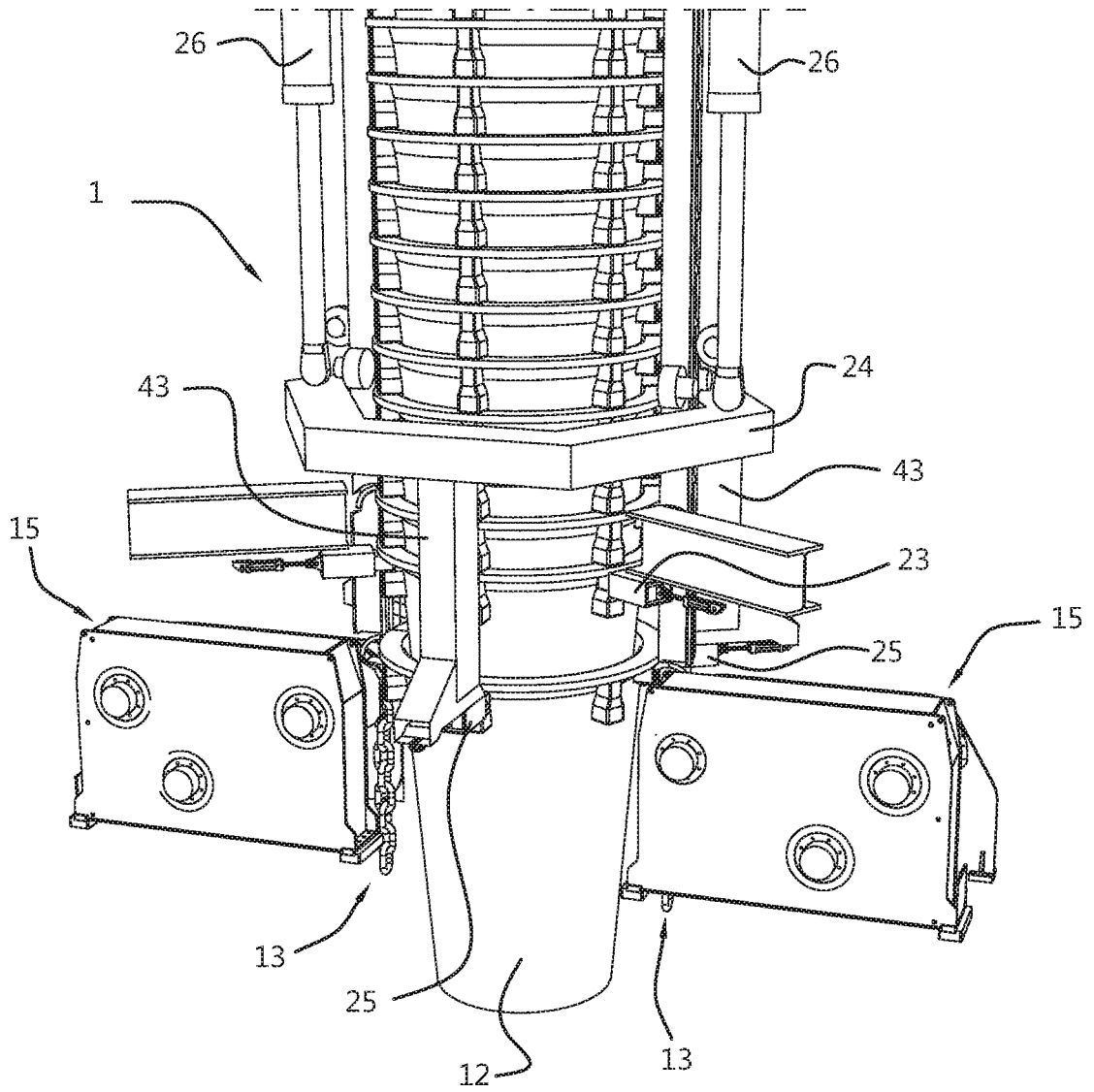


Fig. 9



# SAMENWERKINGSVERDRAG (PCT)

## RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE  <b>P6077527NL</b>
Nederlands aanvraag nr.  <b>2021801</b>	Indieningsdatum  <b>12-10-2018</b>
	Ingeroepen voorrangsdatum
Aanvrager (Naam)  <b>IHC Holland IE B.V.</b>	
Datum van het verzoek voor een onderzoek van internationaal type  <b>05-01-2019</b>	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr.  <b>SN72673</b>
<b>I. CLASSIFICATIE VAN HET ONDERWERP</b> (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)	
Volgens de internationale classificatie (IPC)  <b>B63B27/28;B65G11/14;E02D15/10;B63B35/30</b>	
<b>II. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK</b>	
Onderzochte minimumdocumentatie	
Classificatiesysteem	Classificatiesymbolen
<b>IPC</b>	<b>B63B;B63J;B65G;E02D</b>
Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen	
III. <input type="checkbox"/>	<b>GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES</b> (opmerkingen op aanvullingsblad)
IV. <input type="checkbox"/>	<b>GEBREK AAN EENHEID VAN UITVINDING</b> (opmerkingen op aanvullingsblad)



**ONDERZOEKSRAPPORT BETREFFENDE HET  
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND  
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar  
de stand van de techniek

NL 2021801

A. CLASSIFICATIE VAN HET ONDERWERP INV. B63B27/28 B65G11/14 E02D15/10 B63B35/30 ADD.		
Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.		
B. ONDERZOCHETE GEBIEDEN VAN DE TECHNIEK		
Onderzochte minimum documentatie (classificatie gevolgd door classificatiesymbolen) B63B B63J B65G E02D		
Onderzochte andere documentatie dan de minimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen		
Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden) EPO-Internal		
C. VAN BELANG GEACHTE DOCUMENTEN		
Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X	WO 2016/144178 A1 (VAN OORD DREDGING AND MARINE CONTRACTORS B V [NL]) 15 september 2016 (2016-09-15) * alinea [0024] - alinea [0043]; figuren 1,3a-3c *	1-25
X	EP 0 450 675 A1 (OORD ACZ B V VAN [NL]) 9 oktober 1991 (1991-10-09)  * kolom 3, regel 30 - kolom 4, regel 46; figuren 1-3 * * kolom 4, regel 24 - regel 36; figuren 1-3 *  ----- -/--	1-6, 11-13, 15-17, 19-21,25
<input checked="" type="checkbox"/>	Verdere documenten worden vermeld in het vervolg van vak C.	<input checked="" type="checkbox"/>
° Speciale categorieën van aangehaalde documenten		
"A" niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft		"T" na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvraag, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding
"D" in de octrooiaanvraag vermeld		"X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur
"E" eerdere octrooi(aanvraag), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven		"Y" de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht
"L" om andere redenen vermelde literatuur		"&" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie
"O" niet-schriftelijke stand van de techniek		
"P" tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur		
Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid	Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type	
4 april 2019		
Naam en adres van de instantie	De bevoegde ambtenaar	
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Geiger, Harald	

**ONDERZOEKSRAPPORT BETREFFENDE HET  
 RESULTAAT VAN HET ONDERZOEK NAAR DE STAND  
 VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar  
 de stand van de techniek

NL 2021801

C.(Vervolg). VAN BELANG GEACHTE DOCUMENTEN		
Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X	US 3 949 850 A (SCHUMM H DALE) 13 april 1976 (1976-04-13)  * kolom 2, regel 3 - kolom 4, regel 62; figuren 1,4,5 *  -----	1-6, 8-13, 15-17, 20,21,24
X	EP 0 001 445 A1 (LOHR JURGEN) 18 april 1979 (1979-04-18) * bladzijde 5 - bladzijde 9; figuur 1 *  -----	1-18, 20-25

**ONDERZOEKSRAPPORT BETREFFENDE HET  
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND  
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar  
de stand van de techniek

NL 2021801

In het rapport genoemd octrooigeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
WO 2016144178	A1	EP 3268540 A1	17-01-2018
		WO 2016144178 A1	15-09-2016
-----			
EP 0450675	A1	AU 629106 B2	24-09-1992
		CA 2037368 A1	06-09-1991
		DE 69101071 D1	10-03-1994
		DE 69101071 T2	05-05-1994
		DK 0450675 T3	30-05-1994
		EP 0450675 A1	09-10-1991
		ES 2048553 T3	16-03-1994
		NL 9000501 A	01-10-1991
		NO 176216 B	14-11-1994
		NZ 237257 A	26-08-1992
-----			
US 3949850	A	GEEN	
-----			
EP 0001445	A1	DE 2744590 A1	05-04-1979
		EP 0001445 A1	18-04-1979
-----			

## WRITTEN OPINION

File No. SN72673	Filing date ( <i>day/month/year</i> ) 12.10.2018	Priority date ( <i>day/month/year</i> )	Application No. NL2021801
International Patent Classification (IPC) INV. B63B27/28 B65G11/14 E02D15/10 B63B35/30			
Applicant IHC Holland IE B.V.			

This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the application
- Box No. VIII Certain observations on the application

	Examiner Geiger, Harald
--	----------------------------

**WRITTEN OPINION****Box No. I Basis of this opinion**

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:
    - a sequence listing
    - table(s) related to the sequence listing
  - b. format of material:
    - on paper
    - in electronic form
  - c. time of filing/furnishing:
    - contained in the application as filed.
    - filed together with the application in electronic form.
    - furnished subsequently for the purposes of search.
3.  In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

## 1. Statement

Novelty	Yes: Claims	
	No: Claims	1-25
Inventive step	Yes: Claims	
	No: Claims	1-25
Industrial applicability	Yes: Claims	1-25
	No: Claims	

## 2. Citations and explanations

**see separate sheet**

**Item V**

**Novelty**

The subject matter of claims **1-25** is not new with respect to the prior art.

***ad independent claims 1, 19, 20 & 21***

With respect to claim **1**, the document **D1** discloses

- . *Valpijpsysteem (Fig 3a) voor het plaatsen van stenen op een zeebodem vanaf een zeevaartuig, waarbij het valpijpsysteem omvat:*
- . *een opwindbaar langwerpige steunorgaan (chain or steel cable 220), ingericht om te worden neergelaten uit het vaartuig naar de zeebodem;*
- . *een aantal pijpsegmenten (110), waarbij ten minste één pijpsegment een ophangstelsel omvat voor het losneembaar verbinden van het pijpsegment met het langwerpige steunorgaan;*
- . *een opslagrek (200), ingericht voor het opslaan van de veelheid van pijpsegmenten; en een transportsysteem (hoisting arrangements 130, 230) voor het afzonderlijk transporteren van pijpsegmenten vanuit een eerste positie waarin zij zijn opgeslagen in het opslagrek terwijl ze afzonderlijk losgekoppeld zijn van het langwerpige steunorgaan naar een tweede positie waarin zij zijn verbonden met het langwerpige steunorgaan via het ophangstelsel.*

Since all features of claim **1** in their combination are known from **D1**, the claim **1** is not new.

For the same matter, independent claims **19, 20, 21** and **25** are also disclosed by this state of the prior art.

Furthermore, the disclosure of documents **D2** & **D3** are also anticipating the subject of claim **1**.

Therefore, these independent claims are not new.

***ad dependent claims 2-18, 22-25***

**D1** further discloses the additional features of claims **2-18, 22-25**

**D2** further discloses the additional features of claims **2-6, 11-13, 15-17;**

**D3** further discloses the additional features of claims **2-6, 8-13, 15-17, 24**;

**D4** further discloses the additional features of claims **2-18, 22-25**.

Therefore, these claims are also not new.

### **Further procedure**

If a European application is envisaged, the independent claim **20** would be considered to fail the requirement of unity of invention and -at the same time- Rule 43 (2) EPC.