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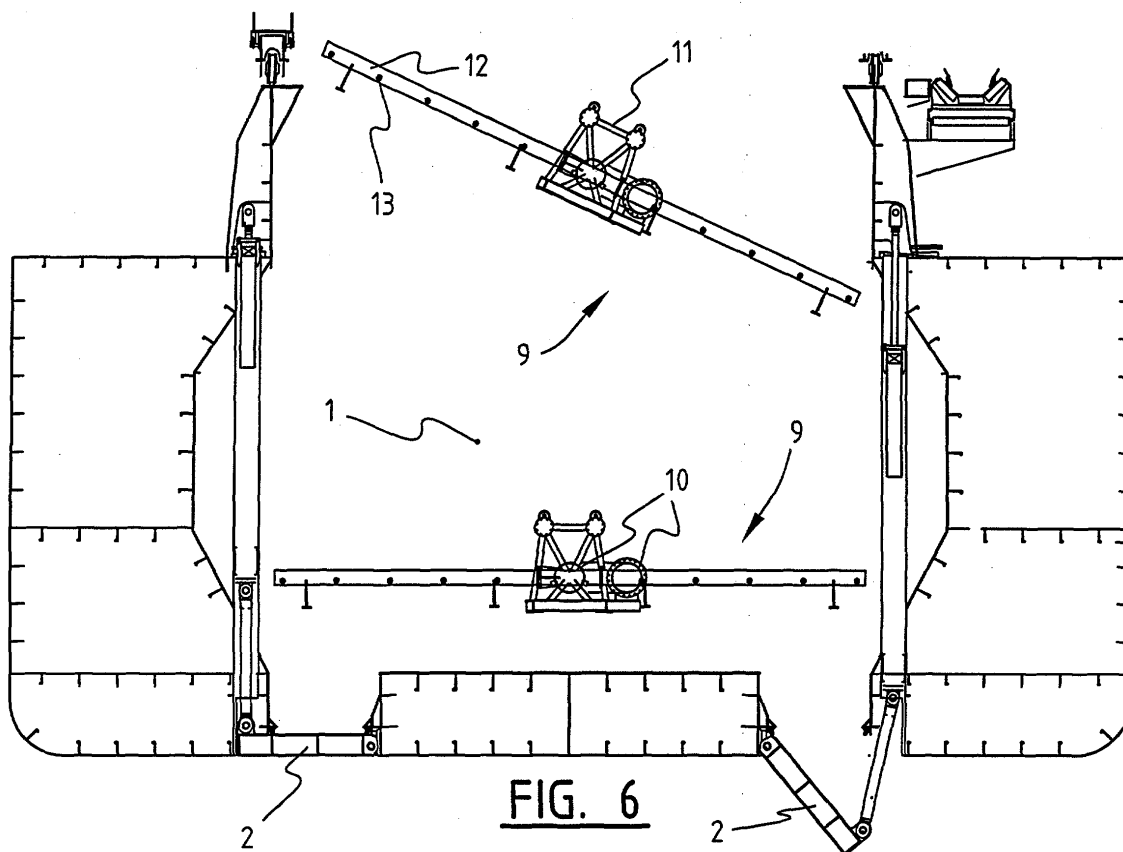
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(54) **Assembly for use in the cargo hold of a ship, and method for arranging thereof**

(57) Assembly for use in a ship with a cargo hold (1) having a substantially flat bottom provided with at least one unloading opening (2) for unloading a cargo, where-in the assembly comprises a system (9) of jet water lines

(10,12) which can be connected to a supply pipe of the vessel, and at least some of the jet water lines are provided with nozzles (13), which nozzles are adapted to move the cargo on the bottom in the direction of one of the at least one unloading openings (2).



EP 1 488 995 A1

Description

[0001] The invention relates to an assembly for use in a ship with a cargo hold having a substantially flat bottom provided with at least one unloading opening for unloading a cargo.

[0002] A cargo hold of a ship, for instance a trailing suction hopper dredger suitable among other things for transporting bulk material, is typically equipped with a flat bottom and steep side walls such that the cargo can be easily unloaded, for instance using dry unloading machines, in particular a gripper. If it is also wished to make such a ship suitable for offloading or dumping via the bottom of a cargo which has for instance been sucked up in the context of maintenance dredging operations, the bottom of the cargo hold can then be equipped with closable unloading openings, so-called bottom doors.

[0003] The flat bottom of the cargo hold with bottom doors has the drawback that after offloading of the cargo via the bottom doors a load residue is left behind on the bottom. This load residue can take on considerable proportions and results in a limitation of the actual hopper capacity, which has a counterproductive effect.

[0004] The present invention has for its object to obviate the above stated drawback, and has the object of making a ship, which is suitable for dry unloading, in particular by means of a gripper, also suitable for unloading via unloading openings in the bottom of the cargo hold by considerably reducing the amount of load residue which typically occurs in this latter case.

[0005] For this purpose the invention consists of an assembly for use in a ship with a cargo hold having a substantially flat bottom which is provided with at least one unloading opening for unloading a cargo, which assembly is distinguished in that it comprises a system of jet water lines which can be connected to a supply pipe of the vessel, and in that at least some of the jet water lines are provided with nozzles, which nozzles are adapted to move the cargo on the bottom in the direction of one of the at least one unloading openings.

[0006] In this manner a cargo in a ship with a cargo hold having a flat bottom can be unloaded in efficient manner in both dry manner and by means of unloading openings in the bottom. The flat bottom provides the option of efficient dry unloading, and the assembly that can be mounted on the bottom of the cargo hold ensures that, during unloading by means of unloading openings in the bottom, the load residue is moved in the direction of the unloading openings and does not remain behind on the bottom.

[0007] The system of jet water lines is preferably accommodated in a support construction so as to form a rigid whole.

[0008] According to a preferred embodiment of the assembly according to the invention, the assembly is suitable for use in a hopper dredger. Such a ship, if designed for recovering building materials such as gravel and sand at sea, is typically equipped with a cargo hold

with a flat bottom and steep side walls, and with an installation for dry unloading of the sucked-up load.

[0009] If such a ship is utilized for instance to transport dredging material which must be offloaded via bottom doors in the cargo hold, the assembly according to the invention can be arranged on the bottom of the cargo hold. The nozzles of the assembly will then ensure that the load residue, which would normally be left behind, is sprayed in the direction of the unloading openings so that it is also unloaded and the load residue is substantially eliminated.

[0010] According to a first variant of the invention, the support construction is a framework structure. This framework structure provides an additional robustness to the system of jet water lines, and ensures the formation of a rigid whole which can be placed on the bottom of the cargo hold using for instance a crane.

[0011] According to a possible variant of the assembly according to the invention, the system of jet water lines comprises a main line with a length substantially the same as that of the cargo hold, and a number of side lines which are directed transversely thereof and each equipped with a number of nozzles. These side lines are for instance connected to the main line in known manner via flanged connections.

[0012] This main line can be connected, for instance via a bulkhead passage through a side wall of the cargo hold, to a supply line which is for instance a dredging line of the ship and is supplied by a water supply pump. Water is carried via the main line to the side lines and the nozzles so that the load residue is still unloaded by water jets from the nozzles.

[0013] The characteristics of respectively the water supply pump and the nozzles are adapted to each other, this such that all nozzles can be supplied simultaneously.

[0014] According to a further developed embodiment of the above described variant, the support construction is arranged substantially above the main line. The support construction can preferably be further connected at its outer ends to a front and rear end wall of the cargo hold.

[0015] The support construction ensures that the main line is supported so as to form a self-supporting assembly which can be displaced easily, for instance with a crane.

[0016] According to a possible embodiment, the supply line is laid closely against the bottom, wherein the support construction has a height such that a sufficient rigidity is obtained to allow the assembly to be lifted in its entirety.

[0017] The assembly according to the invention is generally equipped with fastening means for fastening the assembly in the cargo hold. At least a number of fastening elements are preferably adapted to allow a limited movement of the assembly relative to the cargo hold, this in respect of deformations of the beam of the ship.

[0018] According to a possible embodiment of the assembly according to the invention, the connection between one outer end of the support construction and an end wall of the cargo hold is adapted to allow a limited movement of the assembly in longitudinal direction of the cargo hold.

[0019] Finally, the invention relates to a method for arranging an assembly according to any of the foregoing claims in a cargo hold of a ship, wherein the assembly is carried integrally above the cargo hold and then lowered onto the bottom of the cargo hold, whereafter the system of jet water lines is connected to a supply line and the assembly is fastened in the desired position in the cargo hold.

[0020] The simple construction and self-supporting structure of the assembly according to the invention has the great advantage that, normally speaking, it can be installed or removed within a period of a few hours. Using a crane the assembly can for instance be carried into the cargo hold or hoisted therefrom in one crane movement.

[0021] The invention will be further elucidated on the basis of the following figure description and the annexed drawing of an exemplary embodiment of the invention. In the drawing:

figure 1 shows a longitudinal section of a hopper dredger in which the assembly of the invention can be used;

figure 2 shows a top view of the tank top of the vessel of figure 1;

figure 3 is a top view of an assembly according to the invention;

figure 4 is a side view of an assembly according to the invention;

figure 5A is a top view of a side branch of an assembly according to the invention;

figure 5B is a side view of a side branch of an assembly according to the invention;

figure 6 shows a cross-section of the cargo hold during placing of the assembly according to the invention on the bottom of the cargo hold;

figure 7 shows a detail view of the connection between the main line of the assembly according to the invention and a line of the vessel;

figure 8A shows a side view of the connection between the framework structure of the assembly according to the invention and a rear end bulkhead of the cargo hold with longitudinal freedom of movement;

figure 8B shows a front view of the connection between the framework structure of the assembly according to the invention and a bulkhead of the cargo hold;

figure 8C shows a top view of the connection between the framework structure of the assembly according to the invention and a bulkhead of the cargo hold.

[0022] Figure 1 shows a hopper dredger designed for recovering building materials such as sand and gravel at sea, so-called marine aggregates. The dredged material is carried by means of an underwater pump to cargo hold 1 via pressure pipelines 3 and 7. Cargo hold 1 has a flat bottom with six bottom doors 2 for unloading a sucked-up cargo. This is more clearly visible in the top view at tank top level shown in figure 2, and in figure 6 in which one of the two shown bottom doors is in the opened position.

[0023] The ship is further equipped with an automated gripper installation which can travel over the hopper and can carry the gripped load ashore via a system of conveyor belts. The load can hereby be unloaded in dry manner, i.e. without addition of water.

[0024] When this hopper dredger is used to unload a cargo via bottom doors 2 without the assembly of the invention, a considerable quantity of load residue remains behind on the flat bottom of cargo hold 1, whereby the hopper capacity is considerably limited.

[0025] Figure 3 shows an exemplary embodiment of the assembly 9 according to the invention which can be placed on the bottom of cargo hold 1. Assembly 9 is constructed from a main line 10, around which is arranged a framework structure 11, and from six side lines 12. Side lines 12 are arranged at a distance from each other transversely of main line 10 and on either side thereof via flange connections 19.

[0026] As seen more readily in the side view of figure 4, the framework structure is provided at both its outer ends with fastening means 17, 18 which will be further described with reference to figure 8.

[0027] Figures 5A and B show respectively a detail top and side view of a side line 12. Five nozzles 13 are arranged on either side on each side line 12. These nozzles 13 can optionally be arranged at different angles (not shown), depending on the location of the unloading openings and the form of the cargo hold. The side lines are further provided with support legs 15 which support the side line 12 and place it at the desired height.

[0028] Figure 6 illustrates the method of the invention for arranging an assembly of the above described type. Assembly 9 is first carried integrally above cargo hold 1 and is then lowered downward at an angle into cargo hold 1, wherein it is gradually returned to the horizontal position until it can be placed on the bottom of cargo hold 1. Main line 10 will then have to be connected and assembly 9 will have to be fastened in the desired position in cargo hold 1, as will be further described. In order to facilitate the hoisting, the main line is provided on the top, as shown in figure 4, with a number of lifting lugs 16 for connection of a hoisting cable of a crane via a harp shackle.

[0029] Figure 7 illustrates the connection of main line 10 to a supply line 3 of the dredging vessel. This connection takes place by means of a flexible pipe piece 20 connected to a fitting piece 22 which is mounted with flange 21 against the passage through the hopper front

end bulkhead 25. The passage is connected to the supply line (dredging pressure pipeline) 3 by means of branch 24 and compensator 23. This latter is connected to supply line 3.

[0030] Figures 8A, B and C show the connection 17 between one end of the framework structure and a hopper rear end bulkhead 26 of cargo hold 1. This connection is adapted to allow a limited movement of assembly 9 in longitudinal direction of cargo hold 1.

[0031] Figure 8A shows a saddle part 37 connected to an outer end of framework structure 11 and having a slot opening 38. This saddle part 37 is connected to a sliding piece 30 by means of a locking pin 31. Sliding piece 30 is pushed between two fixed guides 32 on a hopper rear end bulkhead 26 of the cargo hold (see figures 8B and C) to a position against a stop part 36, and secured by means of a second locking pin 34 which passes transversely through the two guides 32.

[0032] It will be understood that the invention is not limited to the above described exemplary embodiment, and that many variants of for instance the construction of the system of jet water lines, or of the position of the nozzles, are possible without departing from the scope of the invention.

Claims

1. Assembly for use in a ship with a cargo hold which is suitable for dry unloading of a cargo, which cargo hold has steep walls and a substantially flat bottom provided with at least one unloading opening for unloading the cargo via the bottom, **characterized in that** the assembly comprises a system of jet water lines which is mountable on the bottom and which can be connected to a supply pipe of the vessel, and that at least some of the jet water lines are provided with nozzles, which nozzles are adapted to move the cargo on the bottom in the direction of one of the at least one unloading openings.
2. Assembly as claimed in claim 1, **characterized in that** the system of jet water lines is accommodated in a support construction so as to allow a rapid installation of the assembly.
3. Assembly as claimed in claims 1-2 for use in a hopper dredger.
4. Assembly as claimed in any of the foregoing claims, **characterized in that** the support construction is a framework structure.
5. Assembly as claimed in any of the foregoing claims, **characterized in that** the system of jet water lines comprises a main line with a length substantially the same as that of the cargo hold, and a number of side lines which are directed transversely thereof

and each equipped with a number of nozzles.

6. Assembly as claimed in any of the claims 2-5, **characterized in that** the support construction is arranged substantially above the main line.
7. Assembly as claimed in any of the claims 2-6, **characterized in that** the support construction can be connected at its outer ends to a front and rear end wall of the cargo hold.
8. Assembly as claimed in any of the foregoing claims, **characterized in that** the assembly is equipped with fastening elements for fastening the assembly in the cargo hold.
9. Assembly as claimed in claim 8, **characterized in that** at least a number of fastening elements are adapted to allow a limited movement of the assembly relative to the cargo hold.
10. Assembly as claimed in claim 9, **characterized in that** the connection between one outer end of the support construction and an end wall of the cargo hold is adapted to allow a limited movement of the assembly in longitudinal direction of the cargo hold.
11. Method for arranging an assembly as claimed in any of the foregoing claims in a cargo hold of a ship, **characterized in that** the assembly is carried integrally above the cargo hold and then lowered onto the bottom of the cargo hold, whereafter the system of jet water lines is connected, and the assembly is fastened in the desired position in the cargo hold.

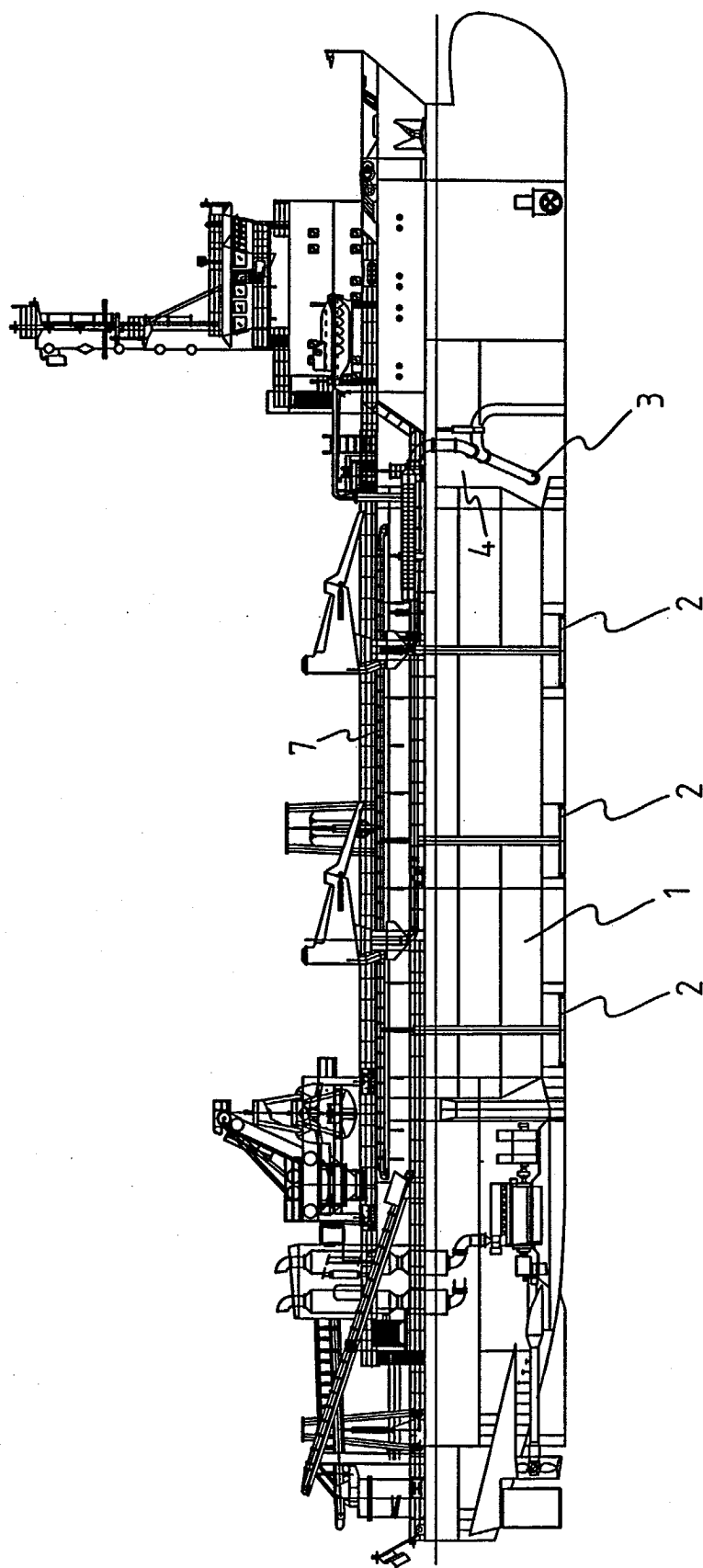


FIG. 1

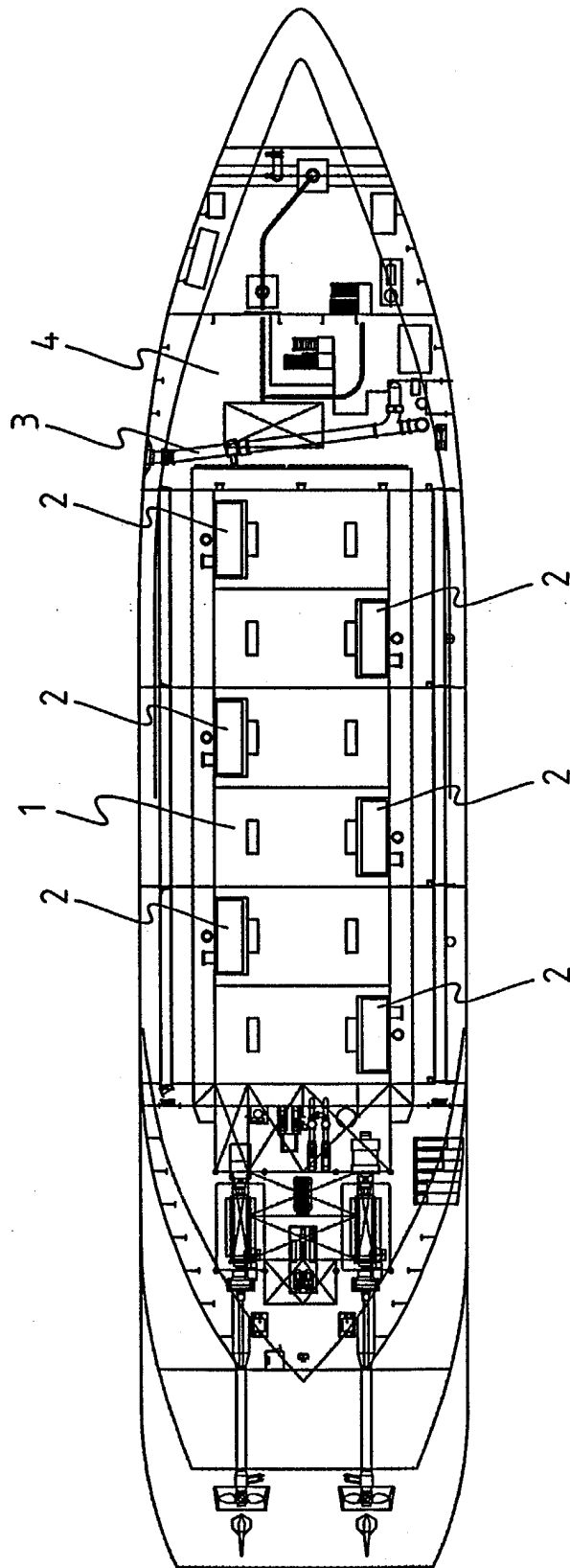


FIG. 2

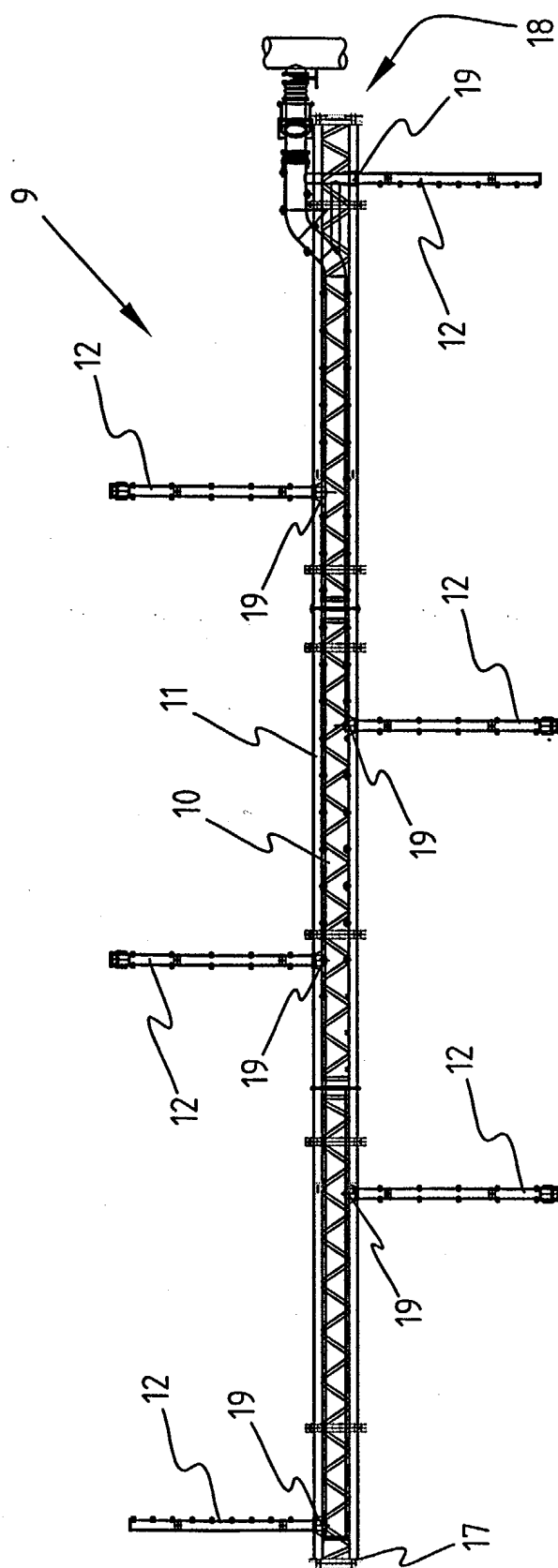


FIG. 3

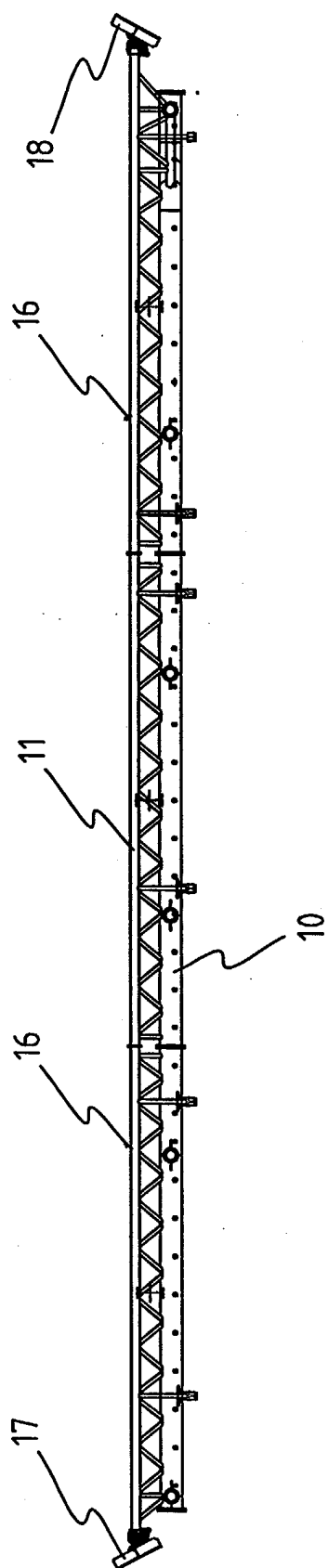
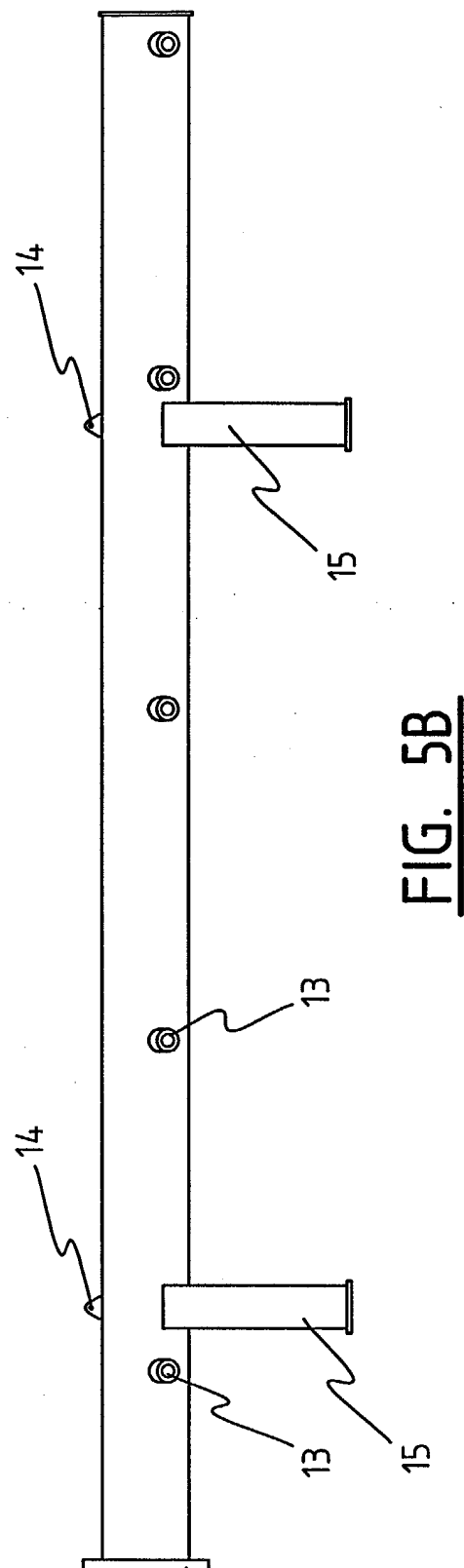
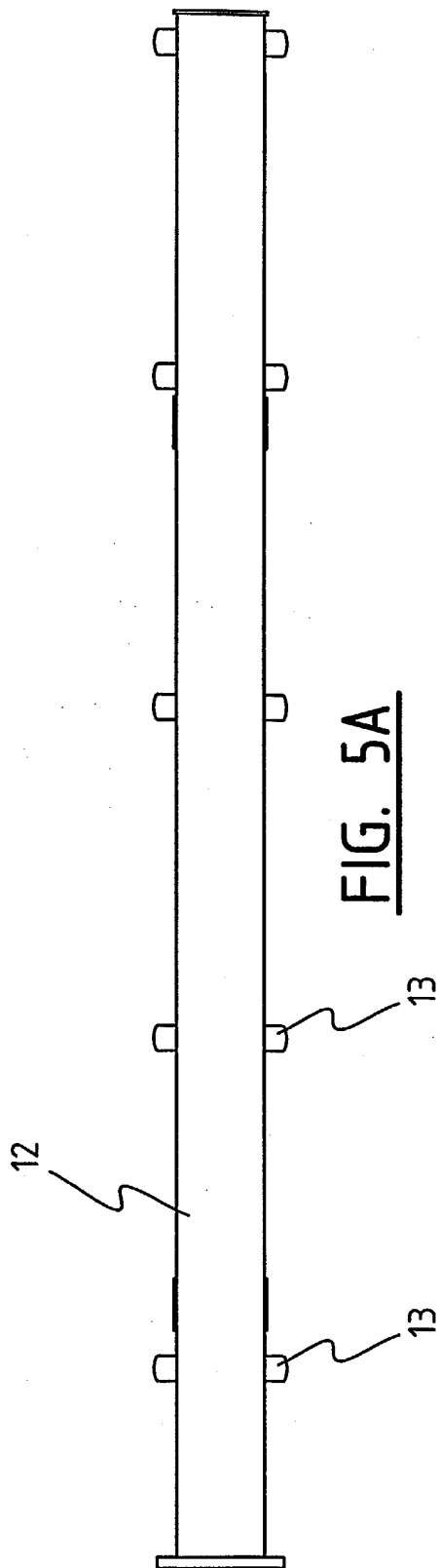
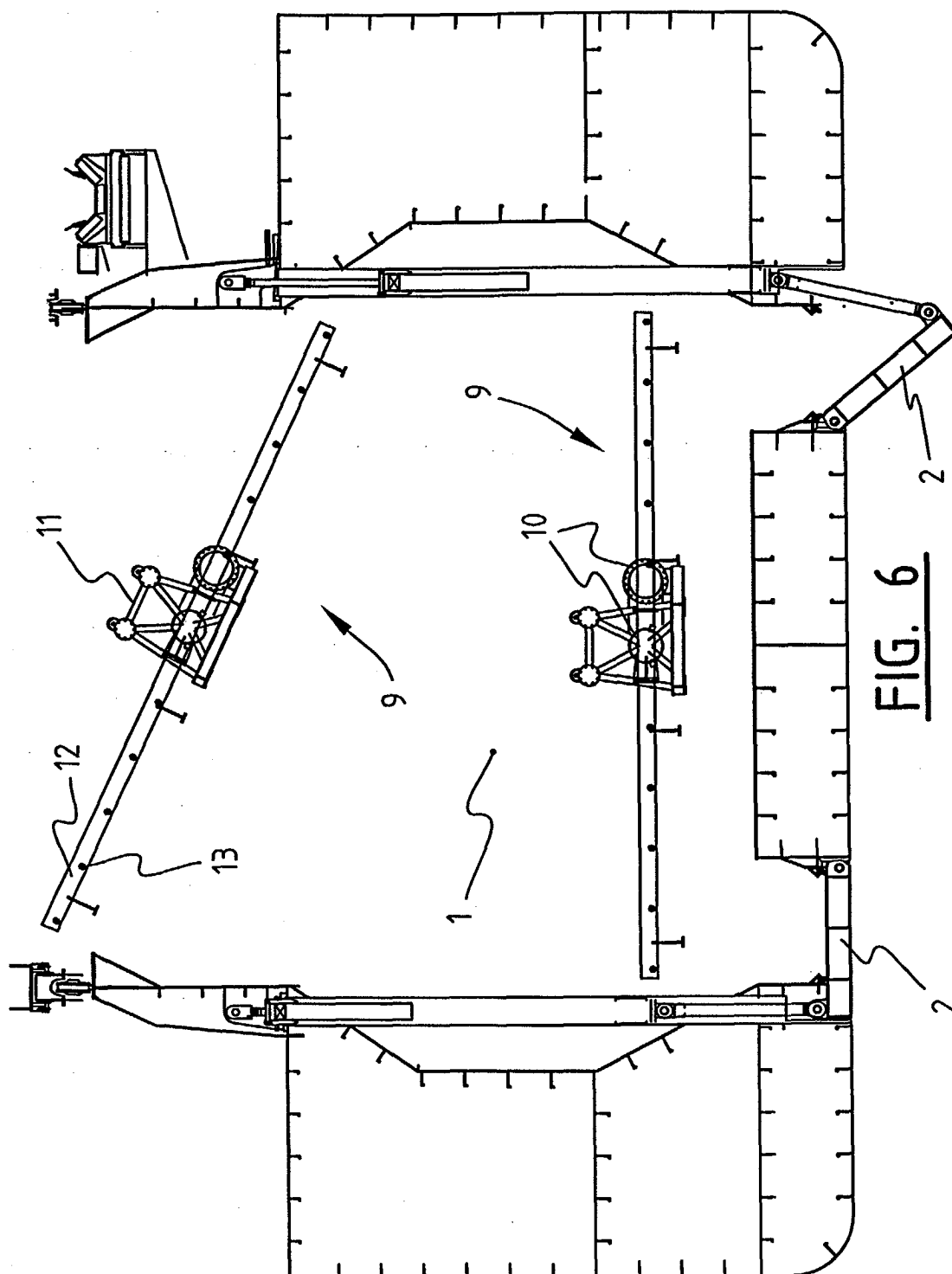
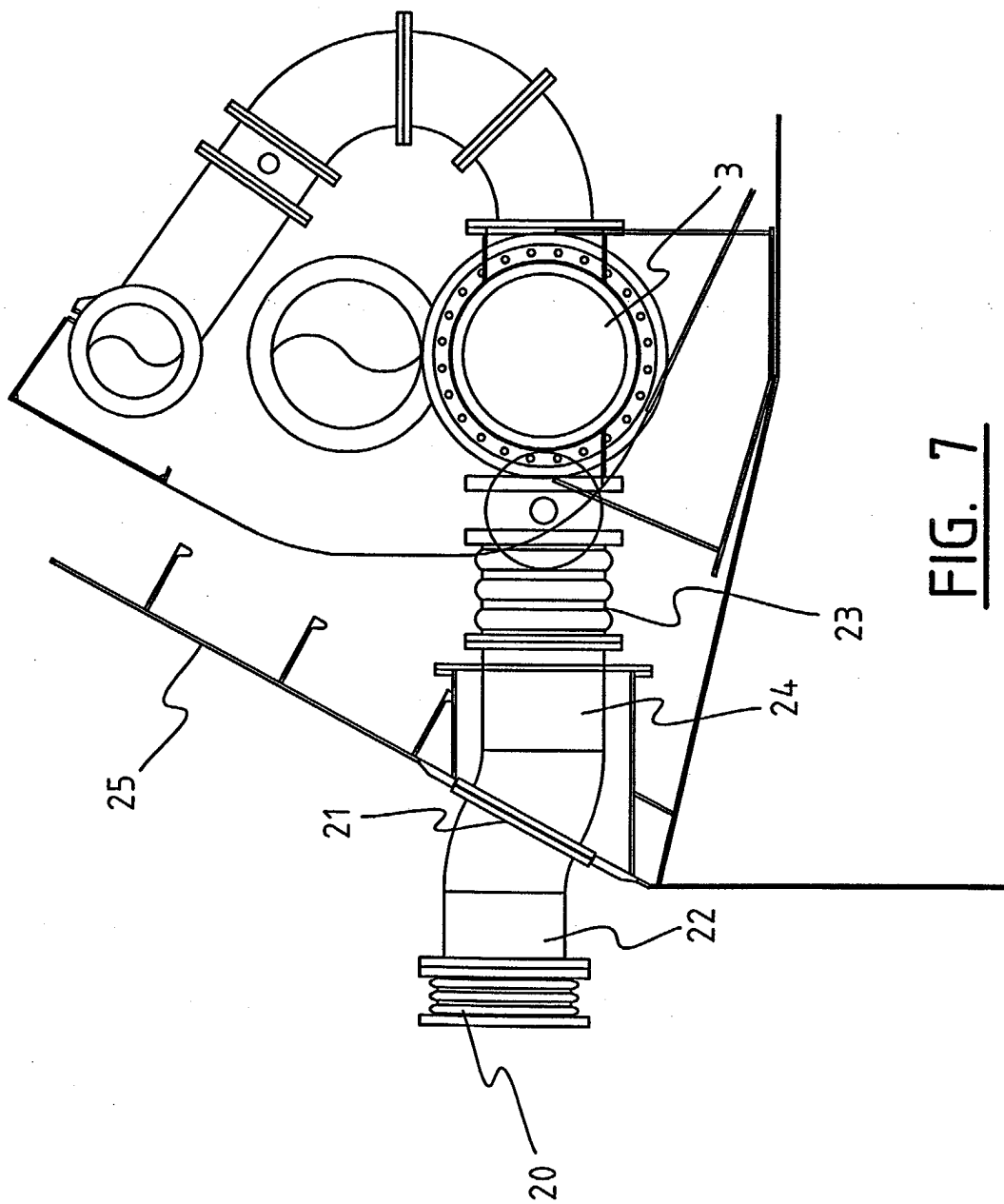


FIG. 4







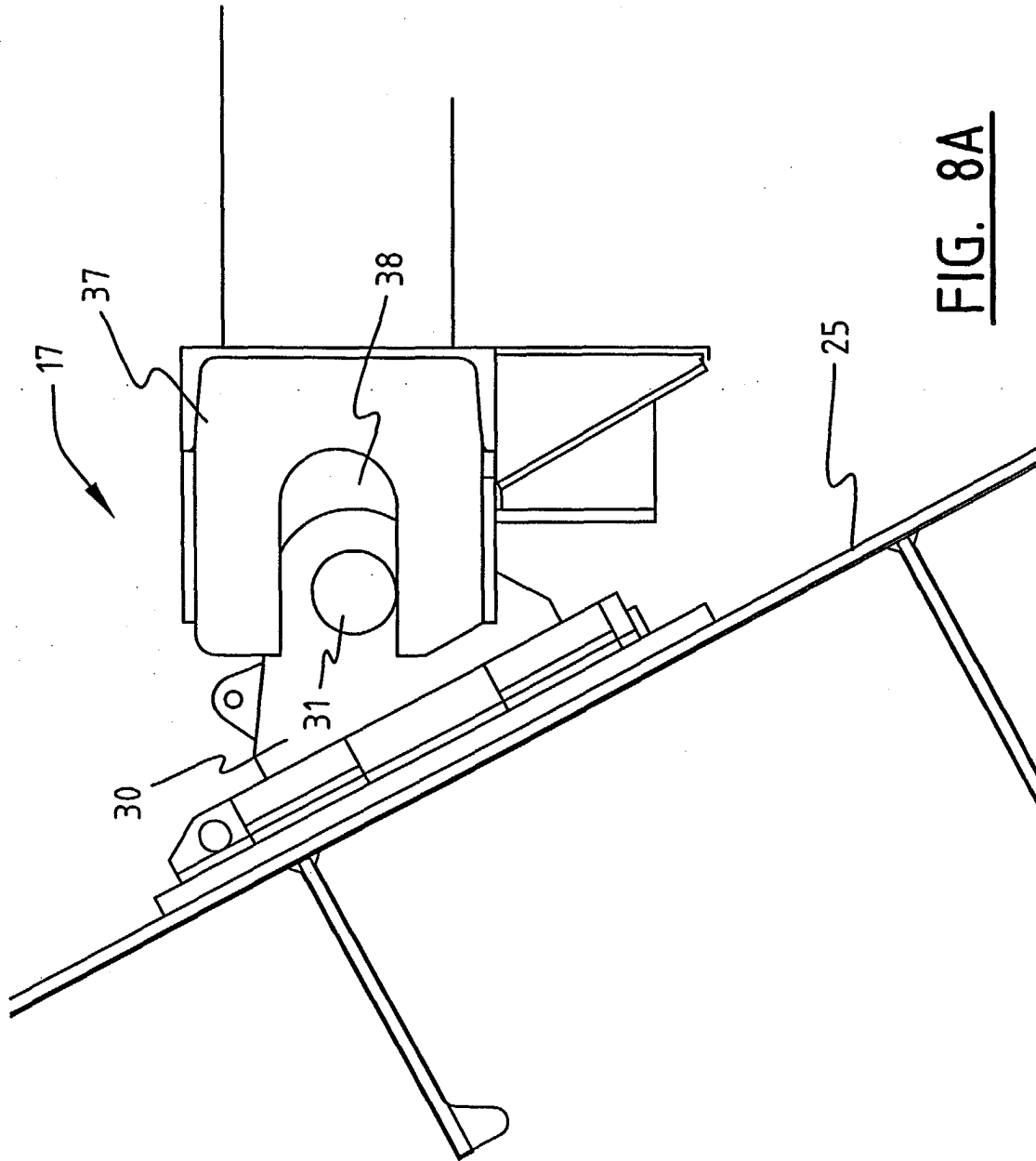
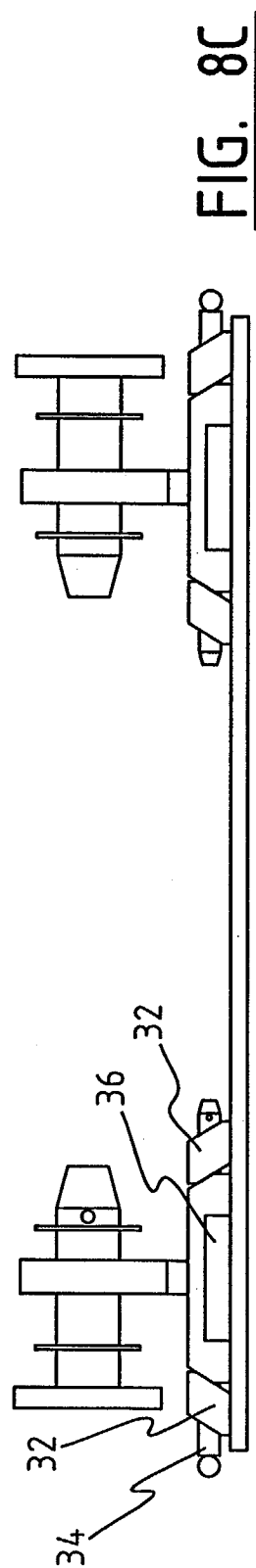
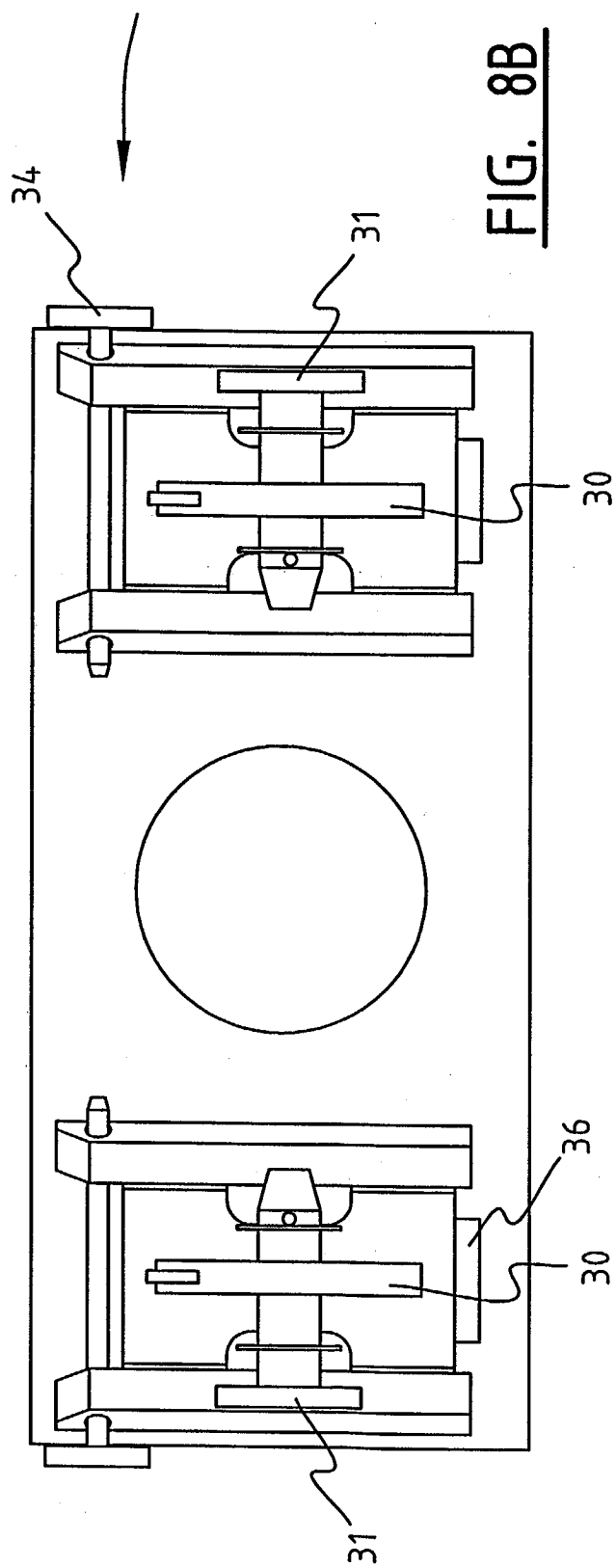


FIG. 8A





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Application Number
EP 04 07 6790

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 1 October 2004	Examiner DE SENA HERNANDORENA
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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