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(54) **A DEVICE FOR TRANSFER OF PERSONNEL OR CARGO BETWEEN A FIXED OR FLOATING
INSTALLATION AND A BOAT IN A HIGH SEA**

VORRICHTUNG ZUM ÜBERSETZEN VON PERSONAL ODER FRACHT ZWISCHEN EINER FESTEN
ODER SCHWIMMENDEN PLATTFORM UND EIN BOOT BEI SCHLECHTEM WETTER

DISPOSITIF SERVANT A TRANSFERER DES MEMBRES D'EQUIPAGE OU DES CARGAISONS
ENTRE UNE PLATEFORME FLOTTANTE OU FIXE ET UN BATEAU EN HAUTE MER

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Description

The invention concerns a device for transfer of personnel or cargo between a fixed or floating installation and a boat in a high sea.

The installation may, e.g., be an oil platform, a quay or a loading ramp on shore. The boat may be a rescue vessel, a cargo boat, a passenger ship, a fishing boat or the like. In one embodiment, the primary application of the device can be as a means of evacuation between the installation and the boat. In a second embodiment, the device can principally be intended to function as a routine means of transport for personnel or cargo, to and from an installation where wave motion or other factors often make traditional connections by crane, gangway or the like difficult, time consuming or hazardous.

One of the most important of the applications of the invention will be the transfer of personnel and/or lighter goods between oil platforms and so-called standby vessels or supply vessels. These vessels are very easy to manoeuvre and capable of coming relatively close alongside the platform and maintaining relatively precisely the same position for extended periods even in a high sea. However, even these vessels will suffer motion amplitudes both horizontally and vertically which greatly complicate cargo and personnel transfer between the vessels and the platforms. For heavier goods this problem is generally solved by packing the goods securely in extremely solid steel containers which can withstand heavy blows against the boat deck or against other cargo. Nevertheless, there will naturally be limits to the how rough the sea can be during which it is practically possible to perform such loading operations with present day equipment. For transfer of cargo between two floating installations or where loading operations have to be performed with a crane which itself is vulnerable to wave motion, there exist so-called active or passive heave compensation systems. These help to limit the cargo's wave accelerations either by suspending the cargo by a spring system, e.g. pneumatically, or by registering the cargo's acceleration or position by a sensor and processing it in a computer which transmits output control signals to the crane in order to compensate for the inadvertent movements caused by the waves. These systems can stabilise the cargo's movements during the cargo transfer, but they still do not remove the horizontal and vertical shock loadings which can occur when the cargo is lowered on to a boat deck which itself is in motion. The usual means of transport for a small number of people or lightweight goods between boat and platform is a so-called "basket" - a light and softly padded basket which is suspended in a crane. Since the basket is soft and light there is little risk of damage to the basket itself. Moreover, it is possible for crew members on deck to take hold of the basket without any great risk while it is still hanging freely in the crane hook, and to help to control it in order to ensure a soft landing on the required spot on deck. Nevertheless, the basket too is dangerous and difficult to use

when there is heavy wave motion, and moreover the basket will have a very limited capacity.

US-A-2874855 discloses a transfer apparatus between an offshore structure and a ship, the apparatus comprising a boom and provided with means for tensioning a guide line to keep it tensioned during movement of the ship.

A particularly complicated but also important problem is to evacuate people safely from a platform to a standby vessel or other seaworthy rescue vessel in an emergency situation. At present this usually has to be done indirectly by first taking the evacuating personnel down into lifeboats or rafts in the water, or they jump directly into the water in special survival suits, are picked up by so-called "mob-boats" or other vessels and are finally transferred to a safer, preferably specially-equipped rescue vessel. In most such evacuation systems the risk is very great, especially in a high sea. Various attempts have therefore been made to find systems which can safely take evacuating personnel directly from the platform to the rescue vessel, so-called "dry evacuation systems". However, the problems with the relative wave movements have been so great that to date there has been no breakthrough for any such systems on the market.

The object of the invention is to solve both this evacuation problem as well as other more everyday problems when transferring small and vulnerable cargoes between platform and boat. The system, however, can also successfully be used between two boats, or from shore to boat where quay or jetty conditions are difficult.

The invention is as set out in the claims. In brief summary, a boom equipped with a longitudinal transport passage is pivoted around a horizontal axis on the installation. One outer end of the boom projects from the platform to a position over the boat deck from where the cargo or person has to be lifted or lowered on to. Between the outer end of the boom and the boat deck a guide wire is stretched. The boom is upwardly suspended so that it follows the movements of the vessel's deck controlled by the guide wire, which maintains a constant distance to the boat deck. In this way a cargo can be controlled horizontally by slidable securing rings through which the guide wire runs, while the vertical movement can be synchronized with the movements of the boom and the deck. In this manner the cargo can be gently lowered on to the boat deck irrespective of the deck's heaving motion in the waves. The heaving motion will be absorbed gently and gradually by the cargo as the latter is pushed out on the boom, and will correspondingly be gradually dampened when the cargo is pushed from the outer end of the boom inward towards the boom's horizontal turning axis. At no time are the cargo or the person to be transferred exposed to any jarring impacts.

Preferred embodiments of the invention will now be described with reference to enclosed drawings, wherein

Fig. 1 illustrates an oil platform equipped with three devices according to the invention

- (with booms 2), and where vessels 9 are connected to two of the devices, thus illustrating the system in an operative condition.
- Fig. 2a-c illustrate embodiments of a boom 2 as usable in the invention, where fig. 2a depicts an open framework construction with an inserted longitudinal gangway or a conveyor belt, while figs. 2b and c illustrate a longitudinal view and a cross section respectively of a partially open framework boom 2 with a partially externally located closed gangway.
- Fig. 3a-b illustrates suspension of the boom 2 in substantially different positions, where 3a illustrates an upwardly directed rest position where the boom's specific weight is balanced against an upwardly directed spring force, while 3b illustrates upper and lower outer positions for the boom's pendulum movement synchronously with the movements of a connected boat deck in the waves. In both these positions in fig. 3b the boom 2 is held down by a tension in the guide wire 6 near the outer end of the boom.
- Fig. 4a-c show examples of suspension systems for the boom, where fig 4a illustrates a passive hydropneumatic suspension 5 in which the characteristics can be adjusted manually by gas valves and a hydraulic pump 10. Fig. 4b illustrates an active hydropneumatic suspension system controlled by computer-processed signals from a tension sensor 13 on the guide wire 6. Fig. 4c illustrates a suspension system in the form of a heave compensating constant tension winch 14.
- Fig. 5 shows a connection between boat 9 and boom 2 being set up, in which the connecting ropes are winched down on to the boat deck.
- Fig. 6 shows the invention in use for transport of personnel down to the boat.
- Fig. 7 shows an embodiment of the transport means between boom and boat deck whereby personnel or cargo can be transferred via two evacuation stockings 15 and a lift.
- Fig. 8 shows an embodiment which is primarily intended for two-way transfer of cargo.

In interpreting the following reference should be made to the last page of description which includes a list of reference characters for guidance.

In the following embodiment, which is primarily intended for the evacuation of personnel from oil platforms, the actual transport means is composed of a gangway on the boom 2, together with an arrangement

with two evacuation chutes or socks 15 and a lift between the end of the boom 2 and the boat deck.

The boat's (vessel 9's) movements in the waves are gradually transferred to the evacuating personnel in that initially only one degree of freedom of the motion (the vertical heave motion) is absorbed while the evacuee moves out towards the outer end of the boom. Thereafter horizontal movements are also gradually transferred as the evacuee slides down through the evacuation sock 15 or goes with the lift. Finally the rolling and pitching motions are also absorbed when the evacuee lands on a soft padding (inflated rubber dinghy) in the middle of the vessel's deck. In this manner the evacuee - or for that matter also any goods in the lift - avoids all the violent and sudden jolts which are otherwise liable to occur during the transfer of personnel or cargo during rough sea conditions, if the conditions at all allow transfer with other technology to take place.

In the embodiment there are proposed three parallel, linked "sock runs" 15, two of which are equipped with slide boards ("Skyscape") in such a way that it is a simple matter to climb over from one sock run to the other. The third sock run has no slide board but instead a lift, which is primarily intended for wounded on a stretcher. (Apart from the evacuation situation the lift can be used for ordinary transport of goods between supply/standby vessel 9 and platform).

The advantage with several sock runs is greater capacity and reduced risk of a blockage of, e.g., panicking people or people who are temporarily stuck in the sock due to non-regulation clothing or the like. Safe evacuation of the injured has a double effect: Firstly, evacuation of the injured in itself is naturally important. Secondly, if one should be injured, the certainty that there is still hope of being rescued is a factor which reduces the risk of the spread of panic. The latter applies particularly in a queue situation or if someone requires to postpone his own evacuation on account of essential work on the platform. From this point of view a lift also offers a better chance of returning to the platform.

For the sake of clarity the embodiment will now be described by means of an evacuation procedure with reference to the technical details which are vital for each step of the procedure.

0. The boom is in a state of readiness in its upper position.

The boom has hydropneumatic suspension. It is normally in a state of full readiness in an upper rest position. A manually controlled hydraulic pump is used for refilling in the case of leakage, which will be immediately detected since the boom drops slightly. (The pump can also be used for manual lifting and lowering of the boom, but this is not a part of the standard procedure).

1. The vessel takes up a position under the boom.

The vessel will take up a position with its bow into

the weather and reverse the afterdeck in under the boom. From the bridge the captain will have a complete all-round view of the afterdeck, the boom and the platform. The captain has the choice of using either dynamic positioning (DP) or manual positioning.

2. Two rope ends are dropped on to the deck from the outer end of the boom.

The rope ends are light, strong rope, e.g. Kevlar, with padded sandbags shackled on at the end. They can be released from the platform deck before anyone has gone out on the boom. One of the rope ends has a tensile strength of at least 10 tons. The other has a calibrated breaking strength of approximately 8 tons, and is intended for use on random rescue vessels which do not have their own mooring winch. If the rope ends do not land on the deck, they can be picked up with a boathook when the vessel manoeuvres alongside.

3. The vessel threads the rope end around a pulley on the deck on to which the sock is to be lowered, and winches the rope end down with a winch with a mooring function of approximately 8 tons.

The rope end is attached to the lowest reinforcing ring in the sock, which is reinforced for the purpose. When the rope end is pulled down, an approximately 500 kg heavy perforated weight is pulled down simultaneously. See figs. 5 and 6.

The weight is suspended in two pulleys mounted a considerable distance above the weight's centre of gravity. The weight is further controlled in that the rope end is threaded through a long sleeve on the weight. On the pulleys runs a guide wire, one end of which is fixed to the boom, and the other end reeled up on a winch with a 0.5 ton slipping clutch mounted on the boom. The guide wires are threaded in the normal manner through all the reinforcing rings on the sock.

When the rope end is stretched, the slipping clutch on the winch will keep the guide wires taut while the sock unfolds in the normal manner during lowering. The lowest cell in the sock is permanently attached to a special raft, which provides a nonimpact reception area on deck, which can hold a few people, and which is capable of carrying these people safely if the vessel is suddenly disconnected. The raft is floating freely on the weight with runners for the guide wires.

The raft is automatically inflated when the rope end is stretched. At the same time the guide wire winch is started. (Both parts have manual backup).

When the vessel has winched down the weight and the raft (which also acts as padding for the weight) so far that the sock is completely extended, the boom will be pulled behind it.

When the weight reaches the vessel's deck, the

boom will swing around with the wave motion in an approximately horizontal position (somewhat depending on ebb/flow). The weight has sprung support legs with friction elements which prevent it from rotating around the rope end when it has been pulled right down to the deck. Otherwise the rope end is the only securing element between the sock and the vessel.

The length of the rope end is adapted so that it lets go of the winch if the vessel has to leave, before the tensile strength in the winch attains too great a horizontal component in relation to the dimensioning of the boom.

4. The crew on deck stretches a guide rope as "support rail" between the raft and the hospital or other doors in the vessel's superstructure.

The guide ropes are attached to the raft at attachment points which withstand the tension that is necessary for the purpose and no more.

5. Door from platform to footbridge on the boom is opened.

6. The evacuation can begin.

See fig. 6.

7. When all personnel have been evacuated, the guide ropes are first untied from the raft. Thereafter the winch which holds the rope end is disconnected, and the vessel leaves the platform.

This causes the boom to return to its upper position in a controlled manner, hydraulically dampened. At the same time the winch will gently hoist the sock with the inflated raft.

Evacuation of injured personnel:

8. Injured personnel are strapped to a stretcher which is suspended in a "sock lift" operated by an ordinary electrical winch with manual pulley and centrifugal brake as backup.

The lift consists principally of a vertical steel frame slightly higher than the height of a man, which is controlled between internal reinforcing rings slightly smaller in diameter than external reinforcing rings to which they are welded. The tension release wires carry the outer rings, while the internal rings act as fenders for the lift.

Backup functions:

If there are found to be more personnel on the platform requiring evacuation after the vessel has cast off:

1. The same vessel, or another vessel, comes back and connects up to the platform again. The dry evacuation continues in the same way as before.

2. If no new vessels are ready for dry evacuation:

- The boom is lowered to its lower position, so that the raft is floating on the water.
(This is done either by operating the manually controlled hydraulic pump, or - in the case of a "dead platform" - by releasing gas from the gas cylinders. In the former case it can be lifted again and connected to a new vessel later).
- Evacuation is carried out to the raft instead of to the boat deck. Extra rafts are attached to the reception raft.

If the vessel has to move 10-20 metres further away with all haste:

1. The captain orders full speed away from the platform.
2. The mooring winch releases rope end in a controlled manner and without losing the connection.
3. The raft lifts a few metres off the deck if the boom reaches its lower end position. The guide ropes between the superstructure and the raft are then pulled in a disciplined manner into the attachment point on the raft.
4. The vessel can return at any time, winch the raft down on to the deck and continue the evacuation without having to be connected again. In the meantime the evacuees in the raft and sock sat waiting safely.

If the vessel has to move right away from the platform:

1. The winch is disconnected, or the mooring function releases the entire rope end. The lateral forces on the boom cannot be so very great since the tension in the rope end will have a limited horizontal component irrespective of the direction in which the vessel is travelling, due to the height up to the boom.
2. The boom can be lowered and evacuation to the rafts can be continued.

Use of the invention for ordinary transport of personnel and goods.

The lift which in the embodiment is primarily included for evacuation of the injured, can of course be adapted for an application as a primary transport means for goods or personnel, without this falling outside the scope of the invention. In this case the previously described evacuation socks, for example, can be omitted entirely in order to make room for a lift with correspondingly greater dimensions. The gangway on the boom can then be replaced with or complemented by a conveyor belt. The need for such transport means for routine use in the North Sea is obvious, when the present day expensive helicopter transport costs are taken into consideration.

EXPLANATION TO THE DRAWINGS:

FIG. 3A: REST/READINESS POSITION The boom is suspended on the gas springs. The top of the boom is far enough out to enable the rope end in free fall to be picked up on the deck of the vessel. The boom is not in the way of supply traffic. Moderate pressure in the gas springs.

Fig. 3B: OPERATIVE POSITION

1) A relatively acute angle of attack (α) gives great tensile forces, but little migration (moderate force amplitude) between the upper and lower operative positions.

2) The cylinder abuts against end stop when the angle of the boom reaches -10 degrees. This limits the horizontal component of tension in the stocking if the vessel leaves without releasing the rope end.

COMMENTS TO FIG. 5:

- Attachment point for guide rope ("Suppoort rail") broken in case of excessive load
- Special raft which is supported by the weight and can only fall during lifting
- Pulley in the middle of the deck

IN THE DRAWINGS THE FOLLOWING REFERENCE NUMBERS ARE USED:

- | | |
|----|-----------------------------|
| 1 | Hydropneumatic suspension |
| 2 | Boom |
| 3 | Arm |
| 4 | Supporting wire |
| 5 | Heave compensating cylinder |
| 6 | Guide wire |
| 7 | Gas tank |
| 8 | Oil tank |
| 9 | Vessel |
| 10 | Manually controlled pump |
| 11 | Computer controlled pump |
| 12 | Computer module |
| 13 | Tension sensor |
| 14 | Heave-compensating winch |
| 15 | Net |
| 16 | Guide wire |
| 17 | Pulleys |
| 18 | Tension release wire |
| 19 | Low coaming |
| 20 | Inflated coaming |
| 21 | Soft, sprung foot |
| 22 | Rope end during winching |
| 23 | Winch 8 tons |
| 24 | Rope end |
| 25 | Perforated weight |
| 26 | Boom |

- 27 Attachment of one end of guide wire
- 28 Guide wire to winch
- 29 Roller for guide wire
- 30 Net slide
- 31 Strong termination for tension releasing sus- 5
- 32 pended in a universal joint
- 32 Guide wire
- 33 Superstructure
- 34 External reinforcement rings
- 35 Internal reinforcement rings 10
- 36 Guide wire winch
- 37 Lift winch

Claims

1. A device for transfer of personnel or cargo between a fixed or floating installation and a boat (9) in a high sea, characterized in that a boom (2,26) equipped with a longitudinal transport passage is pivoted around a horizontal axis on the installation, that one outer end of the boom (2,26) projects over a position to which a boat deck can be manoeuvred, that there is set up at least one approximately vertical rope or wire connection (6,16) of approximately constant length between the deck and the outer end of the boom (2,26), that the outer end of the boom (2,26) is upwardly suspended around the said horizontal axis, thus keeping the rope or wire taut despite the movements of the boat in the waves, and that the rope or wire connection (6,16) serve as a guide rope or guide wire for a transport means in the form of a chutelike rescue sock (15), slide, lift, stairway, gangway or the like between the outer end of the boom (2,26) and the boat deck. 15 20 25 30 35
2. A device according to claim 1, characterized in that the boom is upwardly suspended by means of a passive spring device (1), that the boat is equipped with a winch (23), that a rope or wire connection (6,16) is established by dropping the rope on to the boat deck from the outer end of the boom (2,26), that the rope is connected to the said winch (23), and that the winch (23) is dimensioned so as to pull the boom (2,26) closer to the boat deck by overcoming the boom's upwardly directed spring force, and that the winch pulls the boom so far down that the upwardly directed spring force preferably during the entire course of the wave motion becomes greater than the weight of the cargo which has to be suspended between the outer end of the boom (2,26) and the boat deck. 40 45 50
3. A device according to claim 2, characterized in that the passive spring device (1) comprises a hydraulic cylinder (5) connected to a hydropneumatic accumulator (5,7), and that the spring characteristic can be adjusted by altering the amount of gas and/or liquid in the accumulator with 55
4. A device according to claim 1, characterized in that the outer end of the boom (2,26) is upwardly suspended by means of the tensile force in a wire (4) stretched from a point out on the arm (3) of the boom (2,26) and upwards directly or via a pulley to a slipping winch permanently connected to the same installation as the boom's pivot axis.
5. A device according to claim 1, characterized in that the boom (2,26) is upwardly suspended by means of an active hydropneumatic spring system, whereby a tension sensor (13) in the rope connection (6,16) to the boat deck provides continuous control signals via a computer (12) to pumps and valves (10,11) in order to adjust the spring forces depending on the tension in the said rope connection (6,16).
6. A device according to one or more of the preceding claims, characterized in that a winch (23) on the boat deck which maintains the rope or wire connection (6,16) with the end of the boom (2,26) has a slipping clutch which ensures that a little more rope is paid out temporarily if the sluggishness in the boom's or the cargo's movements causes tension in the rope which exceeds a calculated tolerance limit.
7. A device according to claim 6, characterized in that the winch (23) temporarily reels in more rope if the tension in the rope due to sluggishness in the boom's or the cargo's movements falls below a predetermined tolerance limit in particularly large individual waves.
8. A device according to one or more of the preceding claims, characterized in that there are at least two independent rope connections (16,18) between the boom and the boat deck, the first (18) of which rope connections is intended to keep the boom (2,26) at as constant a height as possible over the boat deck, while a second rope connection (16) is connected to a slipping winch which does not have sufficient tensile force to overcome the boom's spring forces, but which supplies sufficient tensile force to keep the rope taut, thus enabling it to be suitable for use as a guide rope for the transport means even though the distance between the end of the boom and the boat deck should vary somewhat despite the first rope connection (18).

pump and/or valve devices (10,11) provided for this purpose.

Patentansprüche

1. Vorrichtung für den Transport von Personen oder Fracht zwischen einer festen oder schwimmenden Anlage und einem Boot (9) auf hoher See, dadurch gekennzeichnet, daß ein mit einer länglichen Transportpassage ausgestatteter Ausleger (2, 26) um eine horizontale Achse auf der Anlage gedreht wird, daß ein äußeres Ende des Auslegers (2, 26) über eine Position vorsteht, zu der ein Bootsdeck manövriert werden kann, daß wenigstens eine etwa senkrechte Tau- oder Drahtseilverbindung (6, 16) von etwa konstanter Länge zwischen dem Deck und dem äußeren Ende des Auslegers (2, 26) eingerichtet ist, daß das äußere Ende des Auslegers (2, 26) oben um die genannte horizontale Achse aufgehängt ist, so daß das Tau oder Drahtseil trotz der Bewegungen des Bootes in den Wellen gespannt gehalten wird, und daß die Tau- oder Drahtseilverbindung (6, 16) als Führungstau oder Führungsdrahtseil für ein Transportmittel in der Form eines rutschenartigen Rettungsschlauches (15), einer Rutsche, eines Lifts, einer Treppe, einer Gangway oder dergleichen zwischen dem äußeren Ende des Auslegers (2, 26) und dem Bootsdeck dient.
2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß der Ausleger oben mit Hilfe einer passiven Federvorrichtung (1) aufgehängt ist, daß das Boot mit einer Winde (23) ausgestattet ist, daß eine Tau- oder Drahtseilverbindung (6, 16) durch Fallenlassen des Taus vom äußeren Ende des Auslegers (2, 26) auf das Bootsdeck hergestellt wird, daß das Tau mit der genannten Winde (23) verbunden ist und daß die Winde (23) so dimensioniert ist, daß sie den Ausleger (2, 26) durch Überwinden der aufwärtsgerichteten Federkraft des Auslegers näher zum Bootsdeck hinziehen kann, und daß die Winde den Ausleger so weit nach unten zieht, daß die aufwärtsgerichtete Federkraft vorzugsweise während des gesamten Verlaufs der Wellenbewegung größer wird als das Gewicht der Fracht, die zwischen dem äußeren Ende des Auslegers (2, 26) und dem Bootsdeck abgestützt werden muß.
3. Vorrichtung nach Anspruch 2, dadurch gekennzeichnet, daß die passive Federvorrichtung (1) einen Hydraulikzylinder (5) umfaßt, der mit einem hydropneumatischen Akkumulator (5, 7) verbunden ist, und daß die Federeigenschaft durch Ändern der Menge an Gas und/oder Flüssigkeit in dem Akkumulator mit für diesen Zweck vorgesehenen Pumpen- und/oder Ventilvorrichtungen (10, 11) verstellt werden kann.
4. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das äußere Ende des Auslegers (2, 26) mit Hilfe der Zugkraft in einem Drahtseil (4) oben aufgehängt ist, der von einem Punkt in der Nähe des

äußeren Endes des Arms (3) des Auslegers (2, 26) nach oben unmittelbar oder über eine Scheibe zu einer Rutschwinde gespannt ist, die permanent mit derselben Anlage verbunden ist wie die Schwenkachse des Auslegers.

5. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß der Ausleger (2, 26) oben mit Hilfe eines aktiven hydropneumatischen Federsystems aufgehängt ist, so daß ein Spannungssensor (13) in der Tauverbindung (6, 16) zu dem Bootsdeck über einen Computer (12) kontinuierliche Steuersignale zu Pumpen und Ventilen (10, 11) sendet, um die Federkräfte in Abhängigkeit von der Zugkraft in der genannten Tauverbindung (6, 16) zu verstellen.
6. Vorrichtung nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß eine Winde (23) auf dem Bootsdeck, die die Tau- oder Drahtseilverbindung (6, 16) mit dem Ende des Auslegers (2, 26) aufrechterhält, eine Rutschkupplung aufweist, die gewährleistet, daß vorübergehend etwas mehr Tau abgewickelt wird, wenn die Schwergängigkeit in den Bewegungen des Auslegers oder der Fracht eine Zugspannung in dem Tau verursacht, die eine errechnete Toleranzgrenze übersteigt.
7. Vorrichtung nach Anspruch 6, dadurch gekennzeichnet, daß die Winde (23) vorübergehend mehr Tau aufwickelt, wenn die Zugspannung in dem Tau aufgrund einer Schwergängigkeit in den Bewegungen des Auslegers oder der Fracht bei besonders großen Einzelwellen unter eine vorbestimmte Toleranzgrenze fällt.
8. Vorrichtung nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß wenigstens zwei unabhängige Tauverbindungen (16, 18) zwischen dem Ausleger und dem Bootsdeck vorhanden sind, wobei die erste (18) dieser Tauverbindungen den Ausleger (2, 26) auf einer möglichst konstanten Höhe über dem Bootsdeck halten soll, während eine zweite Tauverbindung (16) mit einer Rutschwinde verbunden ist, die keine ausreichende Zugkraft besitzt, um die Federkräfte des Auslegers zu überwinden, deren Zugkraft aber ausreicht, um das Tau gespannt zu halten, so daß es für den Einsatz als Führungstau für das Transportmittel geeignet ist, auch wenn der Abstand zwischen dem Ende des Auslegers und dem Bootsdeck trotz der ersten Tauverbindung (18) etwas variieren sollte.

Revendications

1. Dispositif pour transférer du personnel ou du fret entre une installation fixe ou flottante et un bateau (9) en haute mer,

caractérisé en ce qu'une flèche (2, 26) équipée d'un passage de transport longitudinal est montée à pivot autour d'un axe horizontal sur l'installation, en ce qu'une extrémité extérieure de la flèche (2, 26) fait saillie au-dessus d'une position à laquelle un pont de bateau peut être manoeuvré, en ce qu'au moins une connexion approximativement verticale par cordage ou par câble (6, 16), de longueur approximativement constante, est disposée entre le pont et l'extrémité extérieure de la flèche (2, 26), en ce que l'extrémité extérieure de la flèche (2, 26) est suspendue vers le haut autour dudit axe horizontal, conservant ainsi le cordage ou le câble tendu en dépit des mouvements du bateau dans les vagues, et en ce que la connexion par cordage ou par câble (6, 16) sert de cordage de guidage ou de câble de guidage pour des moyens de transport ayant la forme d'une chaussette de sauvetage par chute (15), d'une glissière, d'un ascenseur, d'un escalier, d'un couloir ou analogue entre l'extrémité extérieure de la flèche (2, 26) et le pont du bateau.

2. Dispositif selon la revendication 1, caractérisé en ce que la flèche est suspendue vers le haut au moyen d'un dispositif élastique passif (1), en ce que le bateau est équipé d'un treuil (23), en ce qu'une connexion par cordage ou par câble (6, 16) est établie par descente du cordage sur le pont du bateau à partir de l'extrémité extérieure de la flèche (2, 26), en ce que le cordage est connecté audit treuil (23), et en ce que le treuil (23) est dimensionné afin de rapprocher la flèche (2, 26) du pont du bateau par traction en surmontant la force élastique dirigée vers le haut de la flèche, et en ce que le treuil tire la flèche assez loin vers le bas pour que la force élastique dirigée vers le haut, de préférence sur la totalité du mouvement de la vague, devienne plus grande que le poids du fret qui doit être suspendu entre l'extrémité de la flèche (2, 26) et le pont du bateau.
3. Dispositif selon la revendication 2, caractérisé en ce que le dispositif élastique passif (1) comprend un vérin hydraulique (5) connecté à un accumulateur hydropneumatique (5, 7), et en ce que les caractéristiques élastiques peuvent être ajustées en modifiant la quantité de gaz et/ou de liquide dans l'accumulateur à l'aide de dispositifs à pompes et/ou à vannes (10, 11) prévues à cet effet.
4. Dispositif selon la revendication 1, caractérisé en ce que l'extrémité extérieure de la flèche (2, 26) est suspendue vers le haut au moyen de la force de traction d'un câble (4) s'étendant d'un point extérieur sur le bras (3) de la flèche (2, 26) et vers le haut directement ou par intermédiaire d'une poulie jusqu'à un treuil glissant connecté de façon permanente à la même installation que l'axe de pivot de la flèche.

5. Dispositif selon la revendication 1, caractérisé en ce que la flèche (2, 26) est suspendue vers le haut au moyen d'un système élastique hydro-pneumatique actif dans lequel un détecteur de tension (13) dans la connexion par cordage (6, 16) au pont du bateau fournit des signaux de commande continus par l'intermédiaire d'un ordinateur (12) à des pompes et vannes (10, 11) afin d'ajuster les forces élastiques en fonction de la tension dans ladite connexion (6, 16) par cordage.
6. Dispositif selon l'une ou plusieurs des revendications précédentes, caractérisé en ce qu'un treuil (23) disposé sur le pont du bateau, qui maintient la connexion par cordage ou par câble (6, 16) avec l'extrémité de la flèche (2, 26), comporte un embrayage glissant qui laisse filer temporairement un petit supplément de cordage si les mouvements lents de la flèche ou du fret entraînent une tension dans le cordage qui dépasse une limite de tolérance calculée.
7. Dispositif selon la revendication 6, caractérisé en ce que le treuil (23) embobine temporairement davantage de cordage si la tension dans le cordage due aux mouvements lents de la flèche ou du fret chute en-dessous d'une limite de tolérance prédéterminée sur des vagues individuelles particulièrement grandes.
8. Dispositif selon une ou plusieurs des revendications précédentes, caractérisé en ce qu'il y a au moins deux connexions indépendantes par cordage (16, 18) entre la flèche et le pont du bateau, la première connexion par cordage étant destinée à maintenir la flèche (2, 26) à une hauteur aussi constante que possible au-dessus du pont du bateau, tandis que la deuxième connexion par cordage (16) est connectée à un treuil glissant qui n'a pas suffisamment de force de tracton pour vaincre les forces élastiques de la flèche mais qui fournit suffisamment de force de traction pour maintenir le cordage tendu, étant ainsi adaptée à une utilisation en tant que cordage de guidage pour les moyens de transport même si la distance entre l'extrémité de la flèche et le pont du bateau devait varier quelque peu en dépit de la première connexion par cordage (18).

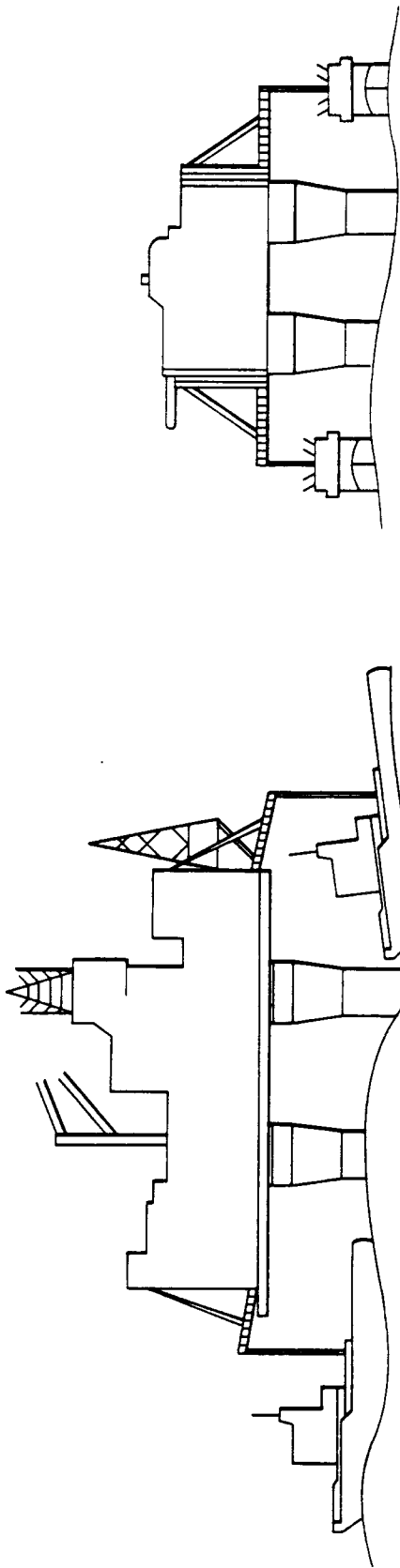
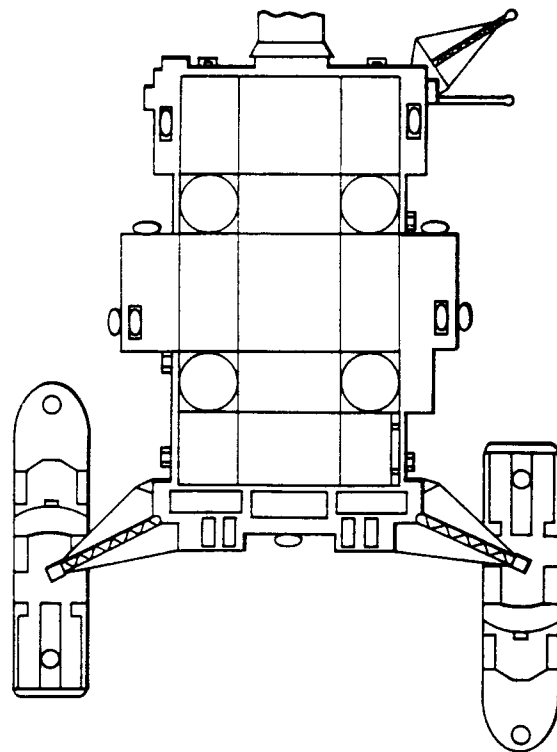
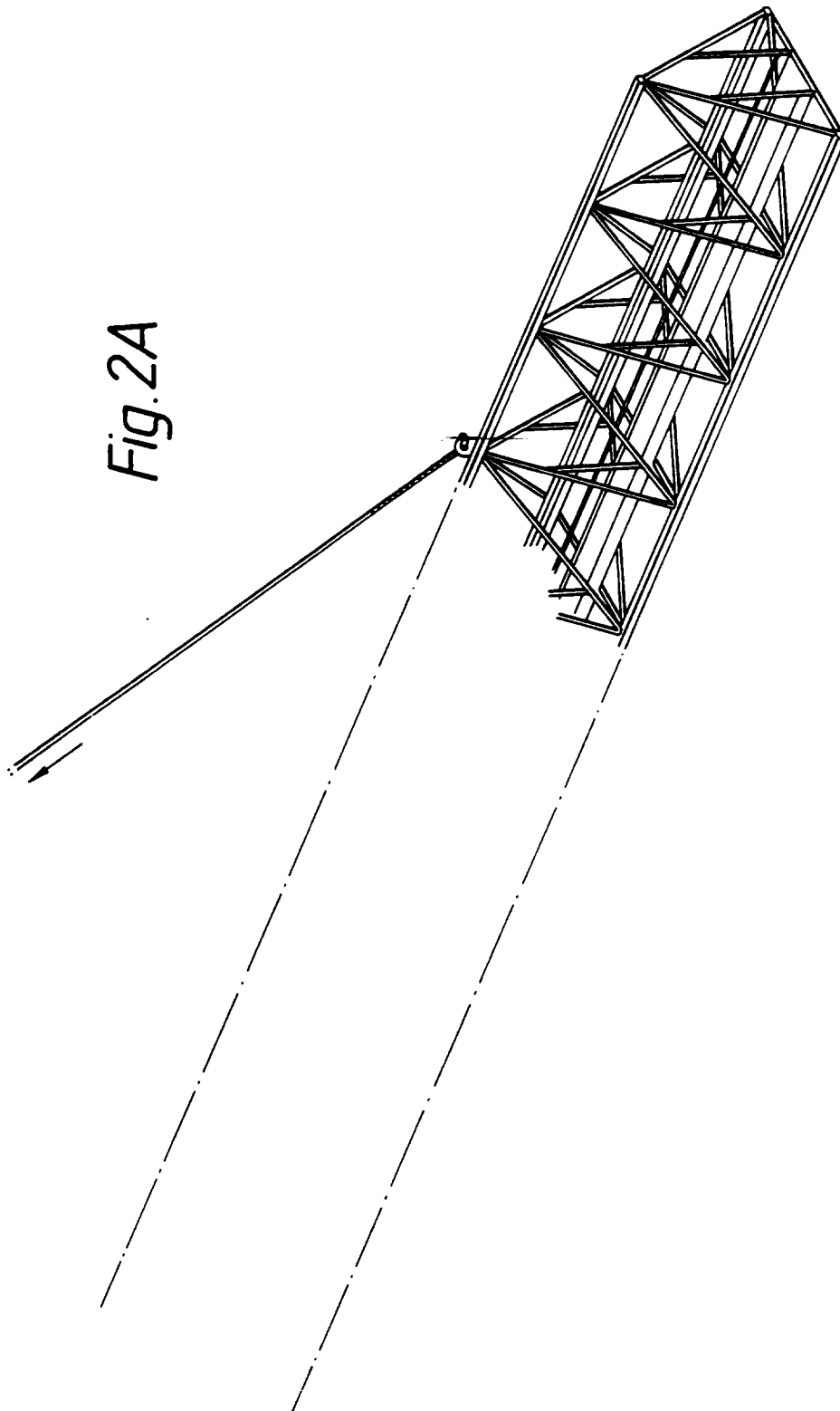


Fig. 1.





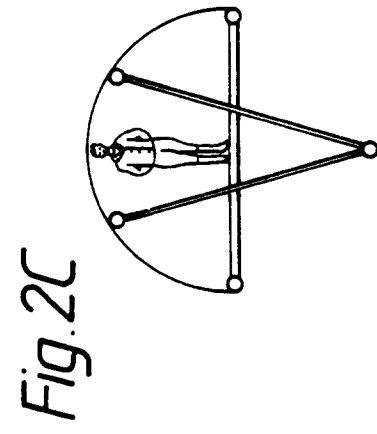
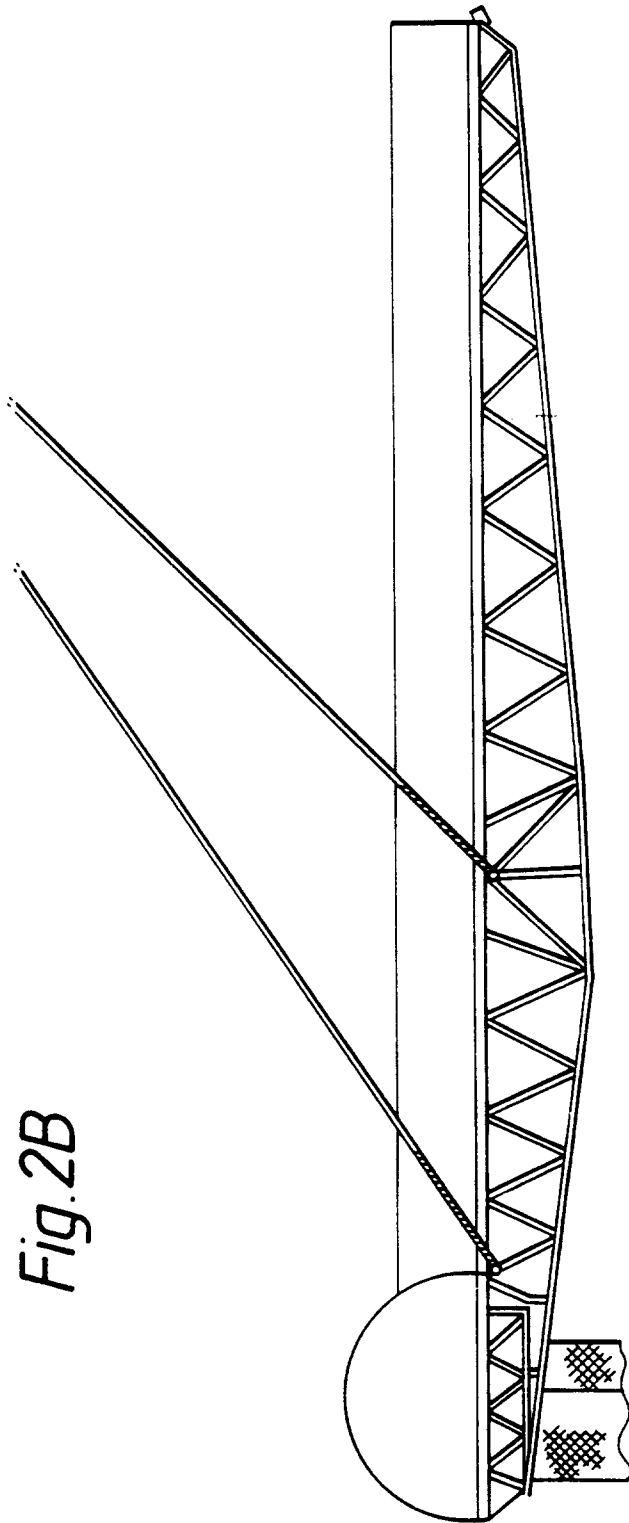


Fig.3A

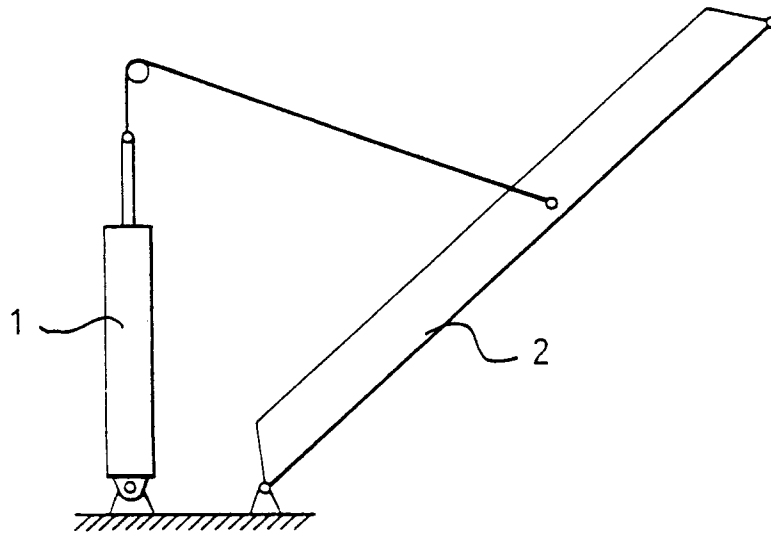


Fig.3B

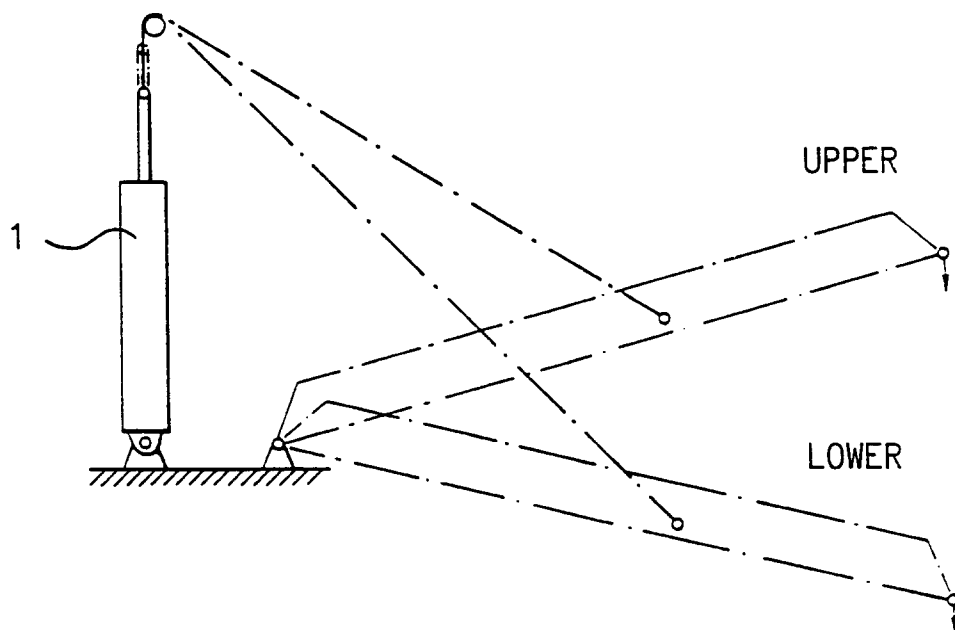


Fig. 4a

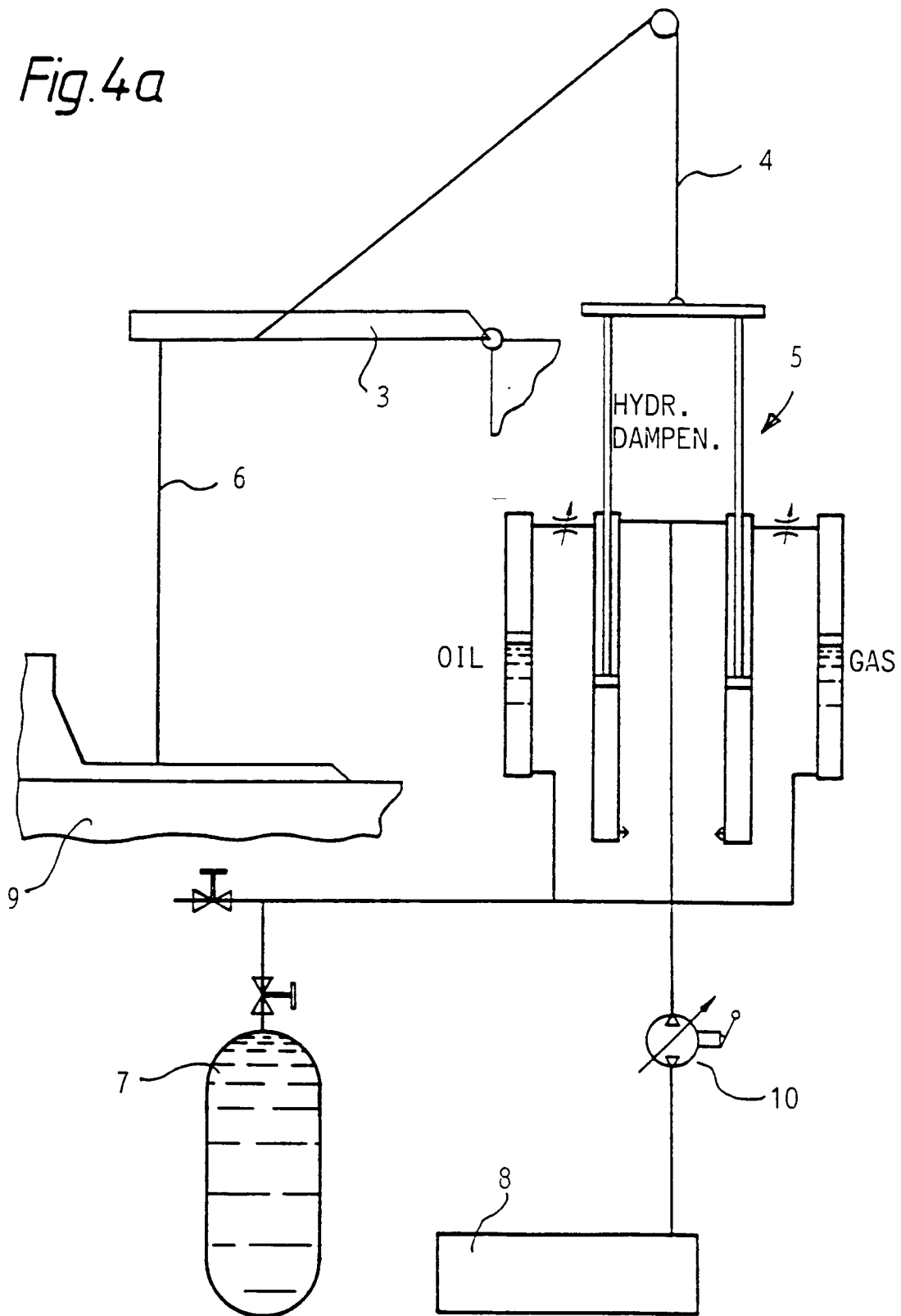


Fig. 4b

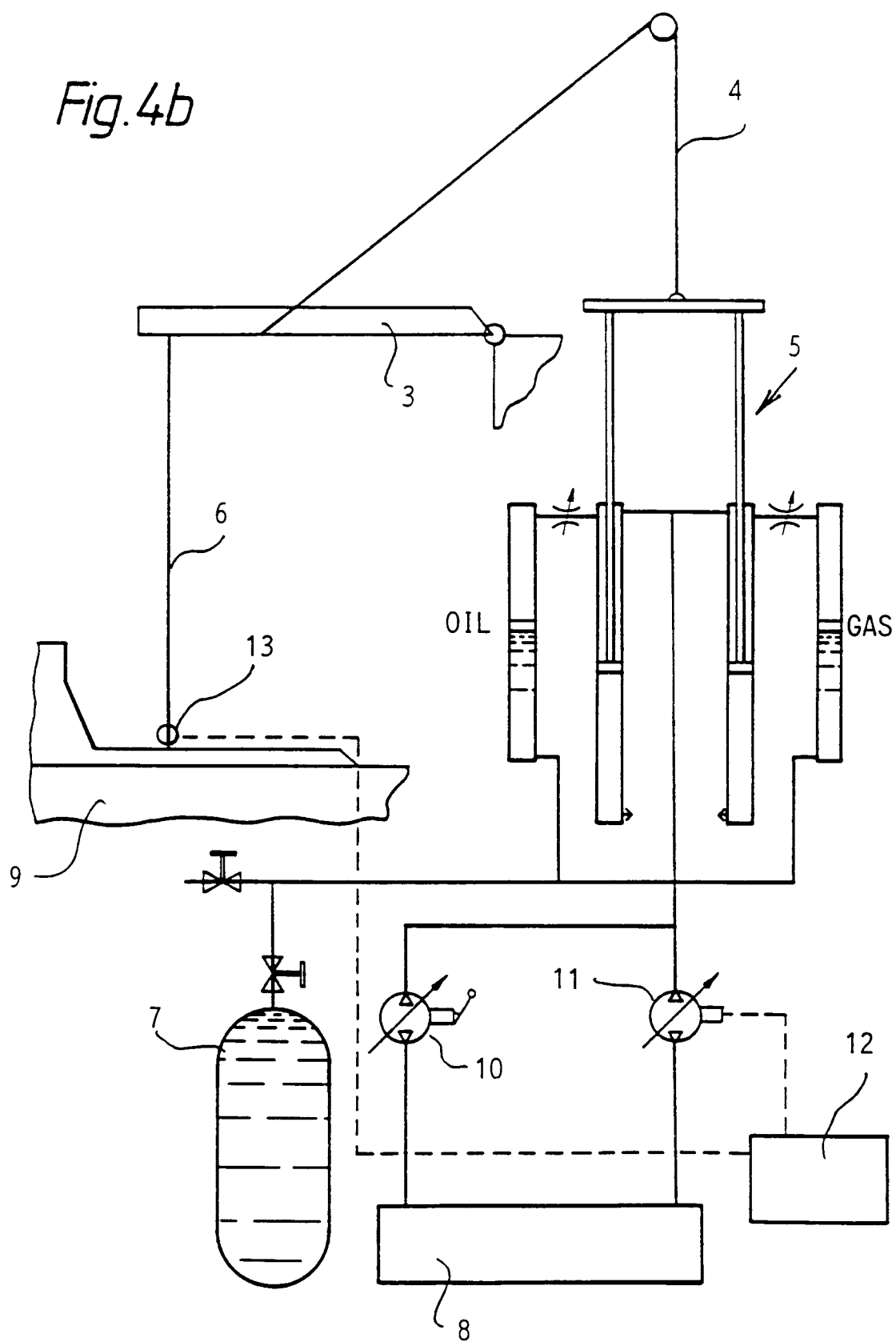
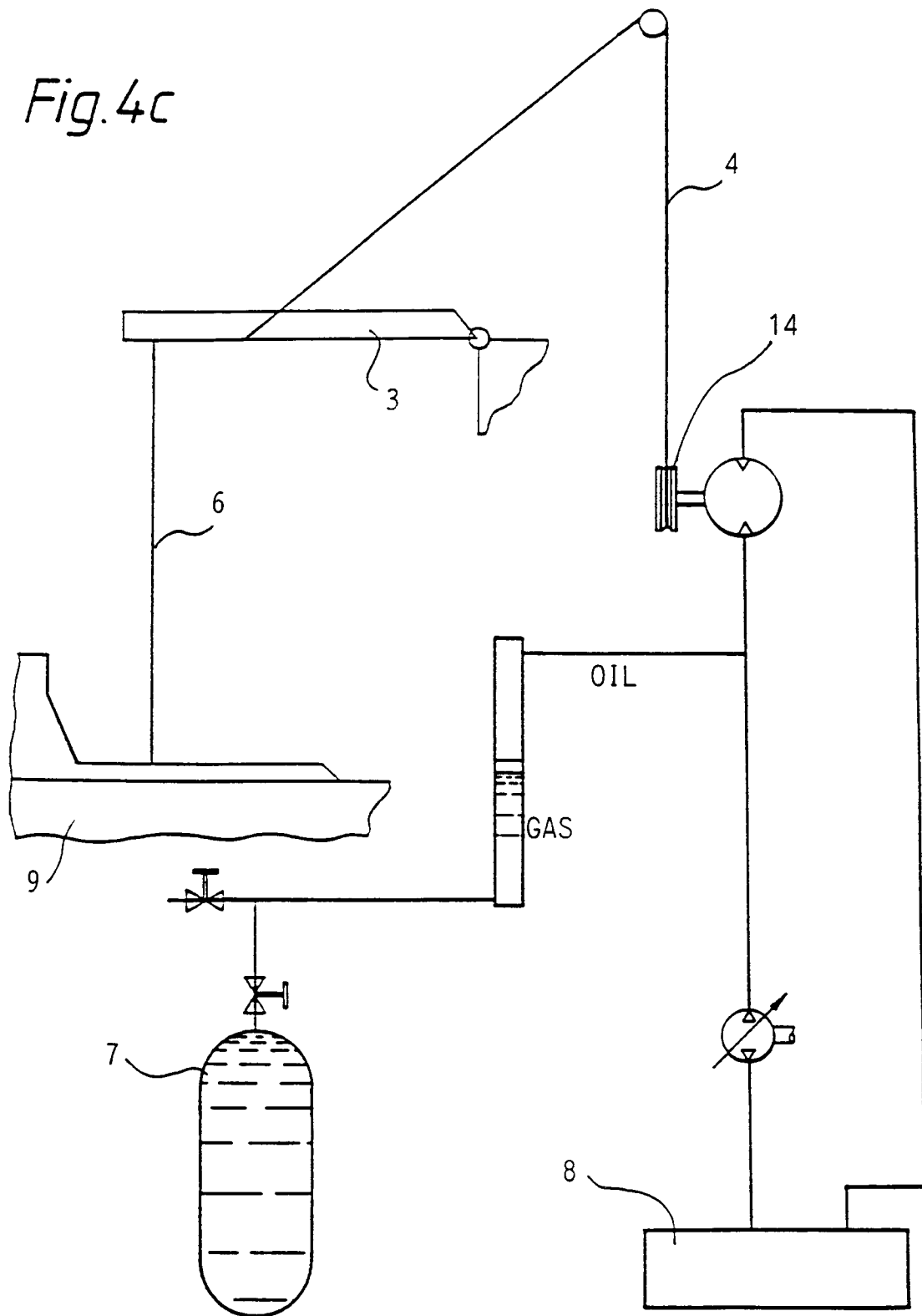


Fig. 4c



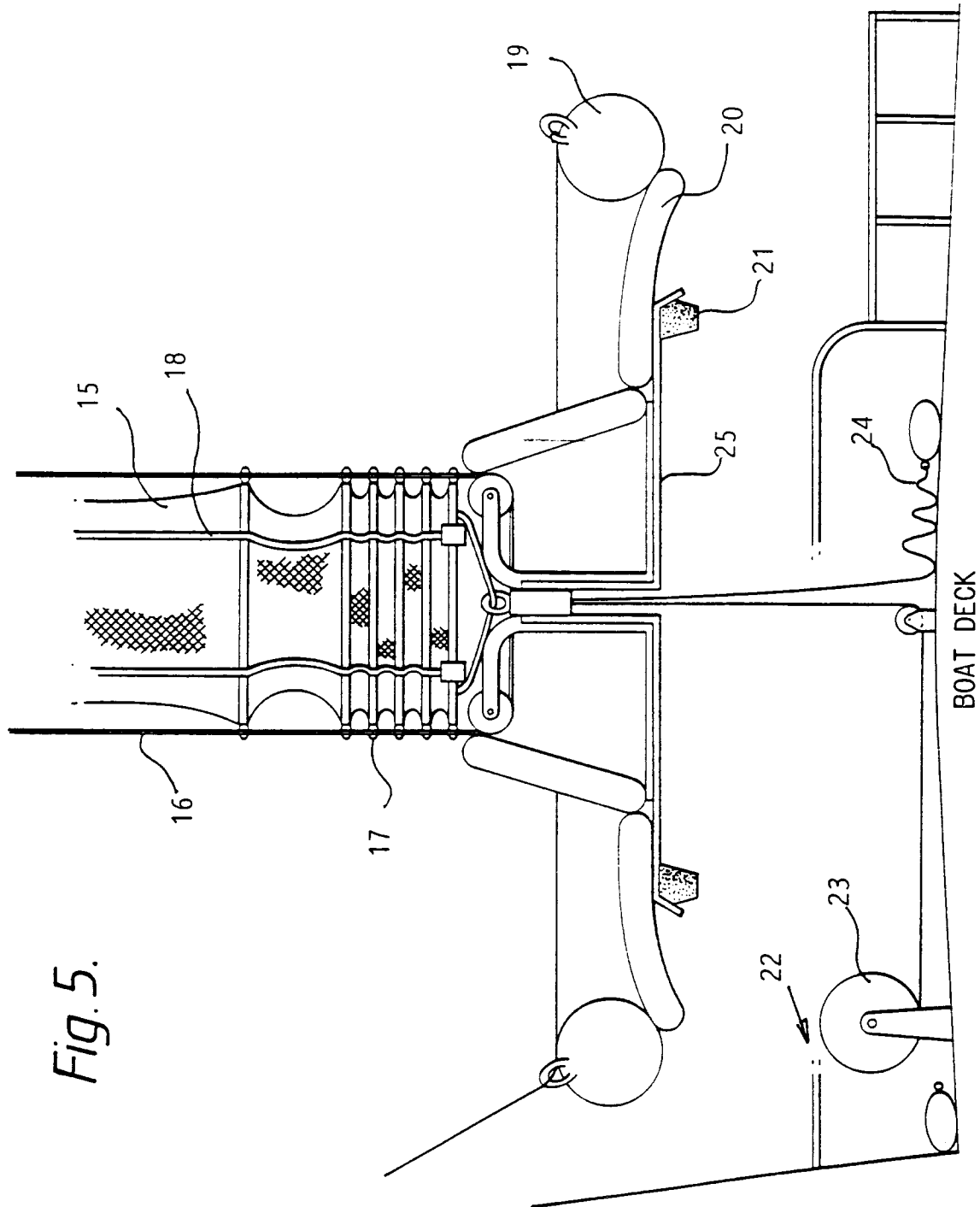


Fig. 6.

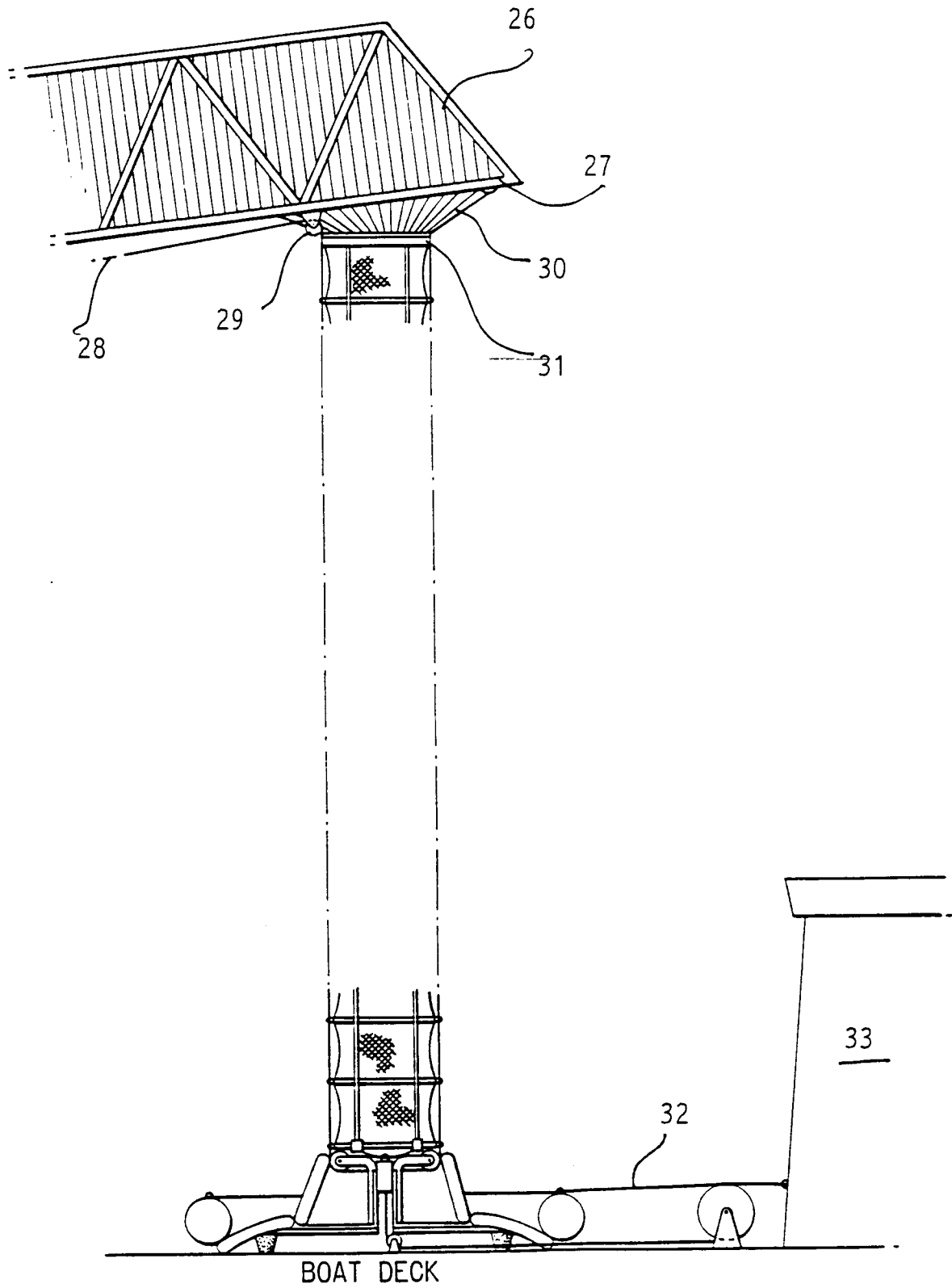


Fig. 7.

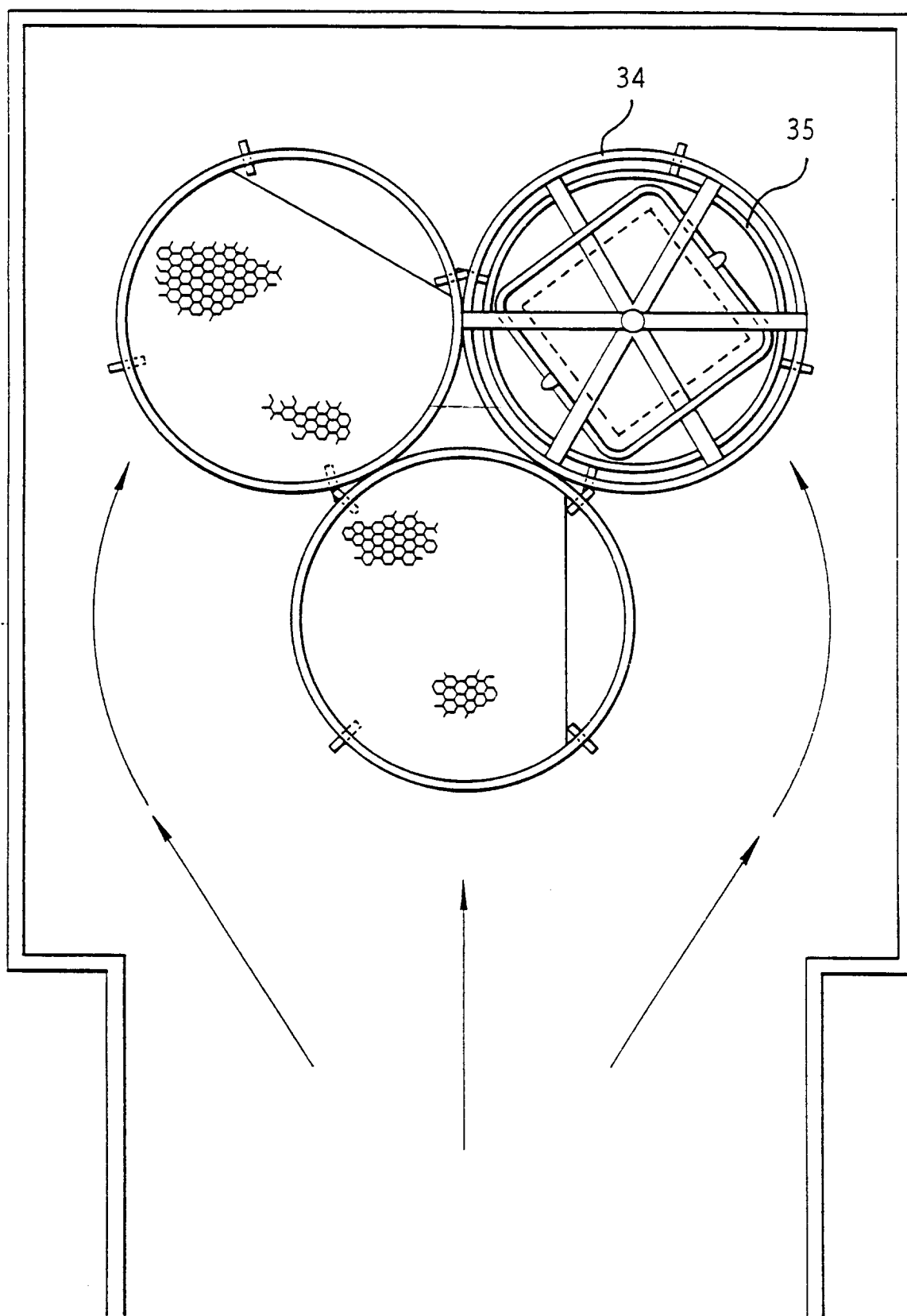


Fig. 8.

