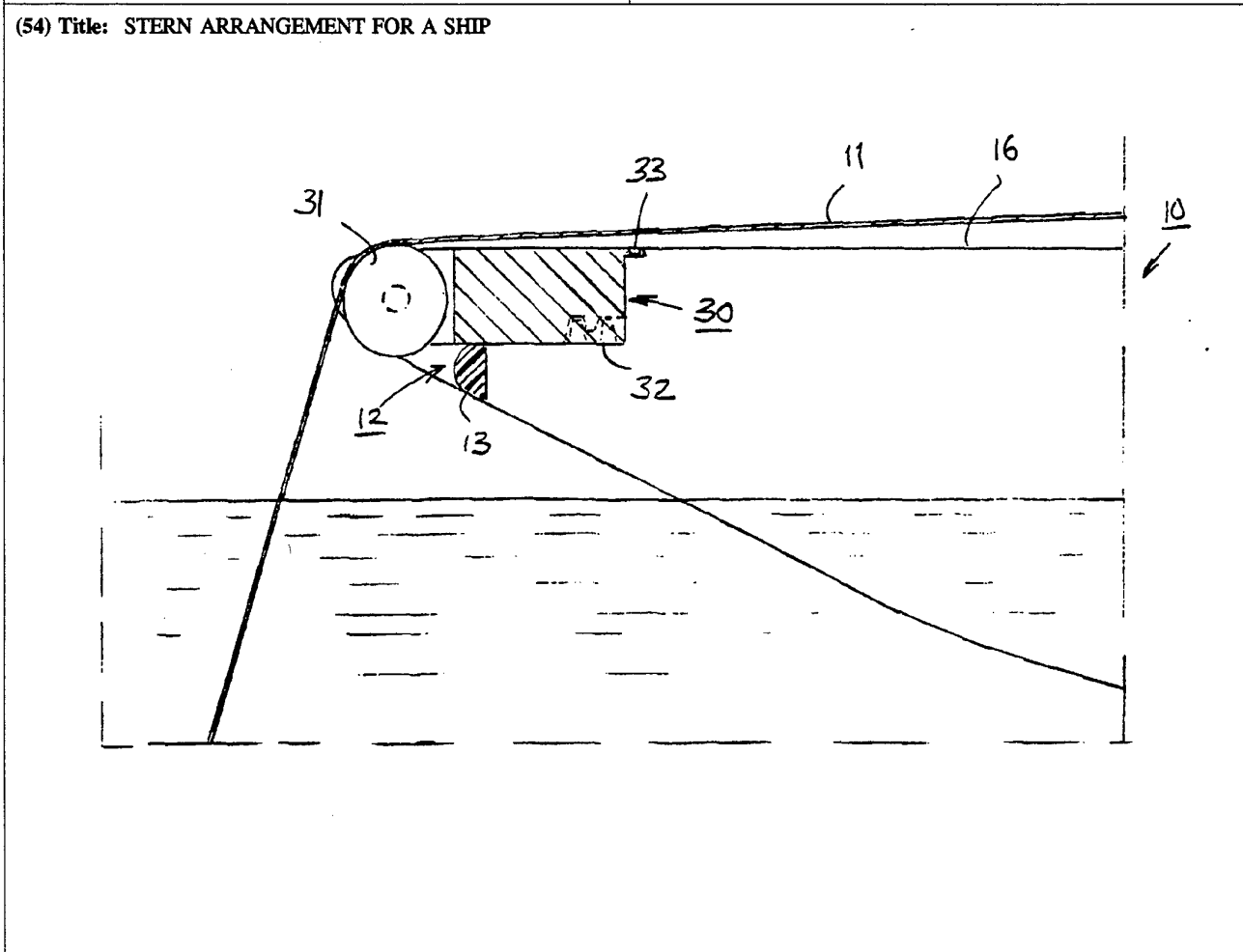




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁵ : B63B 35/00</p>	<p>A1</p>	<p>(11) International Publication Number: WO 94/13528 (43) International Publication Date: 23 June 1994 (23.06.94)</p>
<p>(21) International Application Number: PCT/FI92/00341 (22) International Filing Date: 14 December 1992 (14.12.92) (71) Applicant (for all designated States except US): IN-SINÖÖRITOIMISTO LEHTONEN & SIIRILÄ OY [FI/FI]; Vähäheikkiläntie 37, FIN-21810 (FI). (72) Inventors; and (75) Inventors/Applicants (for US only): ERONEN, Harri [FI/FI]; Frälsintie 9 as. 6, FIN-21200 Raisio (FI). HARJULA, Arjo [FI/FI]; Keskiyöntie 21 G, FIN-02210 Espoo (FI). (74) Agent: PATENTTITOIMISTO KARI PIRHONEN OY; P.O. Box 142, FIN-20521 Turku (FI).</p>		<p>(81) Designated States: AT, AU, BB, BG, BR, CA, CH, CS, DE, DK, ES, FI, GB, HU, JP, KP, KR, LK, LU, MG, MN, MW, NL, NO, PL, RO, RU, SD, SE, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, SN, TD, TG). Published With international search report. With amended claims.</p>



(57) Abstract

A stern arrangement for a ship (10) where the stern of the ship is made modifiable or convertible for at least two different purposes by moving or by replacing at least a part (12, 30) of the stern. The stern of the ship (10) is convertible to be a towing notch (12) or to be equipped with a stern roller (31). The invention provides an icebreaker which is equipped with a towing notch in wintertime and with a stern roller in the summertime for open water operations.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgyzstan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovakia
CM	Cameroon	LU	Luxembourg	SN	Senegal
CN	China	LK	Sri Lanka	TD	Chad
CS	Czechoslovakia	LV	Latvia	TG	Togo
CZ	Czech Republic	MC	Monaco	TJ	Tajikistan
DE	Germany	MD	Republic of Moldova	TT	Trinidad and Tobago
DK	Denmark	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	US	United States of America
FI	Finland	MN	Mongolia	UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

STERN ARRANGEMENT FOR A SHIP

The present invention relates to a stern arrangement for a ship.

BACKGROUND OF THE INVENTION

There are occasions when a ship is towed by another ship.
5 Typically it happens when an icebreaker tows a ship. Towing by icebreaker must be done so that the bow of the ship to be towed has been pulled tightly into the close contact with the stern of the icebreaker. The ship to be towed will be kept in the right place by a towing winch located aboard
10 on the icebreaker. The winch pulls strongly at the wire rope the bow of the towed ship against the stern of the icebreaker during the towing operation.

For towing purposes the stern of the icebreaker must be formed in a special way. At the stern of the icebreaker
15 there is an inwards curved towing notch which makes possible to tow another vessel. Only when equipped with this notch it is possible for the icebreaker to tow a ship in the way that the bow of the ship to be towed is pressed directly towards the stern of the icebreaker.

20 There are also other kind of special needs for the stern form of a ship. In open water for example the anchor handling and the cable laying operations require different kind of stern forming. At the stern of a supply vessel there must not be any formed towing notches. Instead of
25 that it is on the contrary required that the stern of the supply vessel is straight and the stern roller is installed. In the supply vessel the different kind of hoisting operations are done over the transom with a winch or crane.

30 The special requirements said above cause that a ship constructed for one purpose can not be used for another

purpose. The same ship can not be used for the towing in winter and for supply operations in summer. The requirements for the stern shape and the stern structure are so different in winter operations and respectively in
5 summer operations that it is not possible to build a fixed structure which would be suitable for the both purposes.

The problem with icebreakers, however, is their short operating time in winter. It should be able to use icebreakers also in the summertime in open water.
10 Correspondingly the supply vessel can not be used for towing in wintertime because of its unsuitable stern construction.

SUMMARY OF THE INVENTION

The object of the present invention is to eliminate the
15 above mentioned problem. This purpose will be achieved so that according to the invention the stern of the ship is made modifiable or convertible for at least two different purposes, by moving or by replacing at least a part of the stern.

20 PREFERRED EMBODIMENTS OF THE INVENTION

According to a preferred embodiment of the invention the stern of the ship is convertible to be a towing notch or to be equipped with a stern roller.

The preferred embodiment of the invention provides the ship
25 which is equipped with a structure which enables a towing notch in wintertime and a stern roller in the summertime. Combining these two possibilities it is for the first time possible to make a multipurpose icebreaker which is suitable both for winter operations and also for summer
30 operations.

Besides the supply operations in summer the suitable tasks

for a multipurpose icebreaker would be for example towing, anchor handling, cable laying, flexible pipe laying and supply operations. These kind of operations are usually operated by a special supply ship which has the straight
5 stern and which is also equipped with a stern roller. With a supply ship it is possible to do different kind of hoisting operations over the transom with a winch or crane. Typical operations are anchor handling and hoisting of umbilicals and other offshore equipments.

10 According to an embodiment of the invention at the stern of the ship there is at least one movable part which moves out in the way that a towing notch or a stern roller is available.

An other embodiment of the invention the stern of the ship
15 is equipped either with a fixed towing notch or with a fixed stern roller section, and the other one of them is movable or removable in the way that the towing notch or the stern roller is available for use one at a time.

Still one embodiment of the invention is that the towing
20 notch and the stern roller section are both removable, and at the stern of the ship there is a place where the towing notch or the stern roller can be installed one at a time.

The above and other features and advantages of this invention will become better understood by reference to the
25 detailed description that follows, when considered in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

- FIG. 1 is a schematic side view of the stern of the towing ship and the bow of the ship to be towed.
- 30 FIG. 2 is a schematic side view of the ship of FIG. 1 with the modified stern construction.
- FIG. 3 is a top view of the stern of the ship of FIG. 3.

- FIG. 4 is an aft view of the stern construction of the ship of FIG. 2.
- FIG. 5 is a side view of the stern construction of the ship of FIG. 2 according to the second embodiment.
- 5 FIG. 6 is the stern construction of the ship of FIG. 2 according to the third embodiment.
- FIG. 7 is the stern construction of the ship of FIG. 2 according to the fourth embodiment.
- FIG. 8 shows the function of the stern construction of
10 FIG. 7.
- FIG. 9 is the stern construction of the ship of FIG. 2 according to the fifth embodiment.
- FIG. 10 is the stern construction of the ship of FIG. 2 according to the sixth embodiment.
- 15 FIG. 11 is a top view of the stern construction of the ship of FIG. 10.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

FIG. 1 is a schematic side view of the stern of the towing ship 10 and the bow of the ship 20 to be towed. In the FIG.
20 1 the bow 21 of the ship 20 has been drawn against the stern notch 12 of the ship 10 by pulling at the wire rope 11. In icebreaker use the towing notch 12 is equipped with rubber fenders 13 on both sides and a steel casting or a steel plate at the bottom of the notch 12.

25 The stern of the towing ship 10 in FIG. 1 has been formed in the way that the notch 12 is below the working deck level and that there is a clearance 15 between the aft deck 16 and the bow 21 of the ship 20 to be towed. If the towed ship 20 has a bulbous bow 22 there must also be a clearance
30 17 for that.

In FIG. 2 is a schematic side view of the ship 10 of FIG. 1 with the modified stern construction. Above the notch 12 in close contact there is a separate steel section 30 with a stern roller 31 added. The upper surface of the section 30

is fitted to be on the same level with the aft working deck 16 so that the section 30 and the deck 16 together form an ordinary looking supply ship stern. The wire rope 11 can now easily be used for hoisting and for anchor handling operations.

The section 30 has been built and reinforced according to the working deck load requirements. It can be lifted on its place for use in summer and removed again for wintertime. The joint of the stern section can be made by welding the section 30 to the aft working deck 16 or it can be attached by bolts 33. There may also be guide members 32 to help the installation of the section 30 and to help locking the section into its right place.

The notch 12 may also be a removable section instead of the roller section 30. In that case the roller section 30 may be formed to be a fixed part of the aft working deck. Still another embodiment of the ship is that the both sections are removable. Into the ship will then be installed the section which will be needed at that time.

FIG. 3 is a top view of the stern of the ship 10 of FIG. 2. The section 30 with a stern roller 31 is installed to the stern of the icebreaker. The section 30 is located above the notch 12 so that the stern of the ship forms a straight line instead of the notch.

Alternatively the construction of FIG. 3 can also be arranged so that at the stern of the ship 10 there is only a place for an external section. Then depending of the needed operation either the notch section 12 or the stern roller section 30 will be selected and installed into that place.

This arrangement is suitable especially when the ship is so low that the notch section 12 and the stern roller section 30 can not be installed together one on the other. Also the stern roller 31 of very large diameter does not allow the

roller section 30 and the notch 12 arrangement to be installed together at the same time.

The stern roller section 30 in FIG. 3 may also be narrower so that it covers only a part of the notch section 12. In that case the rubber fenders 13 extend further aft and a part of the notch will be seen together with the roller arrangement.

FIG. 4 is an aft view of the stern construction of the ship 10 of FIG. 3. The removable section 30 with a roller 31 is installed to the stern of the icebreaker above the notch 12. The rubber fenders 13 of the towing notch 12 can be seen on both sides and also the steel casting or steel plate 14 at the bottom of the notch.

FIG. 5 is a side view of the stern construction of the ship according to the second embodiment. The roller section 30 is provided with horizontal guide members and with a hydraulic cylinder 34. The cylinder 34 pushes the section 30 out when it will be needed and respectively pulls it back again below the aft deck 16 when the notch 12 is needed in icebreaker use.

In FIG. 6 is the third embodiment for the stern construction of the ship 10. The roller section 30 is provided with guide members and a hydraulic cylinder 34 which are lined together with the bottom line of the ship 10.

FIG. 7 is the stern construction according to the fourth embodiment where the stern roller 31 section 30 can be turned to a store locker 35 while the vessel is used as an icebreaker. The store locker 35 is formed into the working deck 16 and it is provided with a cover 36.

In FIG. 8 is presented the function of this stern construction of FIG. 7. The cover 36 has been opened and

the section 30 will be turned around the axis 37 into the locker 35. When the roller section 30 is in the locker 35 and the cover 36 is closed the ship 10 can be used as an icebreaker.

5 FIG. 9 is the stern construction according to the fifth embodiment where the stern roller section 30 is located on rails 38. When the section 30 will be installed it will be lifted on the rails 38. After gliding along the rails 38 the section 30 will be stopped by the stoppers and the
10 conical locking members will lock it into the place. There may also be bolts or hydraulic locking members at fore end of the rails 38.

In FIG. 10 is the stern construction of the ship 10 where the notch section 12 is moving instead of the roller
15 section 30. The notch 12 may be even removable but in this embodiment the stern roller 31 is fixed. The notch will be moved by a hydraulic cylinder 34. The final locking is made by hydraulic cylinders or preferably by bolts. FIG. 11 shows the top view of the same construction.

CLAIMS

1. A stern arrangement for a ship (10), **characterized** in that the stern of the ship (10) is made modifiable or convertible for at least two different purposes.
2. A stern arrangement according to claim 1, **characterized**
5 in that the stern of the ship (10) is convertible for at least two different purposes by moving or by replacing at least a part (12, 30) of the stern.
3. A stern arrangement according to claim 1 or 2, **characterized** in that the stern of the ship (10) is
10 convertible to be a towing notch (12) or to be equipped with a stern roller (31).
4. A stern arrangement according to claim 1, 2 or 3, **characterized** in that at the stern of the ship (10) there is at least one movable part (12, 30) which moves out in
15 the way that a towing notch (12) or a stern roller (31) is available.
5. A stern arrangement according to any of claims 1-4, **characterized** in that the stern of the ship (10) is equipped either with a fixed towing notch (12) or with a
20 fixed stern roller section (30), and the other one of them is movable in the way that the towing notch or the stern roller is available for use one at a time.
6. A stern arrangement according to any of claims 1-5, **characterized** in that at the stern of the ship (10) the
25 towing notch (12) or the stern roller section (30) can be pushed out by a hydraulic cylinder (34).
7. A stern arrangement according to any of claims 1-6, **characterized** in that the stern of the ship (10) is equipped either with a fixed towing notch (12) or a fixed

stern roller section (30), and the other one of them is removable.

8. A stern arrangement according to any of claims 1-7, **characterized** in that the towing notch (12) and the stern roller section (30) are both removable, and at the stern of the ship (10) there is a place where the towing notch or the stern roller can be installed one at a time.

9. A stern arrangement according to any of claims 1-7, **characterized** in that the stern roller (31) is located above the towing notch (12).

AMENDED CLAIMS

[received by the International Bureau on 14 September 1993 (14.09.93) ; original claims 1-3 replaced by amended claim 1; claims 4-9 replaced by amended claims 2-7 (2 pages)]

1. A stern arrangement for a ship (10) where the stern of the ship is made modifiable or convertible for at least two different purposes, **characterized** in that the stern of the ship (10) is made convertible by moving or by replacing at least one movable or replaceable part (12, 30) of the stern so that the stern is equipped either with a towing notch (12) for pulling the bow of the ship to be towed tightly into the close contact with the stern of the ship or the stern of the ship is equipped with a stern roller (31) or an equivalent equipment.
2. A stern arrangement according to claim 1, **characterized** in that at the stern of the ship (10) there is at least one movable part (12, 30) which moves out in the way that a towing notch (12) or a stern roller (31) is available.
3. A stern arrangement according to claim 1 or 2, **characterized** in that the stern of the ship (10) is equipped either with a fixed towing notch (12) or with a fixed stern roller section (30), and the other one of them is movable in the way that the towing notch or the stern roller is available for use one at a time.
4. A stern arrangement according to claim 1, 2 or 3, **characterized** in that at the stern of the ship (10) the towing notch (12) or the stern roller section (30) can be pushed out by a hydraulic cylinder (34).
5. A stern arrangement according to any of claims 1-4, **characterized** in that the stern of the ship (10) is equipped either with a fixed towing notch (12) or a fixed stern roller section (30), and the other one of them is removable.
6. A stern arrangement according to any of claims 1-5, **characterized** in that the towing notch (12) and the stern

roller section (30) are both removable, and at the stern of the ship (10) there is a place where the towing notch or the stern roller can be installed one at a time.

7. A stern arrangement according to any of claims 1-6,
5 **characterized** in that the stern roller (31) is located above the towing notch (12).

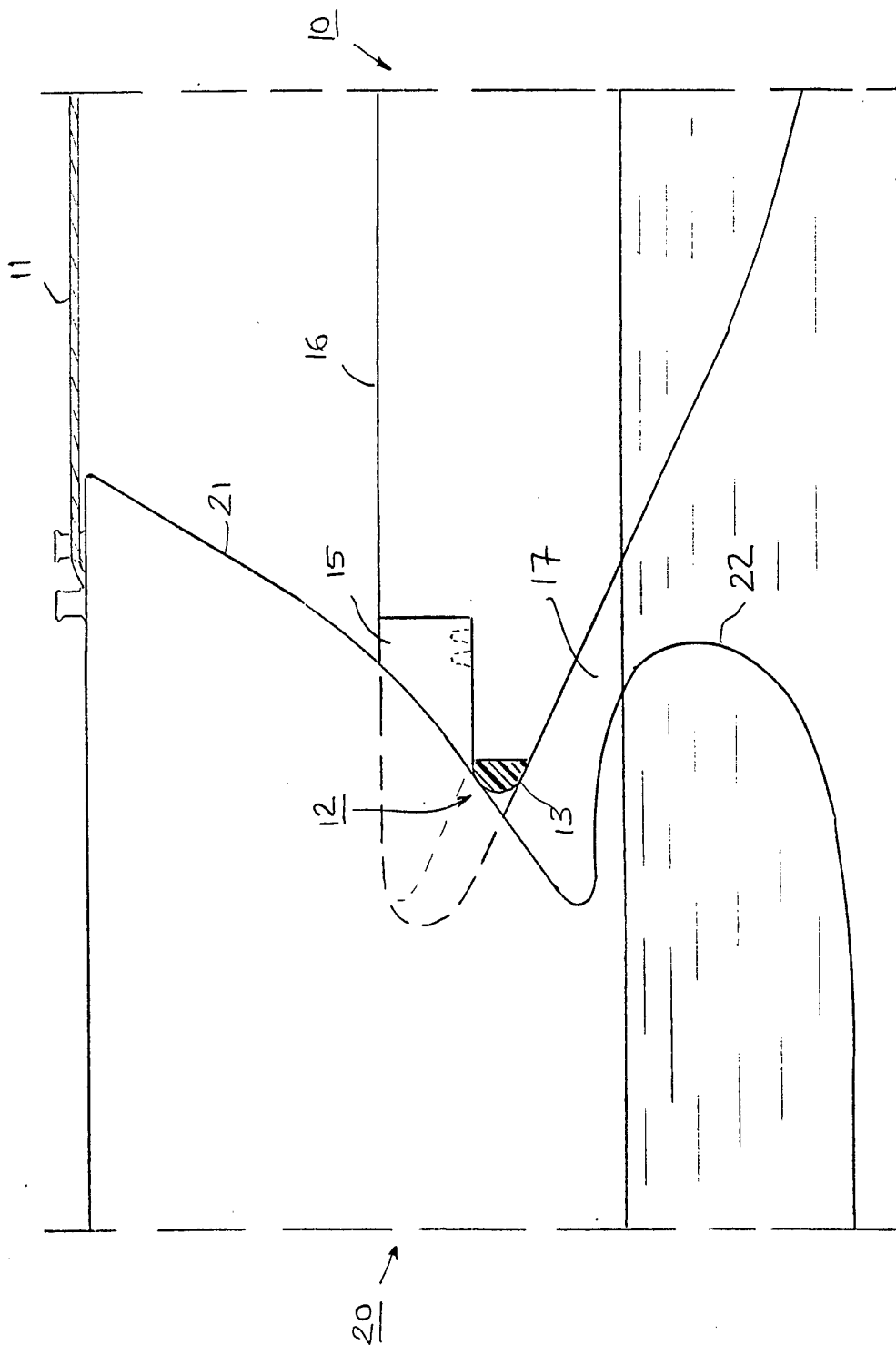


FIG. 1

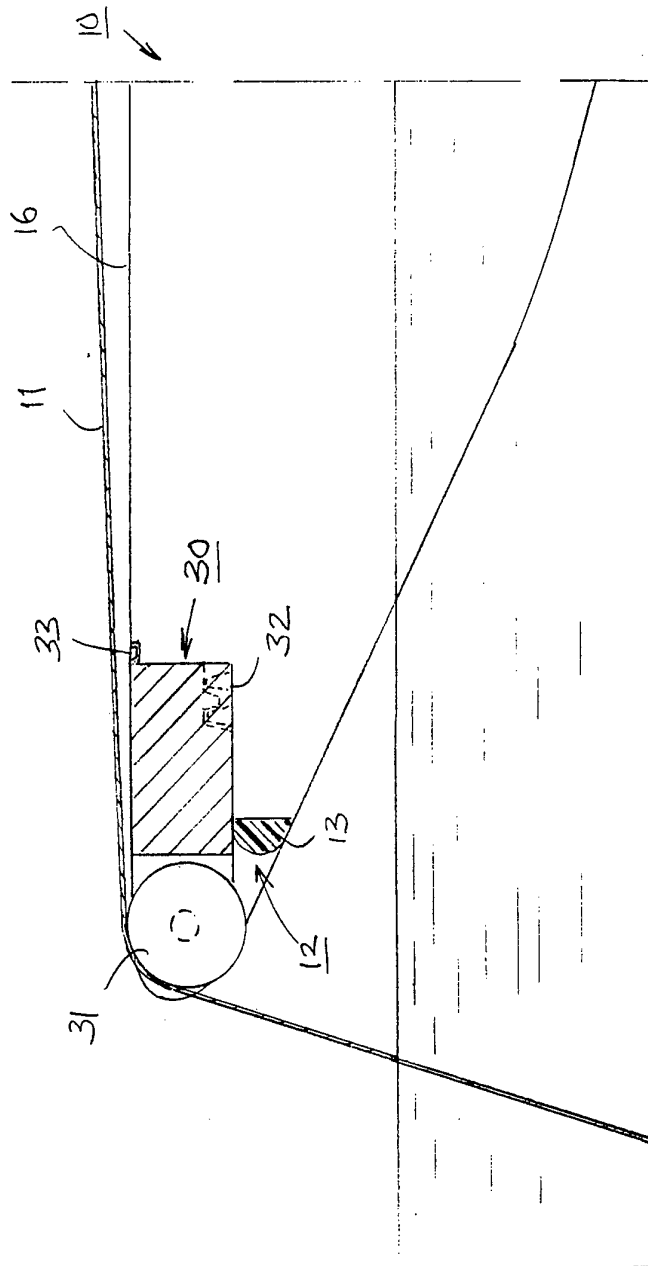
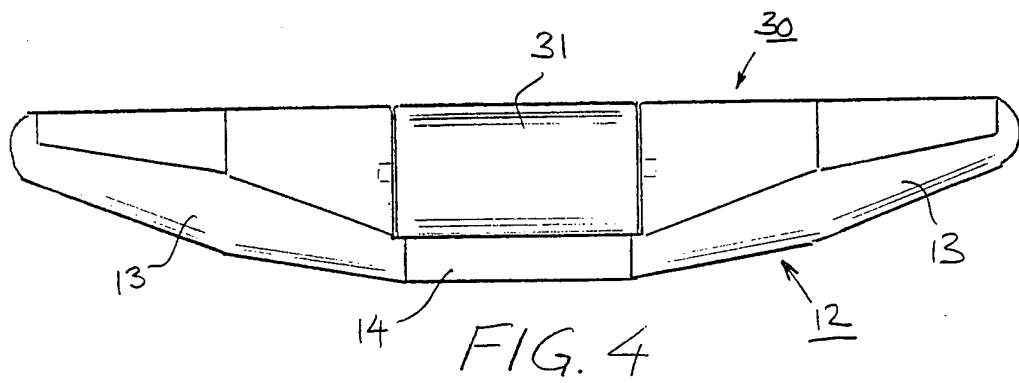
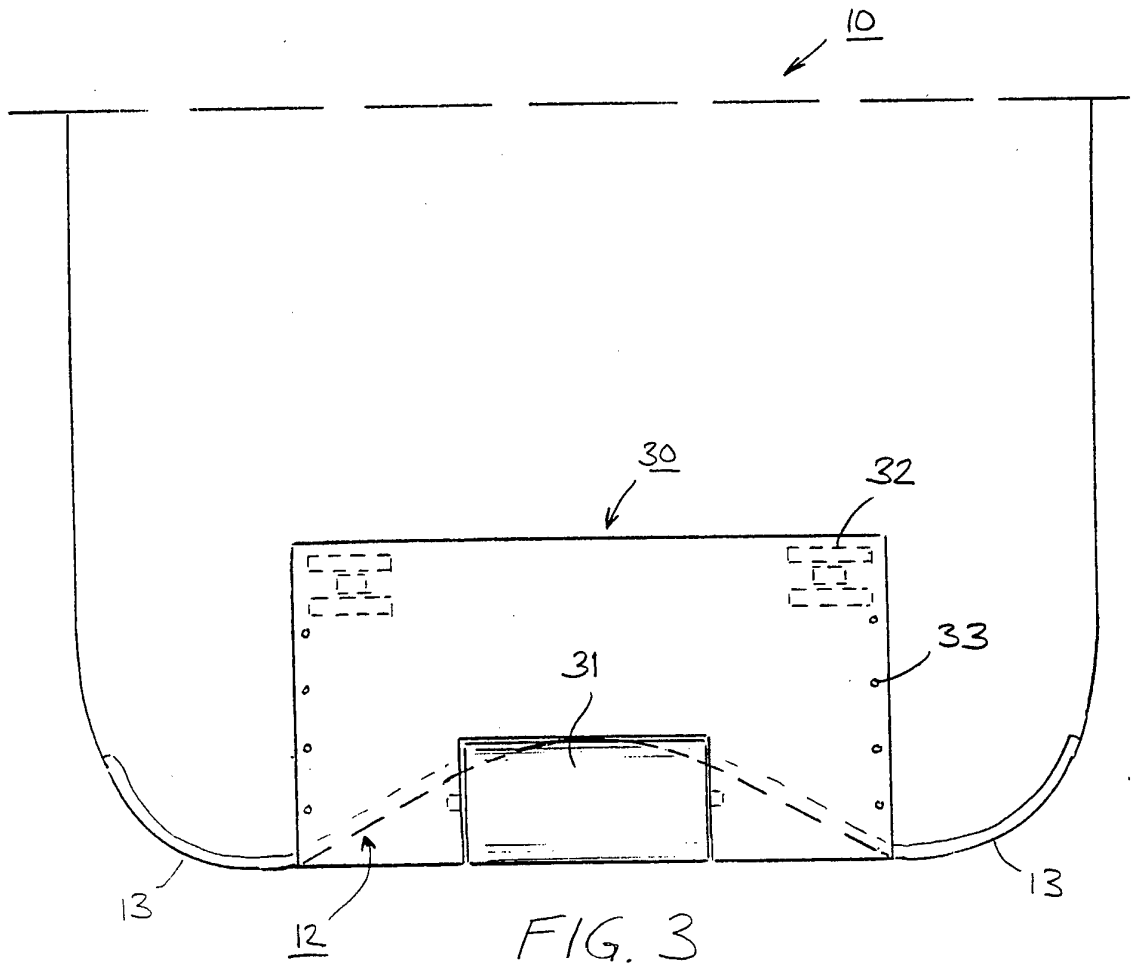


FIG. 2



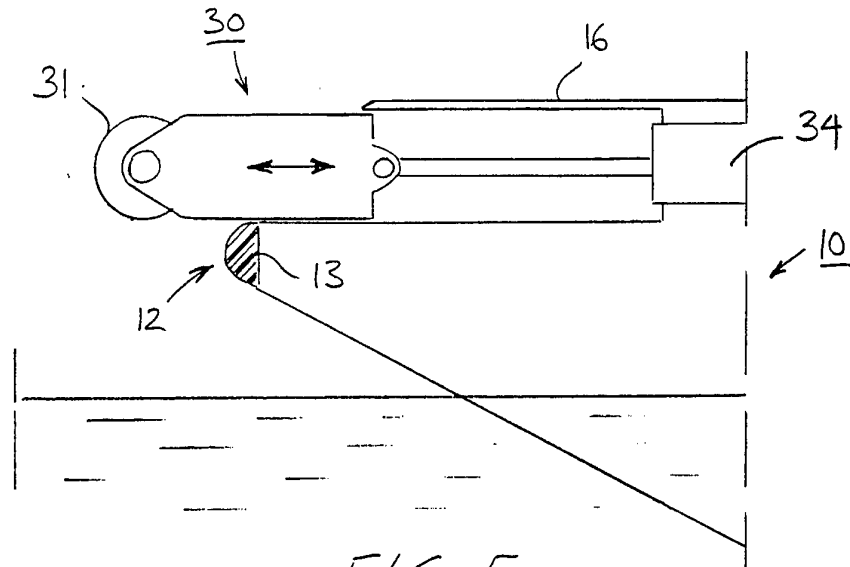


FIG. 5

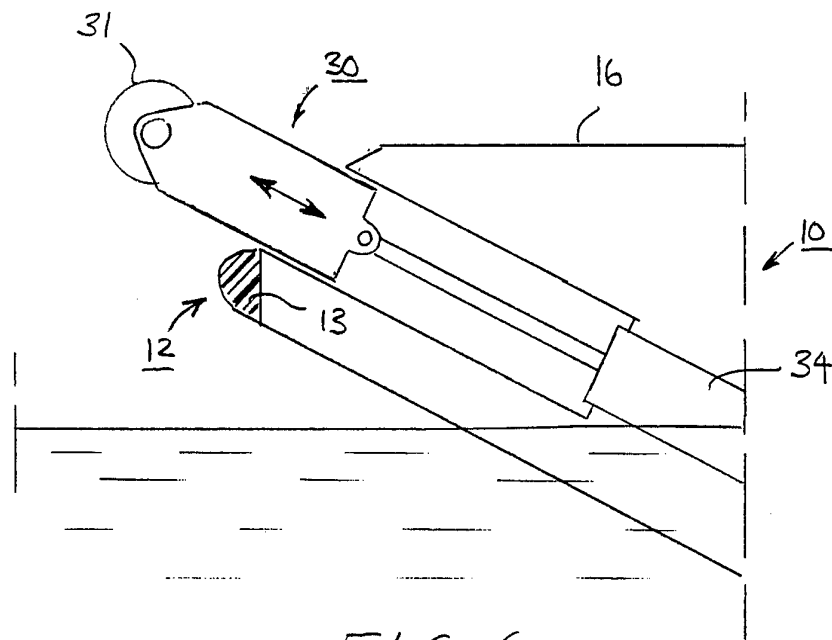


FIG. 6

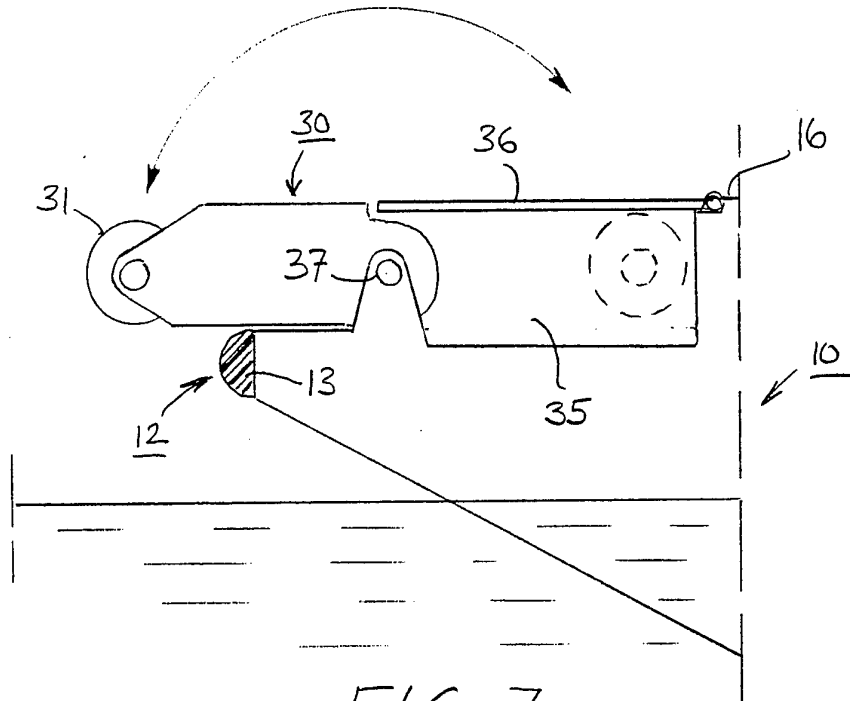


FIG. 7

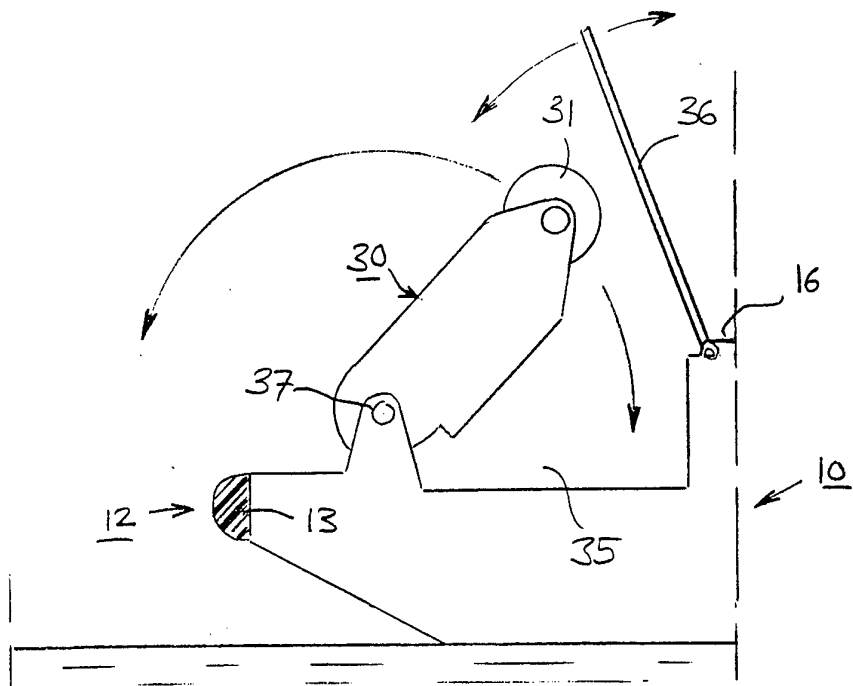


FIG. 8

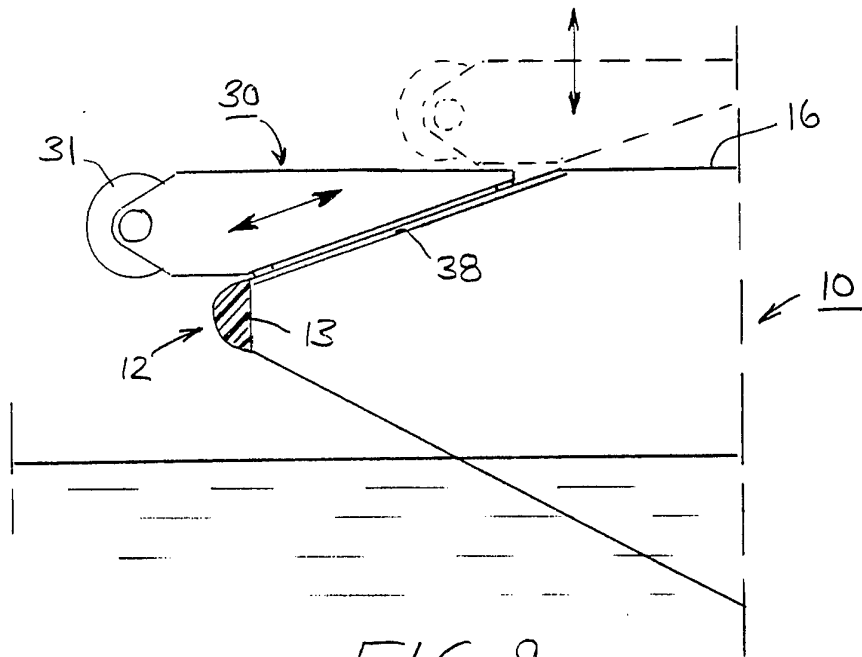


FIG. 9

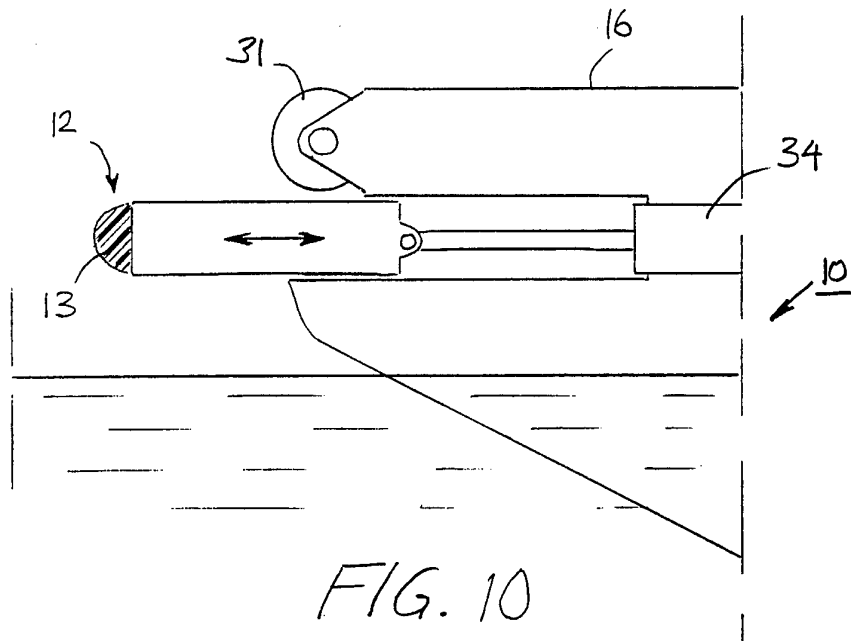


FIG. 10

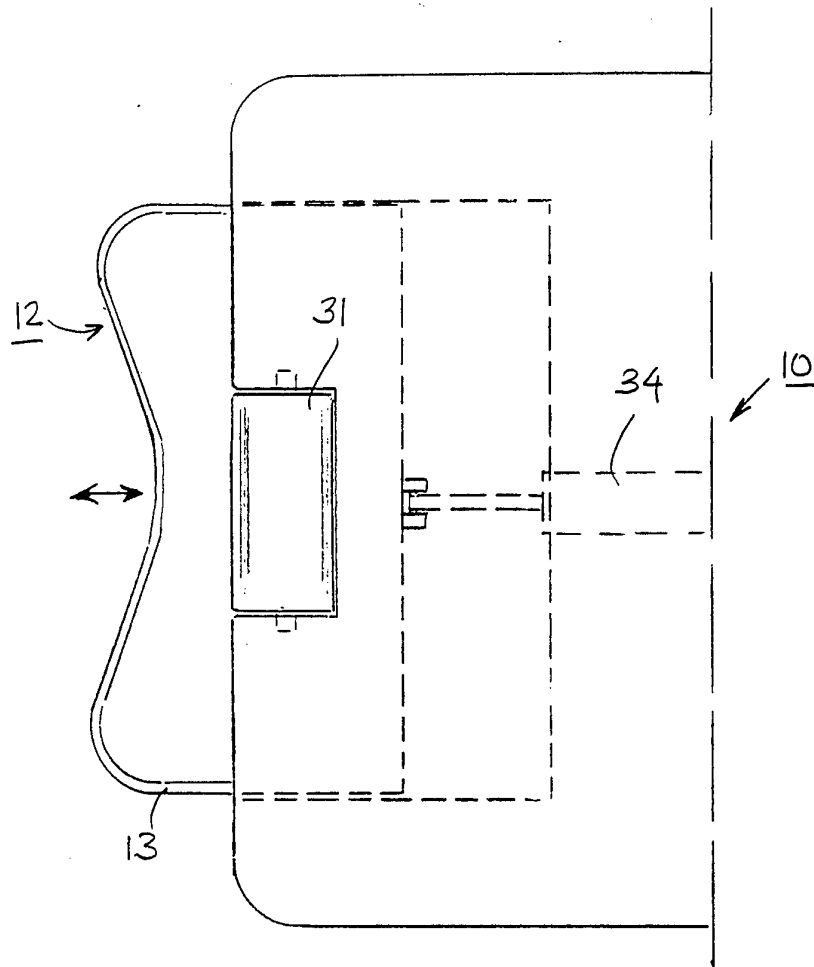


FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 92/00341

A. CLASSIFICATION OF SUBJECT MATTER		
IPC5: B63B 35/00 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
IPC5: B63B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
SE,DK,FI,NO classes as above		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB, A, 2071580 (ALEXANDER NICOLAAS VON BAALLEN), 23 Sept 1981 (23.09.81), page 1, line 3 - line 7; page 1, line 128 - page 2, line 11; page 2, line 89 - page 3, line 4, figures 3,6	1,2,3,
A	--	4,5,6,7,8,9
X	GB, A, 1462797 (LEIF PRAN), 26 January 1977 (26.01.77), page 1, line 83 - line 95; page 2, line 55 - line 69, figure 1	1,2,3
A	--	4,5,6,7,8,9
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p>		
Date of the actual completion of the international search		Date of mailing of the international search report
13 July 1993		14 -07- 1993
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86		Authorized officer Christer Jönsson Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 92/00341

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 3866555 (KORKUT), 18 February 1975 (18.02.75) ----- -----	1-9

INTERNATIONAL SEARCH REPORT
Information on patent family members

28/05/93

International application No.
PCT/FI 92/00341

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A- 2071580	23/09/81	NONE	
GB-A- 1462797	26/01/77	AU-A- 7560574	27/05/76
		BE-A- 822594	14/03/75
		CA-A- 992805	13/07/76
		DE-A,B,C 2454593	03/07/75
		FR-A,B- 2252248	20/06/75
		JP-A- 50085090	09/07/75
		NL-A- 7415404	28/05/75
		SE-A- 7414729	27/05/75
		US-A- 3977352	31/08/76
US-A- 3866555	18/02/75	NONE	