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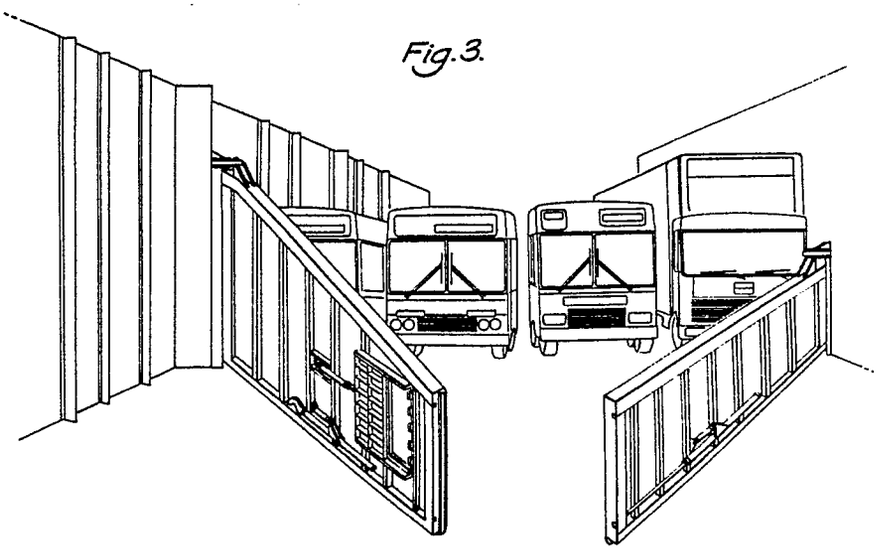
(54) Vehicle ferry.

(57) A ro-ro ferry has a vehicle deck divided by at least one watertight door (10,11) extending across the deck. The door(s) are hinged to the side(s) of the deck and closed and sealed behind the first section of vehicles embarked. On disembarking the doors are opened forwards after the first section to allow the second section to depart.

The sealing means (Fig. 4) comprises one or more flexible gas filled tubes (16) and is releasable by reducing the pressure in the tubes.

Fig.3.



EP 0 348 055 A1

Vehicle Ferry

This invention relates to vehicle ferries of the so called 'roll-on, roll-off' or 'Ro-Ro' type.

Ferries of this type have large open vehicle decks which have proved to be very dangerous if flooded. A large quantity of seawater entering at stern or bow can flood through the length of the ship, and then capsize the vessel by moving to port or starboard. The invention aims to provide a ferry in which this problem is reduced or avoided by provision of flood control.

According to a first aspect of the invention there is provided a ro-ro ferry, openable at bow and stern, comprising a vehicle deck having a plurality of vehicles thereon, characterised in that the deck is subdivided by at least one door extending across the deck to provide at least one watertight barrier along a line dividing the deck, wherein the door(s) are mounted on hinges so as to be closable along said line behind a first set of vehicles which substantially fill the space ahead of the line in a loading direction, and to be openable ahead of a second set of vehicles, which substantially fill the space behind the line, after the first set have driven off in the loading direction.

Such a barrier can prevent an excessive amount of water passing along the deck and thereafter destabilising the vessel.

The system is inherently mainly fail-safe, since movement of the doors is normally required only in port, so failure of the operating power or hydraulics will not jeopardise safety.

In a preferred arrangement the hinges are mounted on the side(s) of the deck. Alternatively, they may be mounted on the roof of the deck.

Preferably, the ferry further comprises releasable locking means to secure the door(s) in a chosen position. The releasable locking means comprises one or more latches attached to the door(s), which engage the floor of the vehicle deck.

Standard types of seal rely on the weight of the equipment to achieve the desired compression and need to be lifted prior to rotating the door. This represents an additional operation and requires costly equipment. Two other types of sealing systems are pneumatically inflatable and pneumatically deflatable types. The first requires pressure above atmospheric to maintain the seal and requires ejectors and/or a vacuum pump to retract the seal. If this type of seal becomes punctured, the sealing is lost.

Preferably, the doors are made watertight by releasable sealing means comprising one or more gas filled, flexible members positioned adjacent to the side edges and bottom edge(s) of door(s). The sealing means are released by reducing the gas pressure in the flexible members below the ambient air pressure.

The preferred system is the "deflatable type" with a hollow resilient tube section which by virtue of its form is "spring loaded", that is, having a natural tendency to the erected or expanded position at atmospheric pressure and requiring to be retracted to break the seal and allow the door to move. This natural tendency to the expanded position means that if the seal becomes punctured it will maintain it's sealing qualities, thereby giving a fail-safe feature. There is a distinct advantage to use a type of seal that can seal against a flat surface, as this eliminates the need for compression bars on other forms of seal which are an obstruction on a deck and are only suitable where the door rotation is no more than 110 degrees. Manual or emergency operation is always be possible, even if the seals are engaged and might be damaged by the operation.

All that is required to retract the seal is a small vacuum pump.

Preferably, the hinges are movable fore and off.

According to a second aspect of the invention there is provided a method of operating a ro-ro ferry having an embarkation or disembarkation opening at the stern and bow and having a vehicle deck subdivided into two sections by at least one watertight door that is swingable about the side(s) of the deck, the method being characterised in that it comprises the steps of embarking a group of vehicles on the ferry through the embarkation opening, passing said group of vehicle through the ship to fill the first section of the deck, said first section being remote from the embarkation opening, closing the door(s), embarking further vehicles to fill the second section of the deck, disembarking the group of vehicles from the first section of the deck through the disembarkation opening, opening the door(s) and disembarking the remaining vehicles from the deck, wherein disembarkation is carried out by moving the vehicles in the direction of embarkation.

In order that the invention shall be clearly understood, an exemplary embodiment will now be described with reference to the accompanying drawings, in which:

Fig .1 shows a plan view of part of a ferry according to the invention car deck with doors closed;

Fig.2 shows an elevation of the doors;

Fig.3 shows an impression of loaded deck with door half-open;

Fig. 4 shows the arrangement of the sections of seal member along the edges of the doors; and

Fig. 5 shows the seal member abutments in plan view.

All the illustrations show only one longitudinal half of a whole deck, which is divided along its centre line. In Figure 1, doors 10, 11 are hinged to the side 12 and mid-wall 13 of the vessel and can both open in both direction, as shown by the arcs. The doors are of steel construction (Figure 2) and include a personnel access hatch 14 openable hydraulically. Each door has hydraulic latches 15.

The door(s) are closed and sealed behind the first section of vehicles embarked, and on disembarking are opened forwards after the first section leave to allow the second section to depart.

Figure.3 shows an impression of vehicles loaded, with the doors half open for disembarkation.

The details of the resilient seals are shown in Figures 4 and 5. In normal relaxed state, the tubes 16 expand so that there is an effective water seal around both doors and along their meeting point in the middle. Application of a vacuum (reduced pressure) shrinks the tubes 16 so that the seal is broken and the doors can move without friction. (In Figure 5, the seal between the two doors is shown on the other door compared with Figure 4). A number of pairs of doors can be spaced along a deck.

The doors are of simple steel construction designed with a minimum thickness, for two reasons; firstly the vehicle stowage loss is kept to an absolute minimum, and secondly when the doors are open there is a minimum loss of "drive through width" for the roll-on roll-off operation.

The simple steel construction is chosen as a cost effective measure, at the same time giving a robust and relatively maintenance-free design. Various other materials could be considered for the doors, but they would have to have a greater structural thickness to achieve the same capability of a steel structure. For example, an aluminium door would require approximately three times the thickness of a steel door to obtain the same load bearing capability. Such other materials would therefore only be practical of weight saving was of prime importance. Other high strength materials may be available but costs and structural thickness are both prime factors and normally the doors, like the ship itself, should be of steel.

In a modification, the hinges of the doors may be mounted on the walls on slide bars so that the whole of a pair of doors may be moved longitudinally to allow for variations in the length of vehicles being stowed.

The doors could be of uniform height across, but in the version shown the weight saving is significant, and it is considered that on the centre line of the ship the door height needed is less.

The hinges of the doors may be mounted on the roof of the vehicle deck.

Claims

1. A ro-ro ferry, openable at stern and bow, comprising a vehicle deck having a plurality of vehicles thereon, characterised in that the deck is subdivided by at least one door (10,11) extending across the deck to provide at least one watertight barrier along a line dividing the deck, wherein the door(s) are mounted on hinges so as to be closable along said line behind a first set of vehicles which substantially fill the space ahead of the line in a loading direction, and to be openable ahead of a second set of vehicles, which substantially fill the space behind the line, after the first set have driven off in the loading direction.

2. A ferry according to claim 1 wherein the hinges are mounted on the side(s) of the vehicle deck.

3. A ferry according to claim 1 wherein the hinges are mounted on the roof of the vehicle deck.

4. A ferry according to any preceding claim, further comprising releasable locking means (15) to secure the door(s) (10,11) in a chosen position.

5. A ferry according to claim 4 wherein the releasable locking means comprises one or more latches (15) that are attached to the door(s) (10,11), which engage the floor of the vehicle deck.

6. A ferry according to any preceding claim wherein the door(s) (10,15) is made watertight by releasable sealing means comprising one or more gas filled, flexible members (16) positioned adjacent to the side edges and bottom edge(s) of door-(s).

7. A ferry according to claim 6 wherein the sealing means are released by reducing the gas pressure in the flexible members (16) below the ambient air pressure.

8. A ferry according to claim 7 further comprising vacuum pumping means connected to the flexible members (16).

9. A ferry according to any preceding claim wherein the door(s) (10,11) contain one or more personnel hatches (14) to allow crew to pass through the door(s).

10. A ferry according to any preceding claim wherein the hinges are movable fore and aft.

11. A ferry according to any preceding claim wherein the door(s) (10,11) is swingable through 180°.

12. A method of operating a ro-ro ferry having an embarkation or disembarkation opening at the stern and bow and having a vehicle deck subdivided into two sections by at least one watertight door (10,11) that is swingable about the side(s) (12,13) of the deck, the method being characterised in that it comprises the steps of, embarking a group of vehicles on the ferry through the embarkation opening passing said group of vehicle through the ship to fill the first section of the deck, said first section being remote from the embarkation opening, closing the door(s), embarking further vehicles to fill the second section of the deck, disembarking the group of vehicles from the first section of the deck through the disembarkation opening, opening the door(s) and disembarking the remaining vehicles from the deck, wherein and disembarkation is carried out by moving the vehicles in the direction of embarkation.

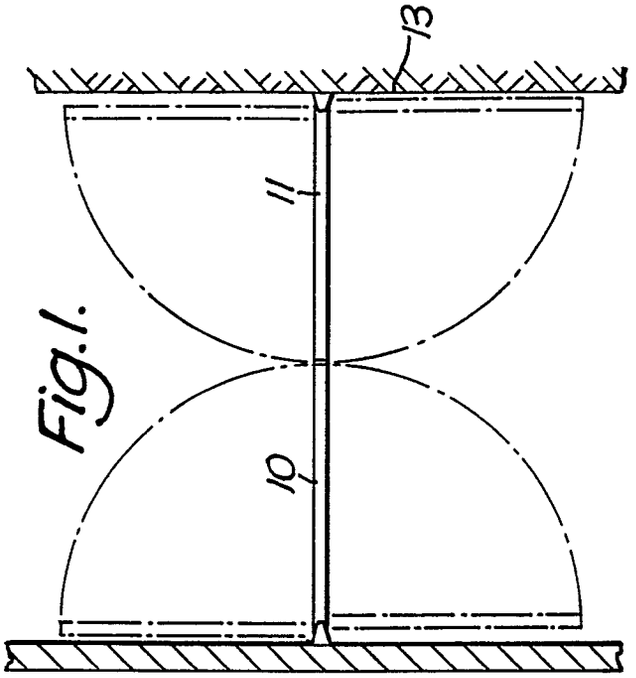


Fig.1.

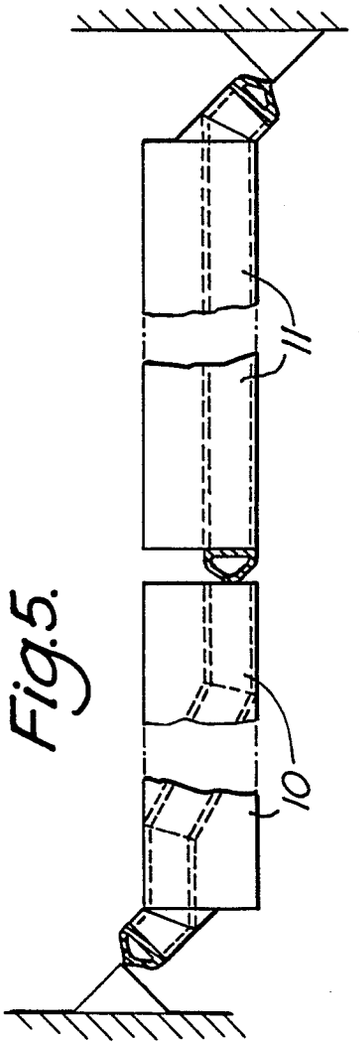


Fig.5.

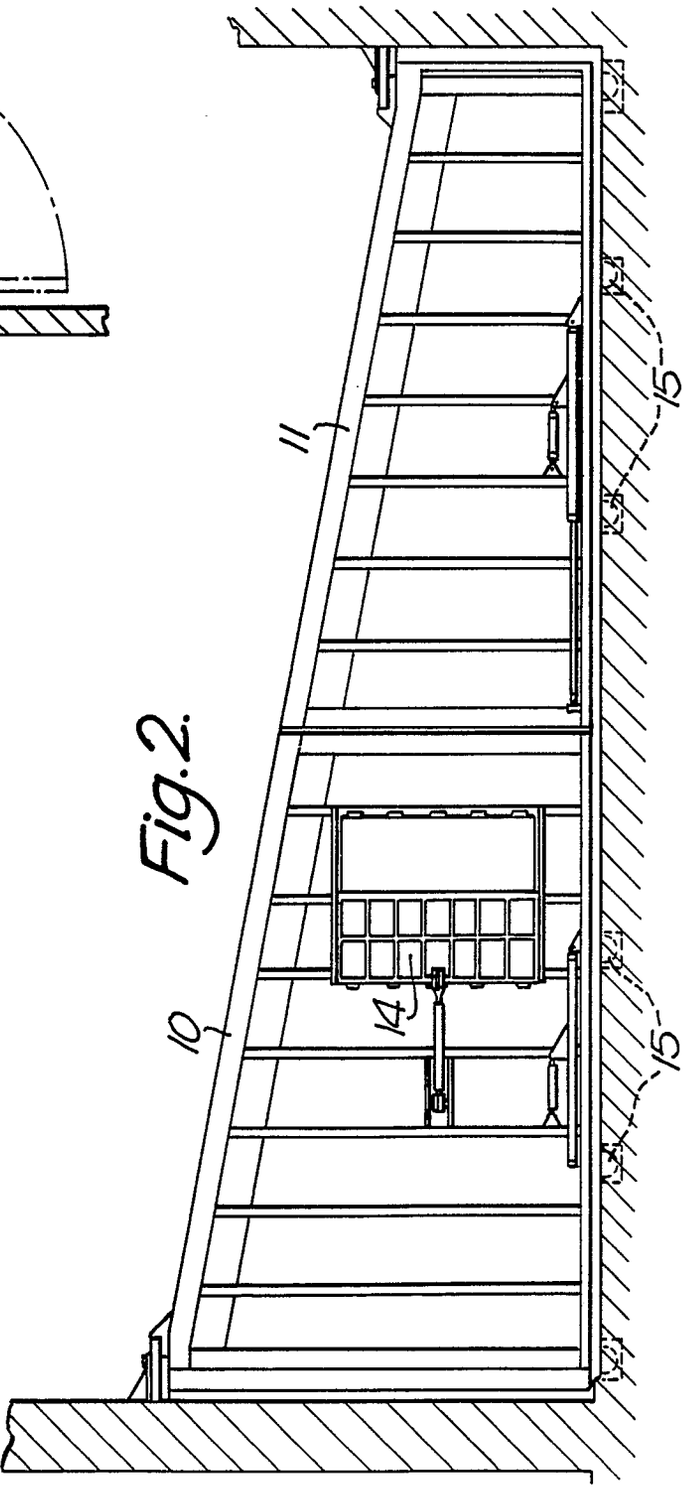


Fig.2.

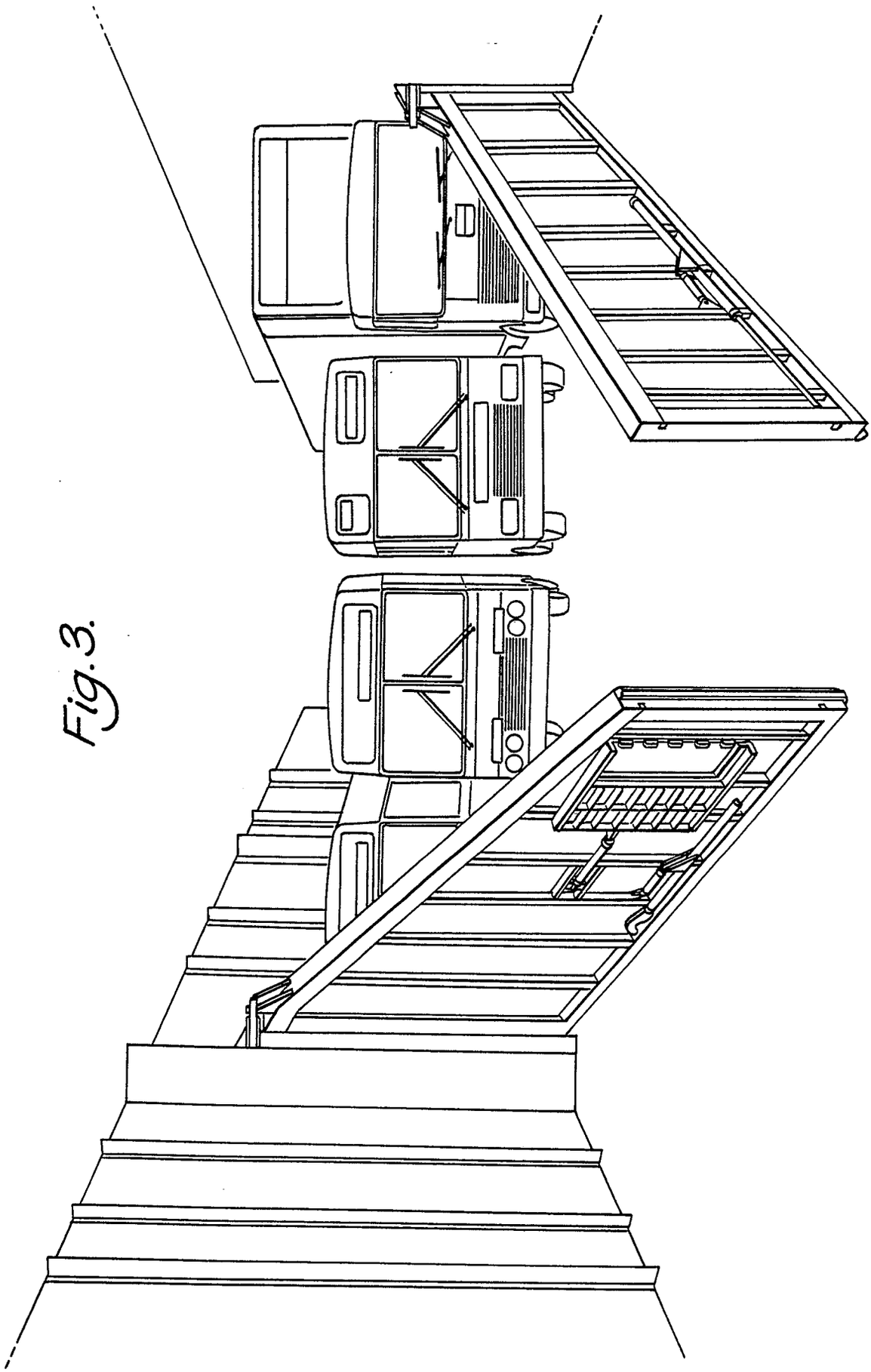


Fig.3.

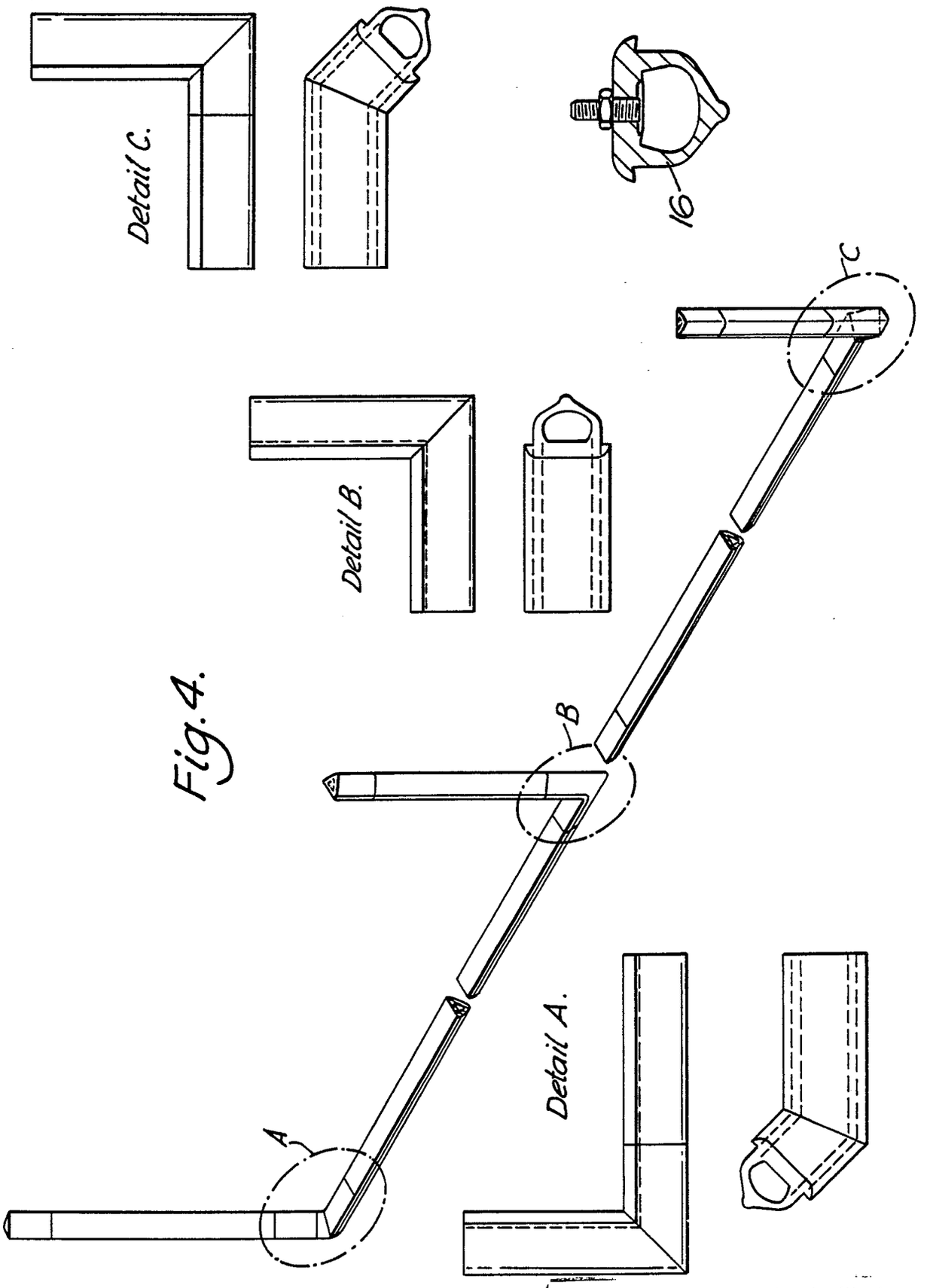


Fig. 4.

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EUROPEAN SEARCH REPORT

Application Number

EP 89 30 5595

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	FR-A-2 502 106 (MACGREGOR) * Page 1, lines 13-29; figures 1-10 *	1,4-6, 12	B 63 B 3/56 B 63 B 35/54 F 16 J 15/46
A	DE-A-3 102 832 (MACGREGOR) * Page 6, lines 7-13; figures 1-4 *	6-8	
P,A	DE-A-3 713 837 (BLOHM & VOSS) * Abstract; figure 3 *	1,6,12	
P,A	GB-A-2 206 544 (HYDROCONIC) * Abstract; figure 1 *	1,6,12	
A	US-A-2 364 928 (THOMPSON)		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 63 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12-09-1989	DE SCHEPPER H.P.H.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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