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(71) Applicant : **BORD NA MONA**
76 Lower Baggot Street
Dublin 2 (IE)

(72) Inventor : **Delahunty, John, Bord NA Mona**
Horticultural Products Division, County Hall
Port Laoise, Co. Laois (IE)

(74) Representative : **Rackham, Stephen Neil et al**
GILL JENNINGS & EVERY 53-64 Chancery Lane
London WC2A 1HN (GB)

(54) **A method and system for lining cargo containers.**

(57) A method and a system of lining a cargo container (1) having an openable end (7), which comprises placing within the container a liner bag (10) of a flexible material which when inflated, is at least of substantially equal size to the interior of the container (1), the liner bag (10) having a closed end (11) positioned adjacent the end wall of the container, and an open end (12) defining a mouth portion of the liner bag positioned adjacent the open end (7) of the container, attaching the mouth portion to the container (1) adjacent the container opening (7) and substantially exhausting air from the space between the exterior of the liner bag (10) and the interior surfaces of the container (1) to cause the liner bag (10) to inflate under the pressure of ambient air within the bag and to cling to the interior surfaces of the container. The system includes air extraction means (18) and an air exhaust connector (14). The invention also includes a container adapted for use with a method and system of the invention.

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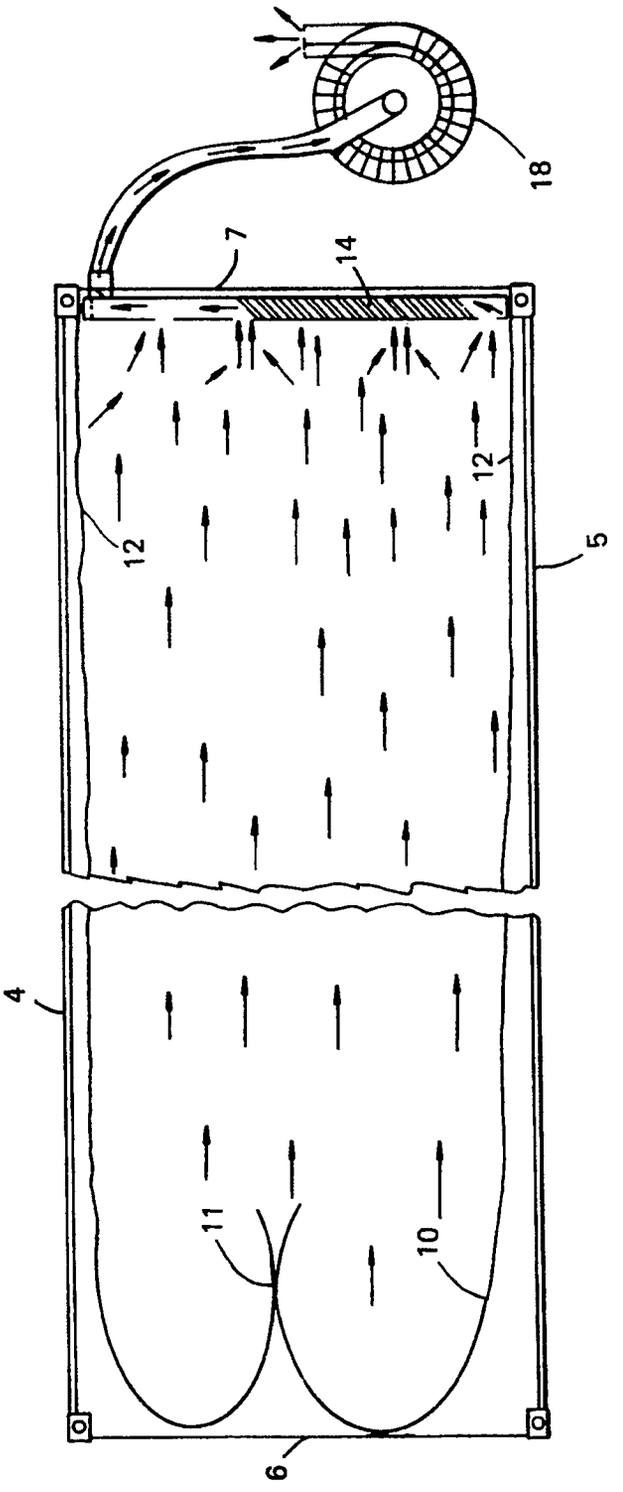


FIG. 2

A METHOD AND SYSTEM FOR LINING CARGO CONTAINERS

The invention relates to a bulk cargo transporting system and, in particular, to a method and apparatus for lining a conventional freight container.

The invention is applicable to all types of containers suitable for transporting and/or storage of bulk materials, and includes transport containers as used for lift-on lift-off ship transport, truck-trailer bodies and box vans which are commonly fixed onto a trailer and may be used for roll-on roll-off shipping transport, and to cargo boxes and the like.

Containers of the kind described generally comprise a floor, side walls, a roof, a rear wall and opposite the rear wall, an opening which is normally closed by door means. The container is adapted to receive, transport and discharge a wide variety of bulk cargo.

It is usually desirable, particularly in the case where the cargo comprises a powder or particulate material, to insulate the cargo from the floor and side walls of the container to prevent contamination of the cargo and/or contamination of the container walls. This is usually achieved by providing a liner bag within the container. In known arrangements the liner usually comprises an elongate, lightweight flexible bag, suitably made from a plastics film material. The bag has a configuration conforming generally to the interior, length and width of the freight container. Frequently, the liner is attached to the interior of the container by fastening means such as snap fasteners or straps.

It is also known to use pressurised air to press the liner against the container walls. The rear end of the bag is sealed and the front end is provided with two openings. One of said openings comprises an inlet through which the cargo is blown into the liner under air pressure. The air pressure causes the liner to inflate to conform to the interior configuration of the container. As the product is blown into the container and the container inflates, the air pressure inside the liner increases. The second opening is therefore provided to exhaust the pressurised air from the liner. In this method straps or fasteners are also sometimes used.

In British Patent Specification No. 2200094-A a continuous lining of non air-permeable sheet material is fastened to the container while in U.S. Patent Specification No. 4373645-A a resilient liner made up of panels is mounted within a hopper type receptacle and the interior of the liner is slightly pressurized to maintain the liner in position.

In European Patent Specification No. 88088A a liner for a container is described in which clamps and support posts are used to mount the liner within the container. German Patent Specification No. 3109395 describes the use of snap hooks on container liners which attach to top anchor ropes within the container to support the liner.

In U.S. Patent specification No. 4092051, the use of a top-opening cargo container and a liner within the container which is loaded from the open top is described.

U.S. Patent Specification No. 3980196-A describes the use of front cross members and a rear frame and a bulkhead to support a bag within the container.

The known arrangements for lining containers suffer from a number of disadvantages. Firstly, the use of clamps and straps to mount the liner within the container is time consuming. Secondly, the method of loading material into the liner is restricted to blowing under air pressure and the inlet opening must, of necessity, be kept small. Thirdly, there is a risk that the internal pressure within the liner may cause damage to the walls, and in particular, to the roof of the container. Where the cargo being loaded is a powder material, a quantity of the powder will invariably be carried with the exhausted air through the exhaust opening in the liner and this material requires to be separated from the exhausted air-flow by cyclone or filter means.

It is an object of the invention to overcome the aforesaid disadvantages and to provide an improved method and means for lining cargo containers.

According to the invention there is provided a method of lining a cargo container, having an openable end, which comprises placing within the container a liner bag of a flexible material which when inflated, is at least of substantially equal size to the interior of the container, the liner bag having a closed end and an open end defining a mouth characterised in that the mouth portion of the liner bag is attached to the container adjacent the container opening and air is substantially exhausted from the space between the exterior of the liner bag and the interior surfaces of the container to cause the liner bag to inflate under the pressure of ambient air within the bag and to cling to said interior surfaces of the container.

The liner bag may comprise a length of tubular plastics material which is closed at one end and has an open mouth at the other end. The closed end of the bag is placed inside the container adjacent to the end wall of the container, and the open mouth of the bag is disposed adjacent the container opening. The tubular liner bag should be at least equal in length to the length of the container but may be greater in length. Likewise the diameter of the tubular bag should be at least equal to, or greater than, the largest internal dimension of the container. The bag may, of course, be made of a material other than plastics, e.g. a paper material. The open mouth of the bag is attached by attachment means, to the roof of the container adja-

cent the container opening, for example the bag mouth may be attached to the inside of the door frame of the container. The attachment means may include mechanical clamping means, magnetic or electromagnetic clamping means, adhesives, adhesive tapes, air-pressure means e.g. an inflated tube, and the like. When the mouth of the liner bag is fixed in position around the container opening, air extraction means is connected, for example by means of an air exhaust connector, to the space between the exterior of the liner bag and the interior surfaces of the container.

The air exhaust connector is usually attached to the container before the mouth of the liner bag is fixed in position around the container opening. The air exhaust connector typically comprises a triangular corner piece having an air outlet and is usually mounted in one of the two upper corners adjacent the container opening so that it abuts the roof and a side-wall of the container. The remaining side of the cornerpiece can be attached to the liner bag which is also attached to the roof.

Air is then exhausted from the space between the exterior of the liner bag and the interior surfaces of the container to cause the creation of a vacuum or partial vacuum between the liner and the interior surfaces of the container. This results in a pressure differential between the inside and outside of the liner bag and causes ambient air to fill the interior of the liner bag and to press the liner bag against the inside surface of the container. As the liner bag is pressed against the inside surface of the container a self-sealing effect takes place so that the mouth of the liner forms a substantially air tight seal with the container opening surround. Depending upon the thickness and flexibility of the material from which the liner bag is constructed, it is found that the liner bag will cling to the side walls and roof of the container without the aid of attachment means.

It may be desirable in some cases to provide additional attachment means such as ties, adhesive pads, clamps or the like such that the inflated bag will remain attached to the walls, ceiling and floor of the container. If desired, the liner bag may be made from a plastics having increased electrostatic properties to improve the clinging effect.

The lining bag may then be filled with cargo using any suitable loading means. The system of the invention has the advantage that all of the opening of the container is available for loading and the loading means is not restricted to the blowing-in of the cargo under air pressure.

The invention also includes a system for lining a cargo container comprising a liner bag of a flexible material which has a length and width at least substantially equal to the length and width of the interior of the container, attachment means for attaching an open mouth portion of the bag to the door surround of the container, and means for extracting air from the space between the exterior of the liner bag and the interior surfaces of the container.

The system may also comprise an air exhaust connector which is fitted between the portion of the liner bag opening and the container opening surround to facilitate connection between the air extraction means and the interior of the container. The air exhaust connector is preferably triangular in shape and has flanges suitable for mating with the interior walls of the container. The triangular air exhaust connector further comprises an opening to which the air extraction means may be connected.

In an alternative arrangement, the air exhaust connector may also comprise an elongate hollow tubular member having an air outlet adapted for connection to the air extraction means and an air inlet for communication with the interior of the container. The air inlet may, for example, comprise an elongate slot.

The exhaust connector may be temporarily or permanently attached to any portion of the container, preferably adjacent the container opening. For example, it may be attached to a portion of the door-surround of the container preferably adjacent the roof on the top member of the door-surround. Alternatively, the air exhaust connector can be formed as an integral part of the container.

The air extraction means may comprise an extraction fan, impeller, vacuum pump, air mover or the like. The air extraction means may be connected to the air outlet of the exhaust connector by means of suitable flexible tubing or quick-release hose.

An embodiment of the invention is hereinafter described with reference to the accompanying drawings, wherein:

Figure 1 is a side elevation, partly in section, showing a cargo container fitted with a bag liner in accordance with the invention;

Figure 2 is a plan view of the cargo container of figure 1, with roof removed;

Figure 3 is an elevation of the open end of the container fitted with an air exhaust air exhaust connector in accordance with the invention;

Figure 4 is a section, to an enlarged scale, on the line IV-IV of Figure 3;

Figure 5 is an elevation of the open end of the container fitted with an alternative air exhaust connector; and

Figure 6 is a side elevation of the container of Figure 5.

Referring to the drawings, these illustrate a cargo container 1 having five walls which are a roof 2, a floor 3, side walls 4/5, a closed end wall 6 and an opening 7. The opening 7 may be defined by a door surround or door frame 8 and, when the container is filled, the opening 7 may be closed by a door 22 (see Figure 5) in well known manner.

An air exhaust connector 14 is fitted to the top of

the door-frame of the container. The connector is shown in more detail in Figure 4 and comprises an elongate tube of rectangular or square hollow section which fits across the container opening. The air exhaust connector may be temporarily attached to the door frame of the container for example using twist locks or mechanical clamping means (not shown). Where the air exhaust connector is temporarily attached to the container, an air seal, for example comprising a length of rubber tubing 15 is fitted between the air exhaust connector 14 and the frame of the container. In an alternative arrangement, the air exhaust connector 14 is formed integrally as part of the structure of the container. As shown in Figure 3, the air exhaust connector 14 is provided with an air outlet 16 which may be connected by means of a hosing 17 (see Figures 2 and 4) to an air extraction fan 18. The inner surface of the air exhaust connector 14 is provided with an air inlet comprising an elongate slot 19 formed in the hollow cross-section.

Figures 5 and 6 show an alternative air exhaust connector 14 which comprises a triangular cornerpiece 20 having an air outlet 21 at its centre to which a hose or tube can be attached. The air exhaust connector is fitted in the upper right corner of the container opening in the Figure. However, it will be appreciated that the air exhaust connector could also be mounted in the upper left corner or in the lower corners. Where the air exhaust connector 14 is formed integrally with the container, it may be located anywhere on the container above the floor area, although adjacent the roof on the top member of the door surround is the preferred position.

The tube or hosing through which air is extracted from the space between the liner bag and the interior surfaces of the container can be attached to the outlet by using, for example, a snap fit, sliding fit or screw fit etc. As shown in figure 6 the air exhaust connector 14 may be provided with a tubular portion 23, which protrudes from the outlet 21, to which the hosing 17 may be attached.

In accordance with the method of the invention, a flexible liner bag 10 is placed within the container. The liner bag 10 suitably is made from a flexible plastics material, for example polythene. The plastics material is suitably approximately 20 to 250 microns in thickness although other thicknesses will also suffice. The clinging properties of the plastics liner bag may also be enhanced by electrically charging the material to increase its electrostatic properties.

The liner bag may comprise a length of tubular plastics film which is unrolled from a roll of film and is cut to a length substantially equal to or greater than the interior length of the container. Preferably, the tube of plastics film is greater than the length of the container. The end 11 of the tube, which is positioned adjacent the end wall 6 of the container is sealed, for example by heat sealing, by welding or by means of a tie. The end 11 is preferably tucked into the tube, as shown in Figure 2, to permit the tube, when inflated, to conform to the shape of the end of the container. The diameter of the tube of plastics film is at least equal to but preferably greater than the greatest cross-sectional dimension of the container. The open end 12 of the liner bag is attached by its edge portions to to the door-surround 8 of the container, as best shown in Figure 3. Suitably the mouth edges of the bag are attached to the door frame 8 by clamps 13 which are pressed, in the direction of the arrows shown in Figure 3, against the liner to clamp the liner, in a substantially air-type fashion between the clamp 13 and the door frame 8. It will be appreciated therefore, that the bag opening conforms substantially in shape to the full opening of the container.

The air extraction fan 18 is then operated and air is extracted, as indicated by the arrows shown in figures 1 and 4, from the space between the exterior of the bag liner 10 and the interior surfaces of the container. The air is drawn into the slot 19 in the air exhaust connector and is exhausted from the air exhaust connector by the outlet 16. The extraction of the air causes a pressure differential to be created between the inside and the outside of the bag liner and causes the ambient air to fill the interior of the bag and to press the plastics film of the bag against the inside surfaces of the container. It has been found that the plastics film will cling to the interior surfaces of the container so long as the air extraction continues. Indeed, even after the air extraction fan is closed down the plastics will continue to cling to the interior surface container for a reasonable period of time. However, if necessary, additional attachment means may be provided, in the form of adhesives, adhesive tapes, or mechanical, magnetic or electromagnetic clamping means, to secure the liner bag walls against the side walls roof and end walls of the container.

The method and system of the invention offer a number of advantages over known methods and systems for lining bulk cargo containers. In the first place, the system of the invention allows access to the whole of the container opening for loading purposes, and cargo can be loaded into the container using a wide variety of conventional loading means, for example conveyor means, manual handling, fork truck, silos, blowers and the like. Secondly, it is no longer necessary to inflate the bag liner under pressure and, because the air pressure within the bag liner is no greater than ambient air pressure there is no danger of damage being caused by air pressure to the container structure.

Claims

1. A method of lining a cargo container (1), having an openable end (7), which comprises placing

within the container a liner bag (10) of a flexible material which when inflated, is at least of substantially equal size to the interior of the container (1), the liner bag (10) having a closed end (11) and an open end (12) defining a mouth characterised in that the mouth portion of the liner bag is attached to the container (1) adjacent the container opening (7) and air is substantially exhausted from the space between the exterior of the liner bag and the interior surfaces of the container to cause the liner bag(10) to inflate under the pressure of ambient air within the bag and to cling to said interior surfaces of the container (1).

2. A method as claimed in Claim 1, characterised in that a substantially air-tight seal is formed between the periphery of the open mouth portion of the liner bag (10) and the container (1) adjacent the container opening (7).

3. A method as claimed in Claim 1 or Claim 2 characterised in that air is withdrawn from the space between the liner (10) and the container walls (2,3,4,5,6) through an air extraction port which communicates with air-extraction means (18).

4. A method as claimed in Claim 3 characterised in that air is withdrawn by extraction means through an air extraction port, which comprises an air-exhaust connector (14) mounted between the liner bag (10) and at least one of the container walls (2,3,4,5,6) adjacent the container opening (7), the air-exhaust connector (14) having an opening which communicates with the space between the exterior of the liner bag (10) and the interior surfaces of the container (1).

5. A cargo container lining system comprising a liner bag (10) of a flexible material which when inflated is at least of substantially equal size to the interior of the container (1), attachment means (13) for attaching an open mouth of the bag (7) to at least one wall (2,3,4,5,6) of the container (1) adjacent the container opening, characterised in that means (18) are provided for extracting air from the space between the exterior of the liner bag (10) and the interior surfaces of the container (1).

6. A system as claimed in Claim 5 characterised in that it comprises an air extraction port through which air can be removed from the space between the liner bag (10) and the interior surfaces of the container (1).

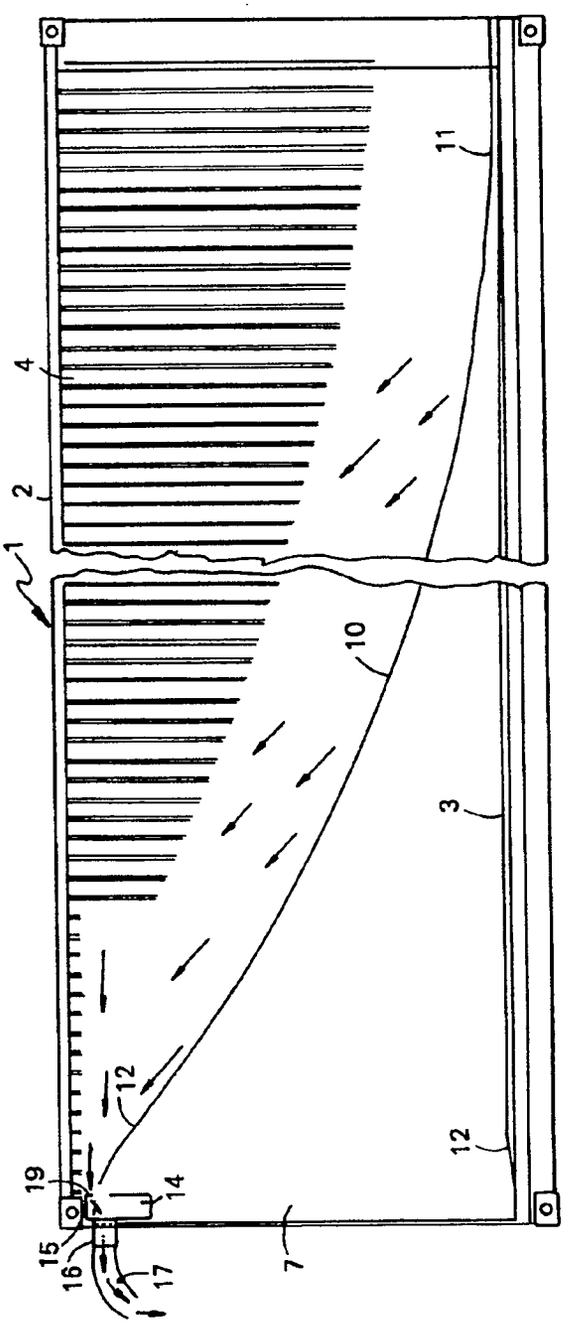
7. A system as claimed in Claim 6 characterised in that the air extraction port comprises an air exhaust connector (14) which is mounted between the liner bag mouth and at least one wall (2,3,4,5,6) adjacent the container opening and tubing to facilitate connection between the air extraction means (18) and the interior of the container.

8. A system as claimed in Claim 7 characterised in that the air exhaust connector (14) comprises a triangular corner-piece (20) having an outlet (21) through which air is extractable from between the interior surfaces of the container (1) and the liner bag (10).

9. A system as claimed in any of claims 5 to 8 characterised in that the extraction means (18) is an extraction tan, an impeller, a vacuum pump or an air mover.

10. A cargo container having a liner bag of a flexible material which when inflated, is at least of substantially equal size to the interior of the container (1), the liner bag (10) having a closed end (11) and an open end (12) defining a mouth characterised in that an air extraction port is fitted to the container and communicates with a space between the liner bag and the container walls, and through which air may be exhausted from said space by air extraction means to cause the liner to cling to the walls of the container.

FIG. 1



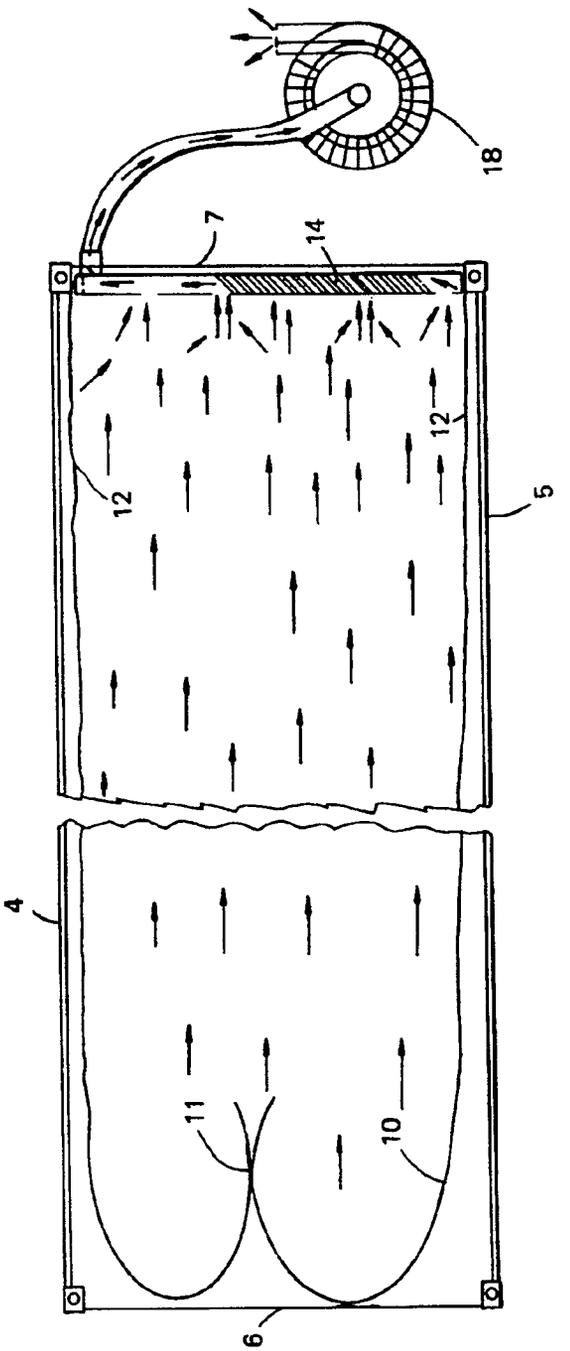


FIG. 2

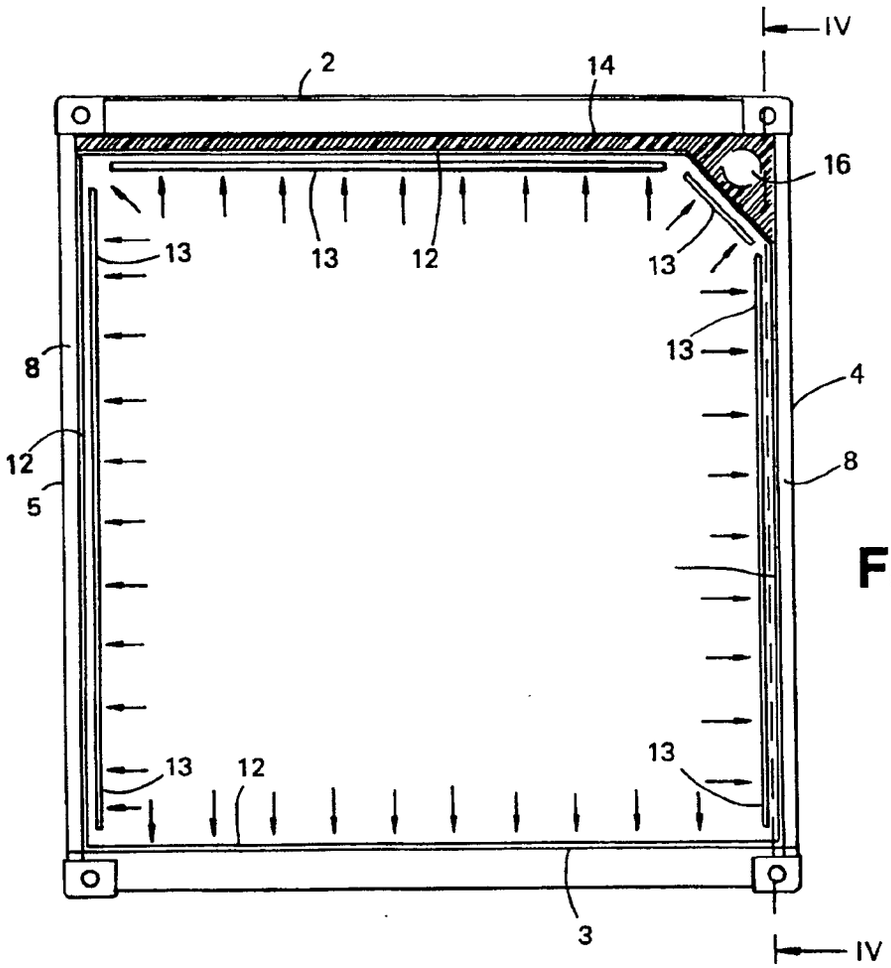


FIG. 3

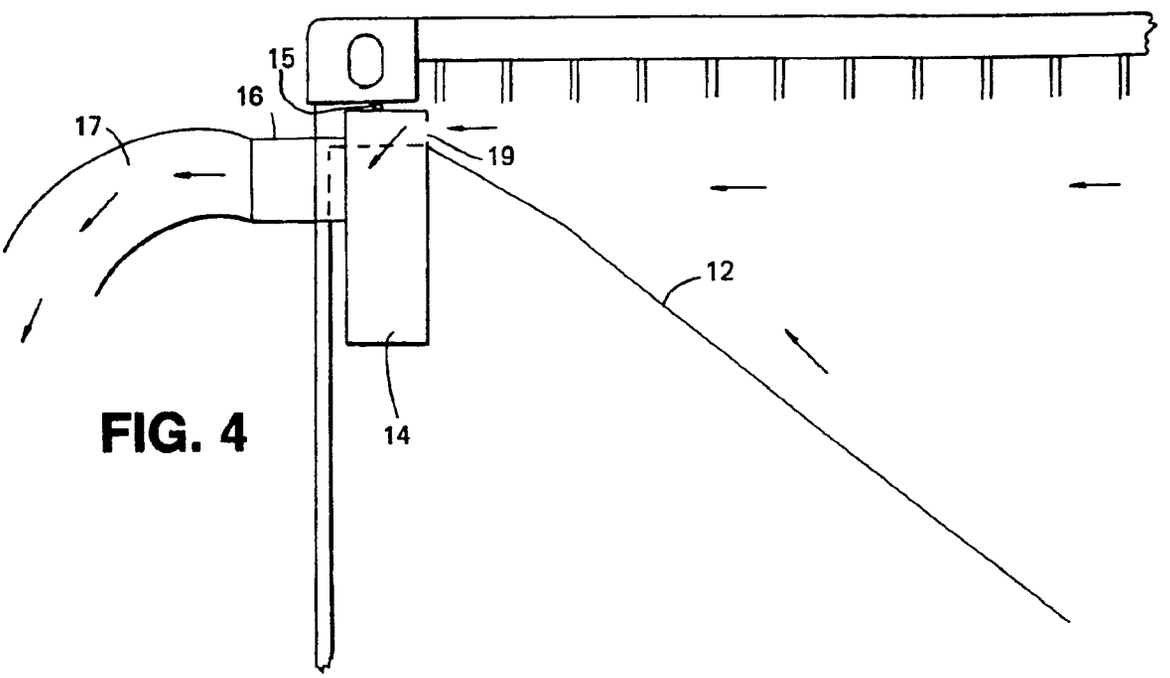


FIG. 4

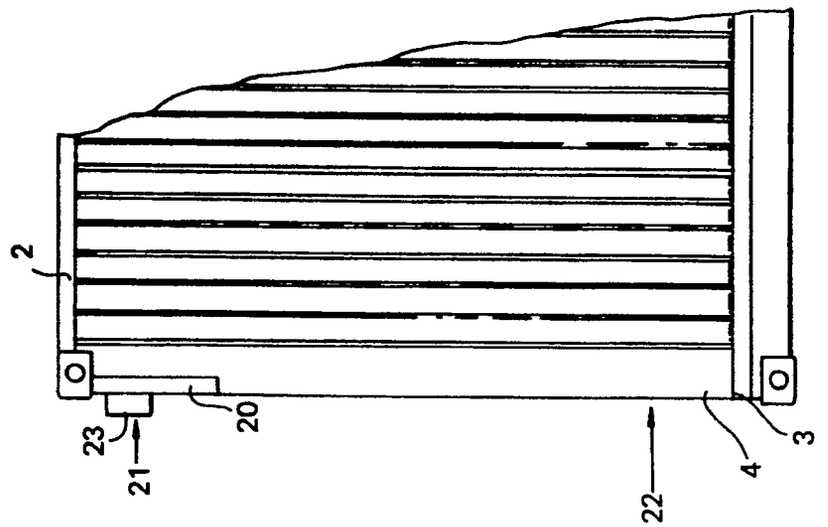


FIG. 6

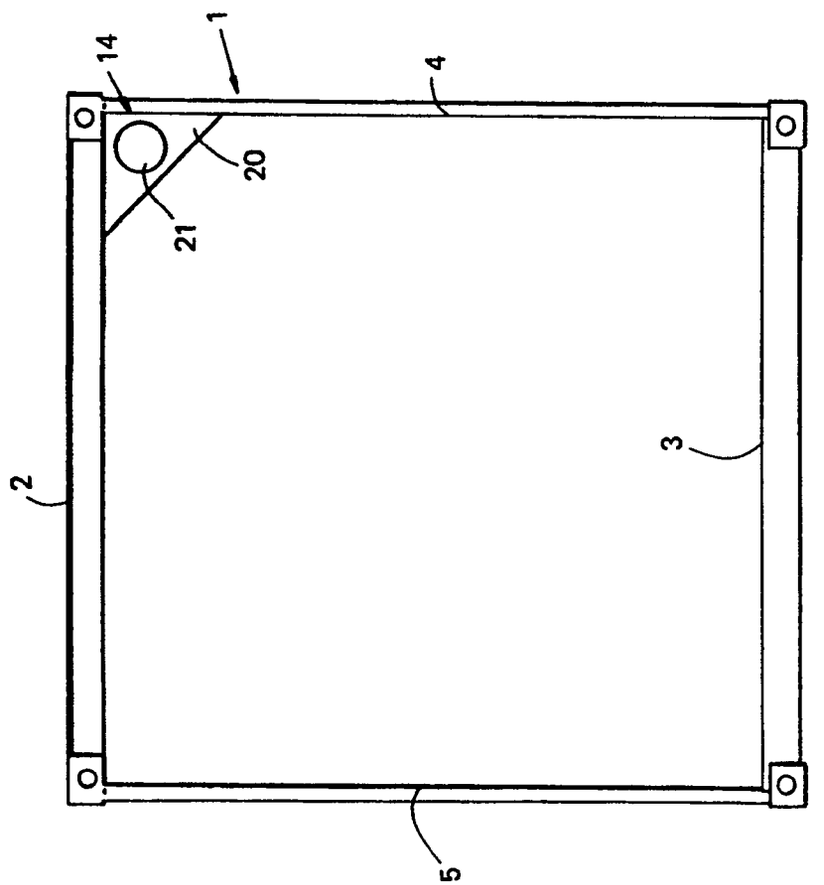


FIG. 5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 30 0189

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.5)
X	US-A-2 762 736 (A. BEUGLET) * Column 1, line 35 - column 2, line 32; fig. *	1,3,10	B 65 D 90/04
A		2,4,5,6,9	
A	FR-A-2 277 004 (THE CARBORUNDUM CO.) * Page 5, lines 9-22; fig. *	1,3,6,9	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 65 D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26-04-1991	VAN ROLLEGHEM F.M.

CATEGORY OF CITED DOCUMENTS

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