

A HEAT-INSULATED HOSE FOR LIQUEFIED GASES

The invention relates to a heat-insulated hose for liquefied gases, such as, for example, liquefied natural gas or liquefied propane, which is suitable for loading and off-loading of tankers transporting liquefied gases.

5 The invention relates more in particular to a hose of the above kind, which is adapted to float at the water surface and which is particularly suitable for use under emergency conditions when it is necessary to transfer liquefied gas from one tanker to another tanker, for example when a cargo tank of
10 a tanker has been damaged, or when a tanker is in distress.

For this purpose, the heat-insulated hose for liquefied gases comprises, according to the invention, an inner hose resistant to cryogenic temperatures, a plurality of successive heat-insulating layers arranged around the inner hose and an
15 outer protective sheath arranged around the outermost heat-insulating layer, wherein each heat-insulating layer comprises a helically wound strip of fibre material upon which a network of blocks of a heat-insulating material is mounted.

In a preferred embodiment of the invention, a barrier of
20 sheet material is arranged between each pair of adjacent heat-insulating layers. A suitable material for this barrier is, for example, a polyester film manufactured from polyethylene terephthalate which is marketed as Mylar (registered trade mark). Each barrier may be formed as a helically wound
25 strip of the sheet material. These barriers have the advantage that they stop convection currents and moreover that they enable the heat-insulating layers to slide relatively to each other.

A suitable, heat-insulating material for use in the hose
30 according to the invention is a plastics foam material. A very suitable heat-insulating material is polystyrene foam, since it is light and has a good compressive strength. Furthermore,

it is not affected by the cryogenic temperatures and by the cryogenic liquids.

The fibre material upon which the network of blocks of the heat-insulating material is mounted can be, for example, hessian, a material which is strong for its light weight and which meets the low temperature requirements.

The invention will be explained with reference to the drawings, showing an embodiment of the invention, wherein

figure 1 shows a longitudinal cross-section of a heat-insulated hose according to the invention;

figure 2 shows a top plan view of an embodiment of a strip of heat-insulating material for use in the heat-insulated hose according to the invention;

figure 3 shows in detail a longitudinal cross-section of a part of the heat-insulated hose according to the invention.

In the drawings, the reference numeral 5 indicates an inner hose, which is of a kind which maintains its strength and flexibility at cryogenic temperatures, such as the low temperatures of liquefied natural gas or liquefied methane.

Since such hoses are available on the market, the construction of the inner hose 5 will not be described in detail in this specification.

The inner hose 5 is surrounded by a number of successive heat-insulating layers, for example three layers 7A, 7B and 7C. The layer 7A is formed by helically winding a strip 17A of heat-insulating material around the inner hose 5, the layer 7B is formed by helically winding a strip of 17B of heat-insulating material around the layer 7A and the layer 7C is formed by helically winding a strip 17C of heat-insulating material around the layer 7B.

A very attractive heat-insulating material for use in the hose according to the invention is, for example, polystyrene foam. A part of a strip 17 of polystyrene foam material is shown in figure 2. The strip 17 of polystyrene foam is backed by a backing strip of fibre material 6, which is preferably

hessian. The polystyrene foam is cut as shown, so as to form a network of blocks 11, which blocks 11 are mounted on the strip of fibre material 6.

In figure 3, the layer 7A of polystyrene foam is formed
5 by a helically wound strip 17A of polystyrene foam, which is provided with a backing strip 6A of hessian. The strip 17A of polystyrene foam is cut in the manner as shown in figure 2 so as to form a network of blocks 11. Between the layer 17A and the inner hose 5 a layer 13 of polyester film material, such
10 as Mylar, is present. On top of the layer 7A, a barrier 8A of sheet material is present. This barrier 8A is preferably a film of Mylar. The barrier 8A is formed, for example, by helically winding a strip of Mylar film material around the layer 7A. The layer 7B of polystyrene foam is formed by a
15 helically wound strip 17B of polystyrene foam, which is provided with a backing strip 6B of hessian. The strip 17B of polystyrene foam is cut in the manner as shown in figure 2, so as to form a network of blocks 11. On top of the layer 7B, a barrier 8B of sheet material is present. This barrier 8B is
20 preferably a film of Mylar. The barrier 8B is formed for example by helically winding a strip of Mylar film material around the layer 7B. The layer 7C of polystyrene foam is formed by a helically wound strip 17C of polystyrene foam, which is provided with a backing strip 6C of hessian. The
25 strip 17C of polystyrene foam is cut in the manner as shown in figure 2, so as to form a network of blocks 11. On top of the layer 7C, a barrier 9 of sheet material is present. This barrier 9 is preferably a film of Mylar. The barrier 9 is formed, for example, by helically winding a strip of Mylar
30 film material around the layer 7C. A layer 10 of cotton cloth and a layer 12 of Mylar film material are arranged around the barrier 9, whereas the layer 12 is enclosed by a protective gas- and liquid-tight sheath 15, made of rubber or neoprene and incorporating a helically wound steel wire.

In the above embodiment of the invention, three heat-insulating layers are used. It will be clear that instead of heat-insulating layers, more or less than three layers can be used, if desired.

5 By cutting the polystyrene foam into blocks and using the hessian backing sheet, as described, the advantage is obtained that the whole hose assembly can be extended axially without loss of its heat-insulating properties. Instead of polystyrene foam other plastics foam material can be used, for example
10 polyurethane foam. Instead of plastics foam material, it is however also possible to use for example balsa wood, if desired. The heat-insulating material selected should of course have suitable tensile and compressive properties at
15 hessian; instead cotton cloth, glass-fibre cloth, terylene cloth or any other suitable fibre material can be used for the backing strip 6, provided it is suitable for use at cryogenic temperatures.

The hose according to the invention is suitable for
20 loading and off-loading tankers transporting liquefied gases, such as, for example, liquid propane or liquefied natural gas. The hose according to the invention is particularly suitable for use under emergency conditions, when it is necessary to transfer liquefied gas from one ship to another, for example
25 when a liquefied gas tank of a tanker has been damaged.

The strips 17 of plastics foam material are preferably helically wound in alternate directions.

The heat-insulating material used is preferably of the closed cell type, since this has the advantage that it will
30 not absorb water in the event of leakage of the outer protective sheath.

C L A I M S

1. A heat-insulated hose for liquefied gases, in particular liquefied natural gas, comprising an inner hose resistant to cryogenic temperatures, a plurality of successive heat-insulating layers arranged around the inner hose and an outer protective sheath arranged around the outermost heat-insulating layer, wherein each heat-insulating layer comprises a helically wound strip of fibre material upon which a network of blocks of a heat-insulating material is mounted.
- 5 2. The heat-insulated hose as claimed in claim 1, comprising a barrier of sheet material arranged between each pair of adjacent heat-insulating layers.
- 10 3. The heat-insulated hose as claimed in claim 2, wherein the sheet material of the barrier is a polyester film.
4. The heat-insulated hose as claimed in claim 2 or 3, wherein each barrier is formed as a helically wound strip of the sheet material.
- 15 5. The heat-insulated hose as claimed in any one of the claims 1 to 4, wherein the heat-insulating material is plastics foam material.
- 20 6. The heat-insulated hose as claimed in claim 5, wherein the plastics foam material is polystyrene foam.
7. The heat-insulated hose as claimed in any one of the claims 1 to 6, wherein the fibre material is hessian.

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