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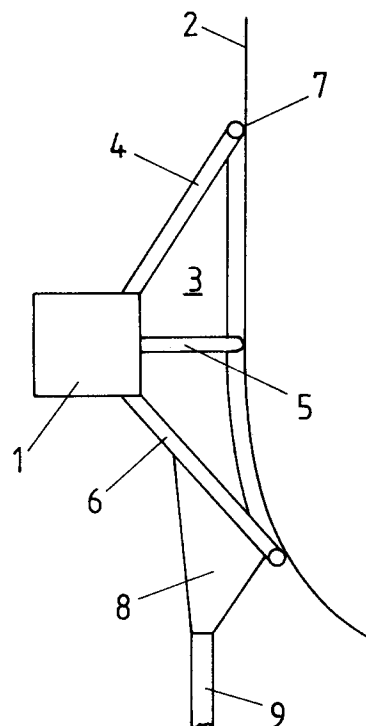
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**NL-2596 HG Den Haag (NL)**(54) **Device and method for enveloping a construction to be treated.**

(57) Device and method for the treatment, in particular gritblasting, of a construction, a sealing being effected by means of an inflatable wall (3) and in case of open constructions an opposing wall (19). By preference the wall (3) is attached to a cabin (1) and the space between the wall and construction, and opposing wall respectively is kept under-pressured. With regard to the construction, the opposing wall may be secured and sealed respectively with any suitable means, such as magnetic means (23), velcro, means of suction (22).

**FIG. 1****EP 0 640 441 A1**

The invention relates to a device for enclosing at least part of a construction to be treated, which device has been provided with a wall enclosing at least said part of the construction to be treated, and to a method for the treatment of constructions.

Such devices are very much desired and have in many cases even been prescribed by law in the event of the treatment giving off substances that may be harmful to environment or health. This may occur when, for example, gritblasting constructions which in the process gives off substances that are harmful to environment or health, such as the grit itself, the primer which for steel constructions often contains lead, other paint residues, flue gas residues that may be found in chimneys, and polycyclic aromatic hydrocarbons or halogenated hydrocarbons, which constructions may have a closed wall such as a ship's hull, or an open framework, or else constructions that have seriously been contaminated due to fire damage, and so on. It is, however, also possible that the treatment itself causes undesired fumes to be given off, originating for instance from chemical substances used during the treatment.

Increasingly more stringent environmental legislation prohibits in many cases undesired contaminations from being carried into the environment, i.e. into the soil, air or water, and therefore enforces the use of the devices outlined.

So far this problem of covering a construction to be treated has been solved by a cloth covering fixed onto bars. This has many disadvantages, in particular the necessity for many working hours, problems with the sealing off with regard to the construction, and the latter in particular with an open construction when also at its other side a covering wall has to be attached.

The invention aims at providing a construction which offers a considerable saving of time and allows for a better sealing off.

In accordance with the invention this becomes possible by providing that the wall has at least one inflatable compartment, which in inflated state gives the wall a shape that at least on one side defines a volume that contains said part of the construction.

In order to prevent substances released in the treatment from reaching the environment, it is provided according to a further elaboration of the invention that means are present to maintain an under-pressure in said volume. In case of possible leaks this means that due to these leaks outer air is drawn in and that the exhaust of the air from the volume is controlled, and can be completely cleaned.

In accordance with a preferred embodiment of the invention it is provided that the wall is secured to a cabin having a side provided with an opening around which the wall has been fixedly mounted,

which cabin is supported by an adjustable supporting structure. This results in a construction easy to be handled, with which further the advantage is obtained that the shifting of the cabin's location can also be employed for that of the wall.

When the construction to be treated is a closed surface, either curved or not, it is preferably provided that in inflated state the wall has a rim devised to be accommodated against a surface of the construction to be treated.

When the construction has openings, such as an open steel construction, this same concept can be applied by mounting an opposing wall cooperating with the wall, which opposing wall is located on the other side of construction parts with which the rim is in contact.

The opposing wall can be secured by fastening means which attach the opposing wall to the wall's rim and/or the construction. Said fastening means may be among other things magnetic means, suction means, velcro and/or mechanical means such as press-studs, hooks, toggles, etcetera.

By preference, the fastening means are also sealing means or additionally provided with sealing means. Said sealing means may be formed by supply strips of air-impermeable material, brushes, teeth and/or foam plastic.

If the construction parts between the wall and the opposing wall are flat, it is not difficult to accomplish an effective sealing. If, however, said construction parts are formed by T-beams or H-beams, it may be desirable or even necessary to provide in situ a means of sealing such as a plug, a magnetically secured sealing member, etcetera.

In order to have the wall take a desired shape, it is provided with pressure compartments that give it the shape desired, the administering of various pressures, possibly to various compartments, being able to result in a greater variation of adjustable shapes.

An entirely different way of forming a sealed-off space is constituted in that the wall consists of a number of flexible sheets, which, when the pressure in the compartments is changed, envelop a different volume. This type of construction, which in a certain embodiments bears resemblance to a lotus flower, is for instance suitable for enveloping protruding objects such as lighting masts rising from the ground, and the like.

Another possibility for similar constructions consists of a cylindrical wall that is inflated around the construction.

It is also possible that the construction to be treated has per se a sufficiently sealed off shape, for example the inner wall of a chimney. In that case the upper side can for example be provided with a sealing and the bottom side with a device according to the invention, then accommodating an

inflatable ring with in the middle a funnel of flexible material. Such a ring may for example be held elevated by fastening inflatable legs at its bottom side.

An important application of the invention is constituted in blasting or gritblasting a construction. In thus applying the invention it is essential that a receptacle and a discharge be present for the grit particles used when blasting and for the material released as a result. When in the volume enveloped by the device in accordance with the invention an under-pressure is prevalent and this is attained by the connection to an exhaust that is linked to a suction device, the air volume flowing in when blasting and possibly in case of leakage, can be discharged, moreover, the possibility existing of separating the grit from the particles released as a result of the blasting, and of reusing it.

When to this end sufficient room is available, it is often advantageous when the opposing wall has been provided with inflatable compartments. In that case the opposing wall can have a rim corresponding to that of the wall, as a result of which the number of places where the opposing wall comes into contact with the construction is limited.

For supplying inflating gas to the opposing wall, provisions can be made for the wall and the opposing wall being provided with means of sealing and/or passage cooperating with each other, to allow passage of pressurized gas from the wall to inflatable compartments of the opposing wall.

In case the connection between the wall, the construction and the opposing wall is at least partly effected by suction means, it is preferably provided that the wall accommodates under-pressure compartments that exit near the wall and there secure by means of suction parts of the opposing wall.

The invention also comprises a method for treating, in particular blasting a construction, with which the device in accordance with the invention is stepwise moved along the construction, as indicated in claims 18 and 19.

The invention will hereinafter be further explained, reference being made to the drawing, where:

fig. 1 shows a cross-section of a device according to the invention which cooperates with a closed construction part;

fig. 2 shows a device according to the invention for enveloping a pole-shaped construction;

fig. 2a elucidates an embodiment of a sheet shown in fig. 2;

fig. 2b is a top view of a detail of fig. 2a;

fig. 3 shows a device according to the invention which is capable of closing under the influence of the compressed air supplied;

fig. 4 shows a device according to the invention for an open frame-work construction; and

fig. 5 shows a sealing between a wall rim and an opposing wall.

In fig. 1 by 1 a cabin has been indicated supported by an adjustable supporting structure, such as, for example, a tower waggon.

By 2 a closed wall has been indicated which has to undergo a treatment such as gritblasting. By 3 an inflatable bell has been indicated, which by means of internal pressure-compartments 4, 5 and 6 inflates a rim 7 and from the cabin 1 pushes to the right. The pressure compartments 4, 5 and 6, assuming more or less like whalebones a predetermined shape, give the bell 3 a certain rigidity, but not to such an extent that no proper adjustment to the wall 2 should be possible.

At the bottom side of the bell there is a discharge 8 with an exhaust 9. When now from the cabin blasting grit is blasted against the wall 2, said blasting grit will rebound, as will material that has been removed from the wall 2, such as contaminations, lead, red lead and/or other paint residues, when for example it concerns a ship's hull. Through 8 and 9 the air under the bell 3, which is continuously replenished by the compression air applied for the gritblasting, is discharged. At the same time grit can be separated from the material removed from the wall 2 and can be reused, if so desired. The connections from the outside for supplying compression air and grit to the cabin 1 have not been drawn for clarity's sake.

Fig. 2 shows another embodiment of the invention, a cabin again having been indicated by 1, which, however, is provided with a set of sheets 10, 11 and 12 that can be unfolded by means of pressure compartments not shown, 10 and 12 of which press upon the sheet 11, which effect can be achieved by moulding the compartments accommodated in the blades, which are not drawn. This construction is not only suitable for horizontal use, it can for example also be applied when a vertical or slanted mainly bar-shaped element must be enveloped, the cabin for the treatment of the enveloped construction part possibly being capable of being moved in relation to the drawn cabin 1.

In fig. 2a a rectangular central duct 25 has been provided with a row of wing parts 26, one of which has been shown. Each wing part has a convex end surface 27 and a concave end surface 28. In each wing part a plurality of gauze sheets 29 are fixed, which are sewed to the concave end surface 28, each of the side walls 30 and the convex end surface 27. As is shown best in fig. 2b, the concave end surface 28 has at its edges flaps 31 which consist in an extension of a side wall 30 and a retracted surface 32. By means of the gauze sheets 29 the end surface 27 is connected to the side walls 31 and to the convex end surface 28, so that after inflation of the wing part it has the shape

as drawn.

The convex end surface of the next wing part protrudes into the cavity of the previous concave end surface.

By reason of the inflation a reasonable sealing between successive wing parts is obtained, but nevertheless it is possible to have poles, tubes or beams passing between cooperating convex and concave end surfaces.

In fig. 2 for instance the sheet 11 may have a central longitudinal duct with wing parts of the type of 26 above and below it.

The same principle of inflated wing parts with cooperating convex and concave end surfaces can be used with many embodiments of the invention. A sufficient seal is obtained by the inflation and such a seal is also maintained in case a mechanical construction element is passed to the exterior between the said convex and concave end surfaces.

Fig. 3 shows an embodiment of the invention which is suitable for the treatment of a vertical mast, such as a lighting mast. The cabin 1 carries an inflatable bell-shaped part 13 that changes into a cylindrical part 14 with an upper shut-off 15. At the bottom side a funnel 16 has been provided which envelopes a schematically drawn mast 17 and under which an discharging part 18 is located that has been laid around the mast 17 in a sealing fashion, for instance by means of sealing means, sealing pieces, etcetera.

Fig. 4 shows the case when the bell 3 is located at one side of the open frame-work construction and an opposing wall 19 at the other side. The rim 7 of the bell meets the opposing wall 19 at the outside, but continues under an H-beam 20 to the point 7' where the bell 3 again touches the opposing wall 19. In order to prevent leakage in this event, sealing parts 21, for example made of foam rubber, have been mounted. Of course, the sealing can be effected in all kinds of different ways, for example by elastic sealing elements protruding from the bell 3 and/or the opposing wall 19, the application of sealing pieces provided with fastening means or brushes not drawn, which may offer no complete sealing, but this is not necessary: the bell is underpressurized and a limited inflow of air is permissible.

By 23 a magnetic member has been indicated which presses the opposing wall 19 upon the H-beam. Of course, it is also possible that the opposing wall itself has magnetic properties.

Finally, fig. 5 shows a detailed cross-section of a rim 7", which has a cavity 24 with a duct 22 for air of a lower than atmospheric pressure, for example created by a connection with the inner side of the bell 3.

It will be clear that the invention is not limited to the embodiment examples considered. It is possible to effect a sealing between the bell 3 and the opposing wall 19 in very diverse ways such as, for example, velcro, temporarily adhering adhesive tape, mechanical connecting means between 3 and 19, such as clips, toggles construction, press-studs, and so on. Furthermore, the shape of the inflatable construction 3 can be adjusted to various constructions to be treated.

When a large construction must be treated the bell 3 can be first fixed on one particular place. Thereupon the opposing wall 19 is mounted, the entity is sealed and the treatment of one side of the construction is carried out. Subsequently, the connection to the opposing wall 19 can, if need be, then be discontinued and the whole can be shifted, whereupon the sealing between 19 and the bell 3 can be effected again. Of course, in doing so, it is advantageous that the rim 7 of the bell 3 should have a rectangular shape.

#### Claims

1. Device for enclosing at least part of a construction to be treated, which device has been provided with a wall enclosing at least said part of the construction to be treated, **characterized in that** the wall has at least one inflatable compartment, which in inflated state gives the wall a shape that at least on one side defines a volume that contains said part of the construction.
2. Device as claimed in claim 1, **characterized in that** means are provided to maintain an under-pressure in said volume.
3. Device as claimed in claim 1 or 2, **characterized in that** the wall is secured to a cabin having a side provided with an opening around which the wall has been fixedly mounted, which cabin is supported by an adjustable supporting structure.
4. Device as claimed in any of the claims 1-3, **characterized in that** in inflated state the wall has a rim devised to be accommodated against a surface of the construction to be treated.
5. Device as claimed in any of the claims 1-4 for the treatment of an open construction such as an open steel construction, **characterized in that** an opposing wall cooperates with the wall, which opposing wall is located on the other side of the construction parts with which the rim is in contact.

6. Device as claimed in claim 5, **characterized in that** fastening means are present to attach the opposing wall to the wall's rim and/or the construction.

7. Device as claimed in claim 6, **characterized in that** the fastening means may contain magnetic means, suction means, velcro and/or mechanical means such as press-studs, hooks, toggles, etcetera.

8. Device as claimed in claims 4-7, **characterized in that** the wall and the opposing wall between said construction parts join together and are provided with sealing means to form a sealing adjacent to a construction part.

9. Device as claimed in claim 8, **characterized in that** the sealing means are formed by flexible strips of air-impermeable material, brushes, teeth, pieces of foam plastic.

10. Device as claimed in claim 1, **characterized in that** the wall is provided with pressure compartments that give it a different curved shape at different pressures.

11. Device as claimed in claim 1 or 10, **characterized in that** the wall consists of a number of flexible sheets which, when the pressures in the compartments are changed, envelop a different volume.

12. Device as claimed in any of the preceding claims, **characterized in that** it contains a supply for compression air and blasting granules and an exhaust for air, blasting granules and material blasted from the construction.

13. Device as claimed in any of the claims 5-12, **characterized in that** the opposing wall has been provided with inflatable compartments.

14. Device as claimed in claim 13, **characterized in that** the wall and the opposing wall have been provided with means of sealing and/or passage cooperating with each other, to allow under pressure passage of gas from the wall to inflatable compartments of the opposing wall.

15. Device as claimed in any of the claims 5-14 **characterized in that** the wall accommodates under-pressure compartments that exit near the wall and there secure by means of suction parts of the opposing wall.

16. Device as claimed in claim 1 **characterized in that** it accommodates an inflatable ring with in

the middle a funnel of flexible material.

17. Device as claimed in claim 16 **characterized in that** the ring has been provided with inflatable legs at its bottom side.

18. Device as claimed in claim 1, **characterized in that** it is composed of a plurality of wall parts at least one of which has a duct and wing parts connected to said duct, said wing parts having first and second end surfaces in inflated state the first being convex and the second being concave, said convex end surfaces in inflated state protruding into the cavity of the opposed concave end surface, the concave end surfaces in their central regions being connected by connection means to the convex end surfaces.

19. Device as claimed in claim 18, **characterized in that** the connecting means consist in gauze sheets connected to the convex and concave end surfaces.

20. Method for the treatment, in particular the blasting, of a construction part, when successively different parts of the construction are enveloped and blasted, **characterized in that** a rim of the wall of a device as claimed in any of the claims 1-15 is accommodated against the construction, the part enveloped by the wall of the construction is treated, the blasting granules and the blasted-off material together with air are extracted in such way that a pre-determined under-pressure is maintained, that, subsequently, the wall is released from the construction and is brought to another part of the construction and that there the blasting is repeated.

21. Method as claimed in claim 18, **characterized in that** after the termination of the blasting the opposing wall is released from said first part and is brought to another part of the construction, that the wall is connected to said other part in similar manner and that then the treatment of this part is effected.

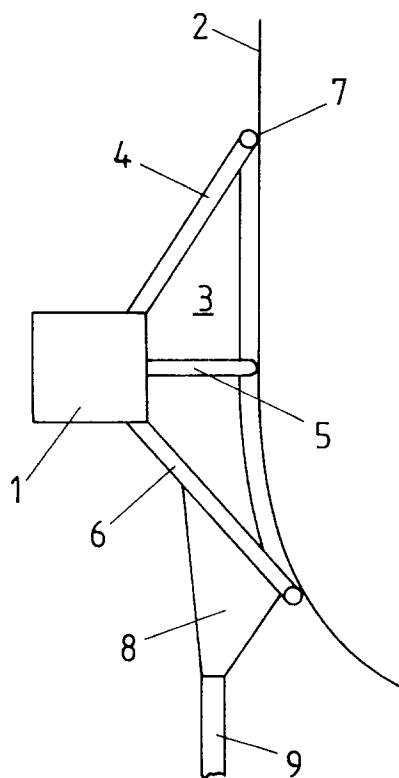


FIG. 1

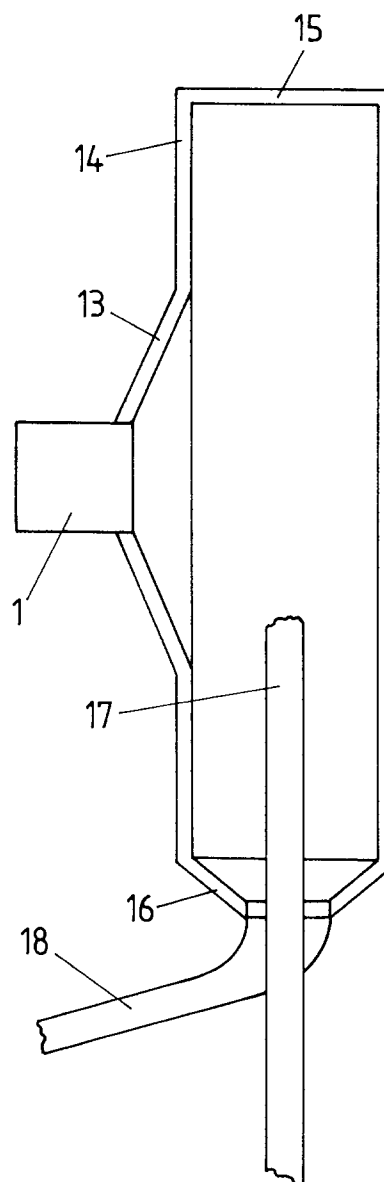


FIG. 3

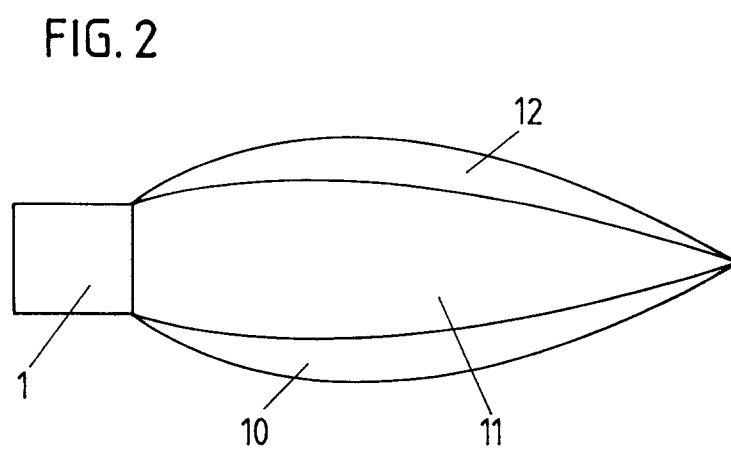
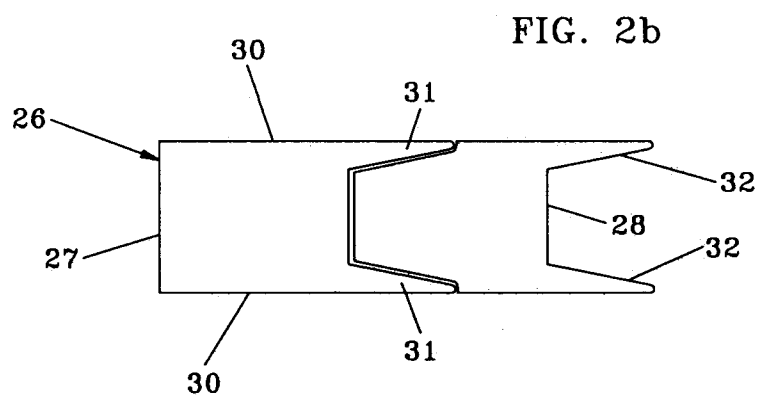
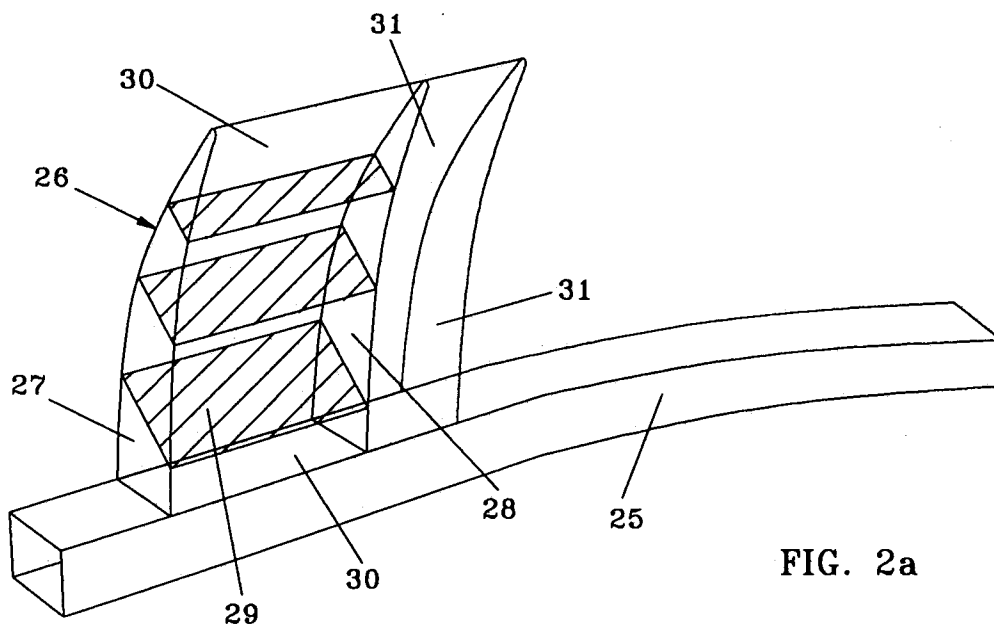


FIG. 2



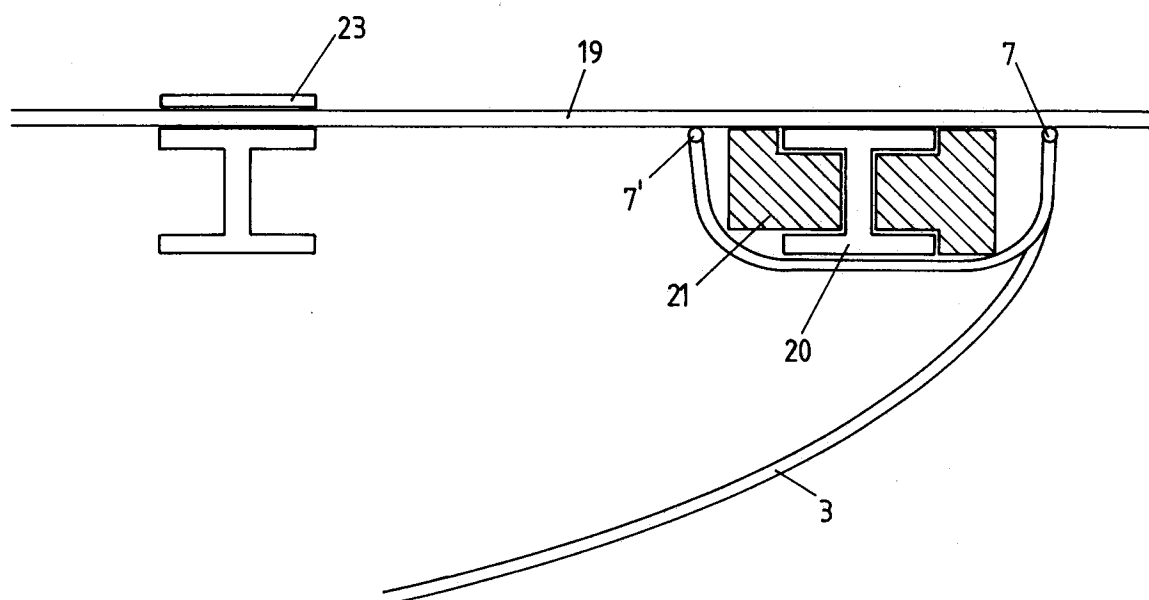


FIG. 4

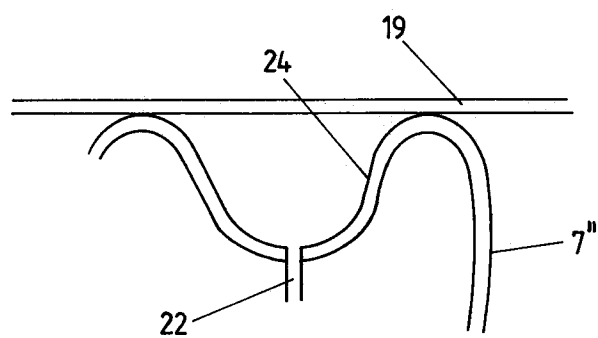


FIG. 5





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## EUROPEAN SEARCH REPORT

Application Number  
EP 94 20 2478

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.6)
X	EP-A-0 315 500 (G.THOMANN)	1,3	B24C3/06
Y	* column 1, line 54 - column 2, line 12; figures *	20	B63B59/06
	---		E04G23/00
Y	EP-A-0 393 918 (VAPORMATT LTD.)	20	
A	* abstract; figures *	1,7,21	
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A	GB-A-460 790 (C.LUMB)	1,20	
	* claims; figures *		
	---		
A	DE-A-34 02 907 (G.DRESHA)	1,20	
	* abstract; figures *		
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B63B B24C E04G
Place of search		Date of completion of the search	Examiner
THE HAGUE		7 December 1994	STIERMAN, E
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