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54 Flexible container in folded position.

57 The present invention relates to a flattened flexible container made ready for filling with bulk material, and method and means for making a container comprising a liner of impervious sheet in an outer container of strong load-bearing material. The liner and the outer container are folded longitudinally in the same way such that the liner is kept in position by having its folds or gussets everywhere placed in the corresponding folds or gussets of the outer container. Both the liner and the outer container may have a longitudinal gusset on each side which can have a width of up to 1/8 of the container's circumference. The manufacture can be carried out in an apparatus (8) in form of a box which is open in both ends and can be folded together. Its side walls consist of longitudinal parts (7) which are connected to each other and the roof (4) and bottom (5) of the apparatus (8) by means of pliable connecting means (6). The container according to the invention can be filled with bulk material without prior inflation at the filling site.

EP 0 141 429 A2

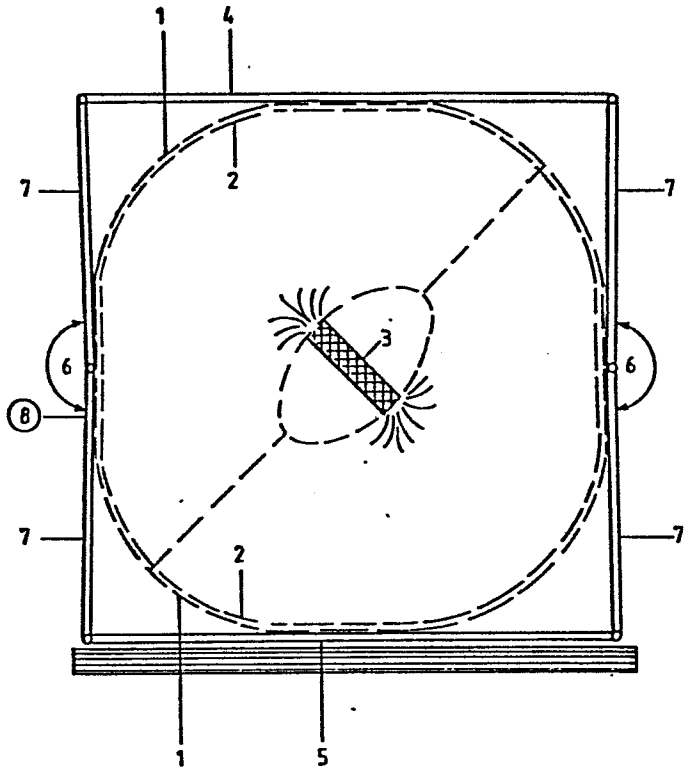


FIG. 1

The present invention relates to a flattened flexible container or intermediate bulk container made ready for being filled with bulk material, and it comprises an outer container of strong load-carrying material and an inner liner of impervious sheet material, e.g. of thermoplastic or paper.

The invention also comprises a method for manufacturing such containers and means for manufacturing the container.

For most applications of flexible containers it is necessary that the material to be transported is protected against being contaminated by dust, water etc., and this is usually obtained by application of an impervious liner which ideally shall be positioned against the outer container when it is filled with a material which shall be transported and/or stored. It has been found practical to place the liner in the load-carrying container already at the production site of the container. However, it has proved to be difficult to place the liner in such a way that it will not be damaged or crumpled and get a form which deviates from that of the outer container, and thereby easily bursts when it is filled with bulk material.

One way of making the above mentioned containers has been to fasten the liner to the base material for the outer container with glue or tape and thereafter finish sewing the outer container. This is labour-consuming and requires great precision in order to avoid damage of the liner during said sewing operation. Further the tapes, and thereby the liner, can be

incorrectly positioned such that it will be unevenly loaded during filling and may then burst easily.

The final centration of the liner in the outer container can take place by its inflation at the filling station, for instance as described in GB Patent No. 1.475.019 (corresponding to Norwegian Patent No. 136.744). The liner will then be pressed against the outer container and be in close formation with it, presupposing that the liner originally is correctly placed and fastened to the outer container. Accordingly, this method presupposes great accuracy during placement of the liner in the outer container.

In DE No. 2.721.771 it is described a container consisting of an outer load-carrying container of roundwoven material and a liner of thermoplastic sheet. According to this application the sheet is centrally placed and possibly folded during manufacture of the roundwoven base material for the load-carrying container. Cutting of suitable pieces of sheet and web, and closure of one end of the inner and outer container must then be carried out in successive steps. By this method the liner is folded by simple gusset and placed in the middle of the container, which is folded by double gusset. Thereby the folded liner will be placed between the central side fold in the double-folded outer container such that the liner is kept in place in the middle of the outer container during its further manufacture. Even though this method secures centering of the liner in the outer container, the method is limited to manufacture of outer containers made from roundwoven material. Further one will in certain cases get problems by the final placement of the liner in connection with securing close placement against the outer container, at least that part of it which shall be filled with bulk material.

The object of the present invention was to arrive at a flexible container which when inflated or filled will have a liner with the same form as the outer container and where the

liner everywhere lies closely against corresponding points of the outer container, at least that part of the container which shall be filled with bulk material, without using fastening means as tape etc., and that crumpling of the container is avoided.

A further object was to arrive at an apparatus and a rational way for correct placement of the liner in the outer container at the production site and thereby be able to manufacture a product which is completed as far as possible there.

The most important problems experienced with flexible containers, proved to be caused by incorrect placement and fastening of the liner at the production site. The inventors therefore tried to change the method of placing the liner in the outer container and a way of fastening the liner or keeping it in place in the outer container. Obviously, it is no help in placing the liner correctly at the beginning if it is displaced before or during the filling operation. In order to avoid penetration and fastening by securing the liner to the outer container if it is displaced or incorrectly placed, the container can of course be readymade before the liner is placed in it. The problem will then be to place the liner correctly in the outer container in a rational way and such that it is not crumpled during filling of bulk material and thereby can be damaged.

To start with the inventors chose to direct their effort on placing the liner in the outer container after the latter had been joined together. It was found that placement of the liner could be carried out in a simple way and that it also could be locked in a centered position in the outer container without using glue or tape. The operation of placing and fastening the liner would thereby be simpler than by previously used methods. In addition one obtained a product consisting of a load-carrying outer container and a protecting liner of impervious material which was simpler, faster and

more secure to fill with bulk material than previously known containers where the liner was fastened to the outer container by tape or the like. It was found that if the liner was placed in an outer container and folded lengthwise with the same type of gusset as the outer container, the liner would be kept in place by the gusset or fold of the outer container. Further would those points of the liner which are opposite and against corresponding points in the outer container when it was inflated or filled also be opposite each other when the two containers were folded together. By this way of manufacturing the container one obtained all the above advantages.

Manufacture of such a product can be carried out in several ways and will to a certain degree depend on whether the outer container is made from flatwoven or roundwoven base material. Primarily the liner and the outer container are folded with gusset lengthwise in the same way such that the liner's gusset is kept in place by the outer container's gusset when the containers are flattened and that corresponding points lie against each other such as stated above.

The inventors found a suitable way of obtaining the new product by placing the liner in the finished outer container which then was inflated. This was carried out in a special way, i.e. by first placing the container in some folding means in form of a tunnel or box having squarish cross-section and then inflated. The longitudinal side walls were divided in two and joined together by hinges or the like. Subsequent to inflation the box was pressed together, and during this operation the hinged side walls formed gussets in both the liner and the outer container. The containers were pressed together and could then be drawn out of the box, and optionally they could be folded crosswise of the longitudinal direction and were then ready for transport to the filling site for bulk material.

A flexible container according to the invention can be connected to a filling apparatus and bulk material can be filled directly into it without prior inflation. For some types of bulk material inflation of the container at the filling site can be practical for other reasons than adjustment of the liner to the outer container. Containers according to the invention can also be obtained in several other ways than the above one, and some of these will be described in the following text.

The invention is as defined in the following claims.

The invention will be further explained in connection with the description of the figures and an example.

Figure 1 shows a cross-section of the folding apparatus with the container in inflated form.

Figure 2 shows the folding apparatus with the inflated container viewed from the side.

Figure 3 shows a cross-section of the liner and outer container partly folded together in a folding apparatus.

Figure 4 shows a cross-section of the folding apparatus with the container completely pressed together.

In figure 1 is shown a folding apparatus (8) in form of a squarish box or tunnel being open in both ends. The cross-section of the apparatus (8) can of course deviate from the squarish form. It can for instance be rectangular or its walls (7), roof (4) and bottom (5) can be slightly curved.

The apparatus (8) can be folded together as its side walls consist of at least two longitudinal parts (7) which are connected to each other and the roof (4) and the bottom (5) by means of pliable joining means (6) which can be hinges, flexible tapes or the like.

A product according to the invention can be made by first placing a liner (2) in a completed outer container (1) which can be equipped with lifting grip (3). Both the liner and the container are then placed in the apparatus (8) and air is blown into the liner (2) and pressing it against the outer container (1) such that it touches the walls (7), roof (4) and bottom (5) of the apparatus (8). In order to show that one has two containers, the liner or inner container (2) is shown on the figure at a certain distance from the outer container (1), while in practice the two containers will lie closely against each other when they are inflated.

In figure 2 there is a side view of the apparatus (8), and one will notice parts of the containers outside the apparatus (8) such that one can get hold of the lifting grip (3).

In figure 3 the apparatus (8) is partly pressed together as the roof (4) is pressed against the bottom (5), and the joining means (6) of the side walls (7) are pressed against the centre of the apparatus (8). During this pressing operation both containers (1 and 2) are exposed to a certain air pressure at the same time as air can get out corresponding to lowering the roof (4) against the bottom (5). Hereby one obtains that both containers are folded in the same way and that the liner (2) all the time and all over is pressed against the outer container (1).

In figure 4 the apparatus (8) is shown after having been pressed completely together, and both containers are folded in the same way. In order to clearly visualize how the containers are folded, the roof (4) and the bottom (5) of the apparatus (8) are drawn in an artificially large distance from each other. The folds of the liner (2) lie in the corresponding folds of the outer container (1). As can be seen from figures 3 and 4 the width of the gussets will be about  $1/4$  of the flat laid width of the container, i.e. about  $1/8$  of the container's circumference. By applying such deep gussets one obtains both that the liner is kept securely in place in correct position in the outer container and that corresponding points in the two containers lie across each other such as they shall when the containers are inflated or filled with bulk material. The containers can now be drawn out of the apparatus (8) in folded form by using the lifting grip (3). The containers can then be folded together one or several times and will then be ready for transport to the filling site for bulk material.

The product according to the invention can also be made in other ways than the one described above. The essential feature of the manufacture is that the liner is placed in the outer container and that the folding is carried out such that both containers are folded in the same way such that the liner everywhere lies against the outer container. This can for instance be obtained by inflating the containers or pressing them out crosswise before both containers are folded. One can for instance first place the liner in on the outer side of a rack or the like having the same form as the cross-section of the apparatus (8) shown in figure 3. Thereupon the outer container can be placed over the liner and the apparatus pressed together till one gets a folded two-gusset flexible container. In order to use this method the containers must be open in one end. During manufacture from material for double-gusset flexible containers, one will

principally carry out the method in a similar way by round-weaving the outer container around the continuous hose of the liner and then place the two base materials in on a folding apparatus such that the base material for the liner and the outer container are folded lengthwise in the same way and that the base material for the liner is kept in place as its folds or gussets lie in the corresponding folds or gussets in the outer container's base material. Base materials manufactured in this way can then be cut up in suitable pieces and joined together in at least one of their open ends by forming bottom and lifting loops.

The present invention has given a product into which bulk material can be filled without prior inflation at the filling site and without damaging the liner. This leads then to less rejection of containers and totally faster filling of the containers. One also avoids that the liner forms pockets which can not be utilized. Already from the moment the liner and the outer container are folded and until they are filled with bulk material they will be in such relative position which they shall have when filled.

The inventors also arrived at a method for manufacturing the product, an apparatus which both by itself is rational and which in addition simplified the whole process from manufacture of the flexible container till it is filled with bulk material and is ready for further transport to storage or application.

Claims

1. Flattened container ready for filling with bulk material, comprising a liner of impervious sheet in an outer container of strong load-carrying material, characterized in that the liner and the outer container are folded lengthwise in the same way such that the liner is kept in position by having its folds or gussets everywhere placed in the corresponding folds or gussets of the outer container.
2. Flexible container according to claim 1, characterized in that both the liner and the outer container have a longitudinal gusset on each side.
3. Flexible container according to claims 1 and 2, characterized in that each of the lengthwise gussets for both inner and outer container have a width of up to 1/8 of the container's circumference.
4. Method for manufacture of flattened flexible containers according to claims 1-3, characterized in that the liner or continuous material for this is placed in an outer container or continuous material for this and inflated or stretched out cross-sectionally, whereby both the liner and the outer container or their base material are folded for making longitudinal gussets and that the liner's gusset everywhere is placed in the outer container's gussets.

5. Method according to claim 4,  
c h a r a c t e r i z e d i n t h a t  
both the liner and the outer container are positioned  
in a collapsible box or tunnel and where the side  
walls are divided in the middle and hinged together,  
and that the liner and the container then are in-  
flated, whereupon the box is pressed together and  
the centre line of its side walls pressed against the  
centre line of the box and that the thereby formed  
container is pulled out of the box.
  
6. Means for manufacturing containers according to  
claims 1-3,  
c h a r a c t e r i z e d i n t h a t  
said means consist of a joining apparatus 8 in  
form of a box or tunnel which is open in both ends  
and can be folded together as its side walls consist  
of at least two longitudinal parts (7) which are con-  
nected to each other and the roof (4) and bottom (5)  
of the apparatus (8) by means of pliable connecting  
means (6).

1/3

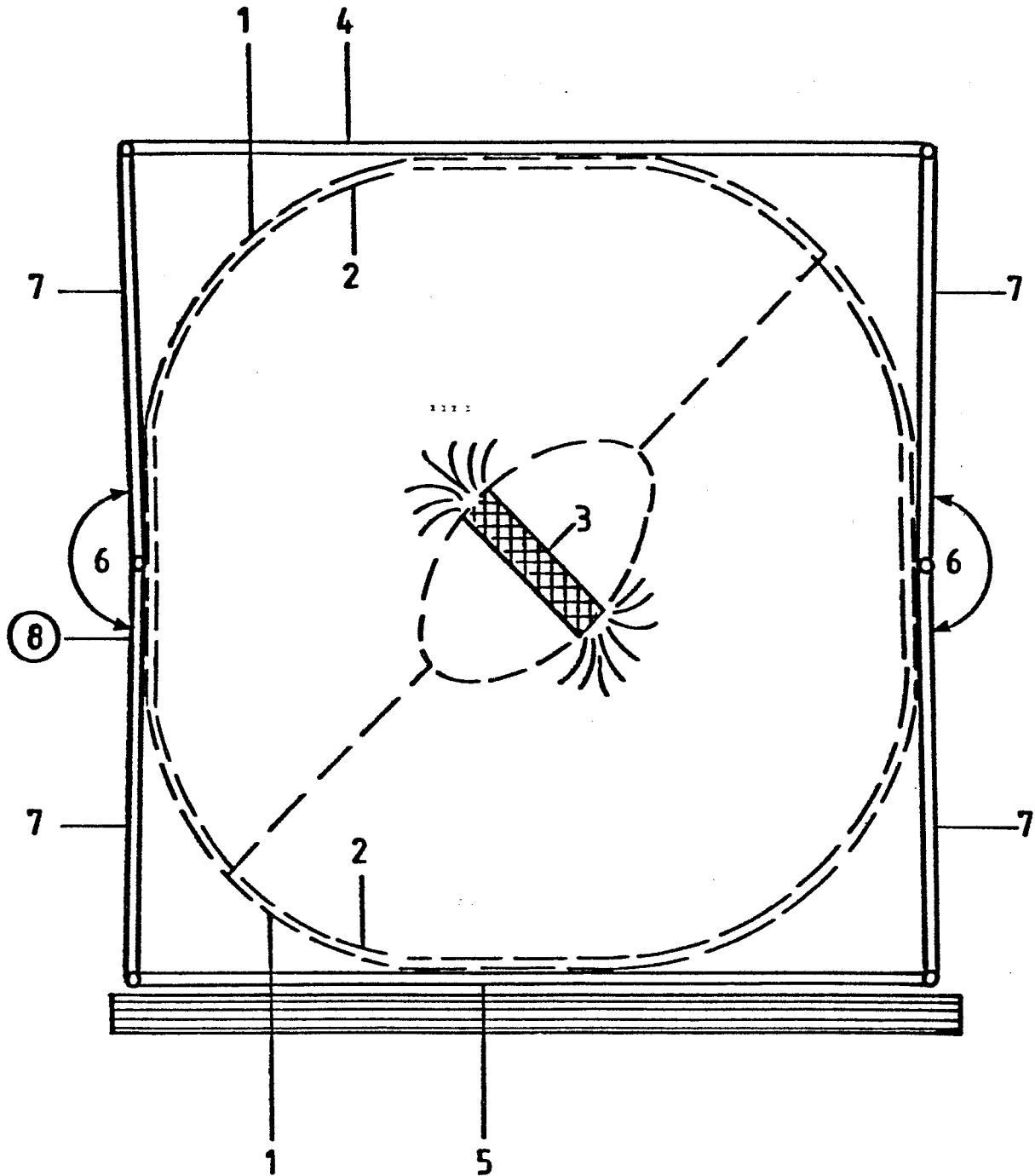


FIG. 1

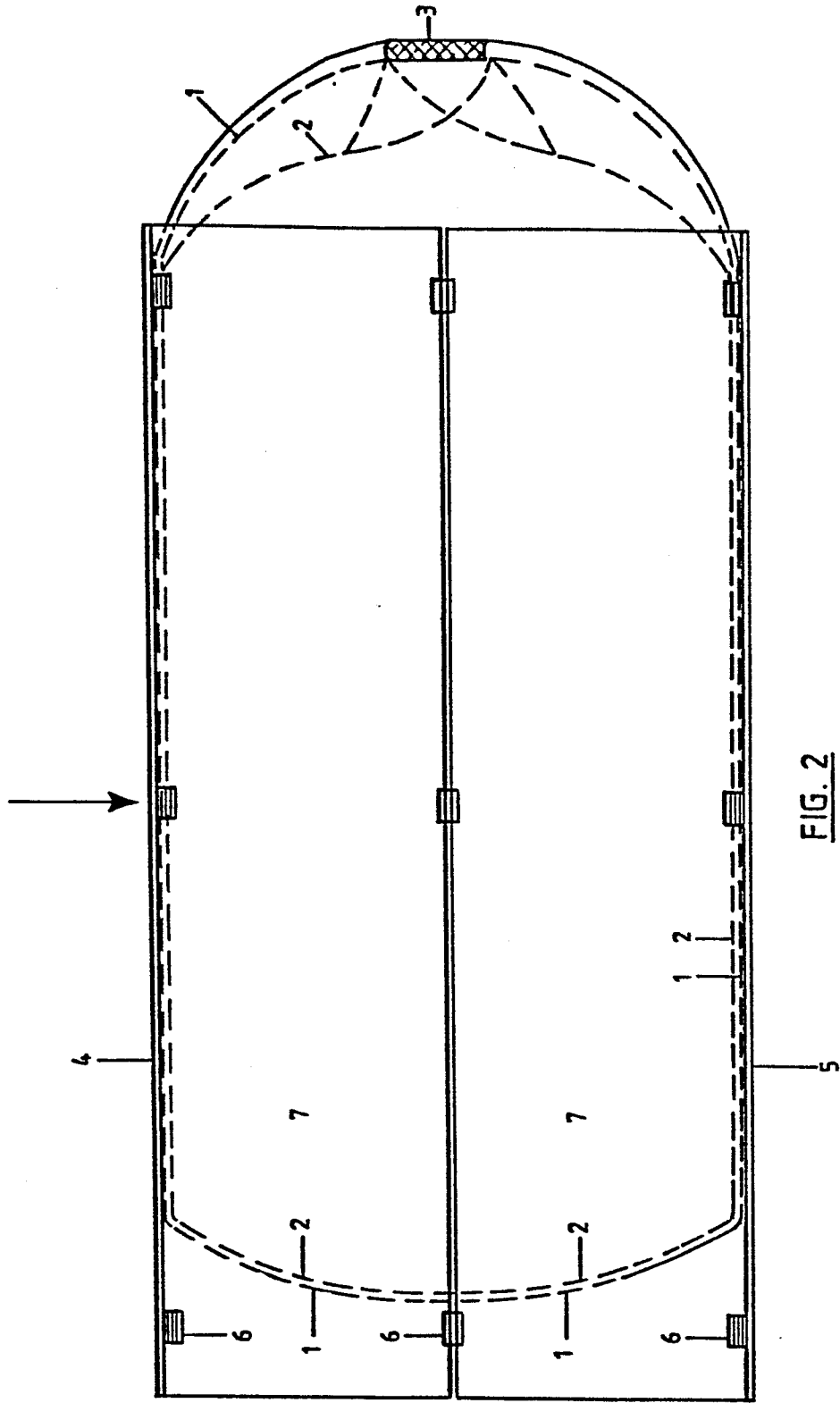


FIG. 2

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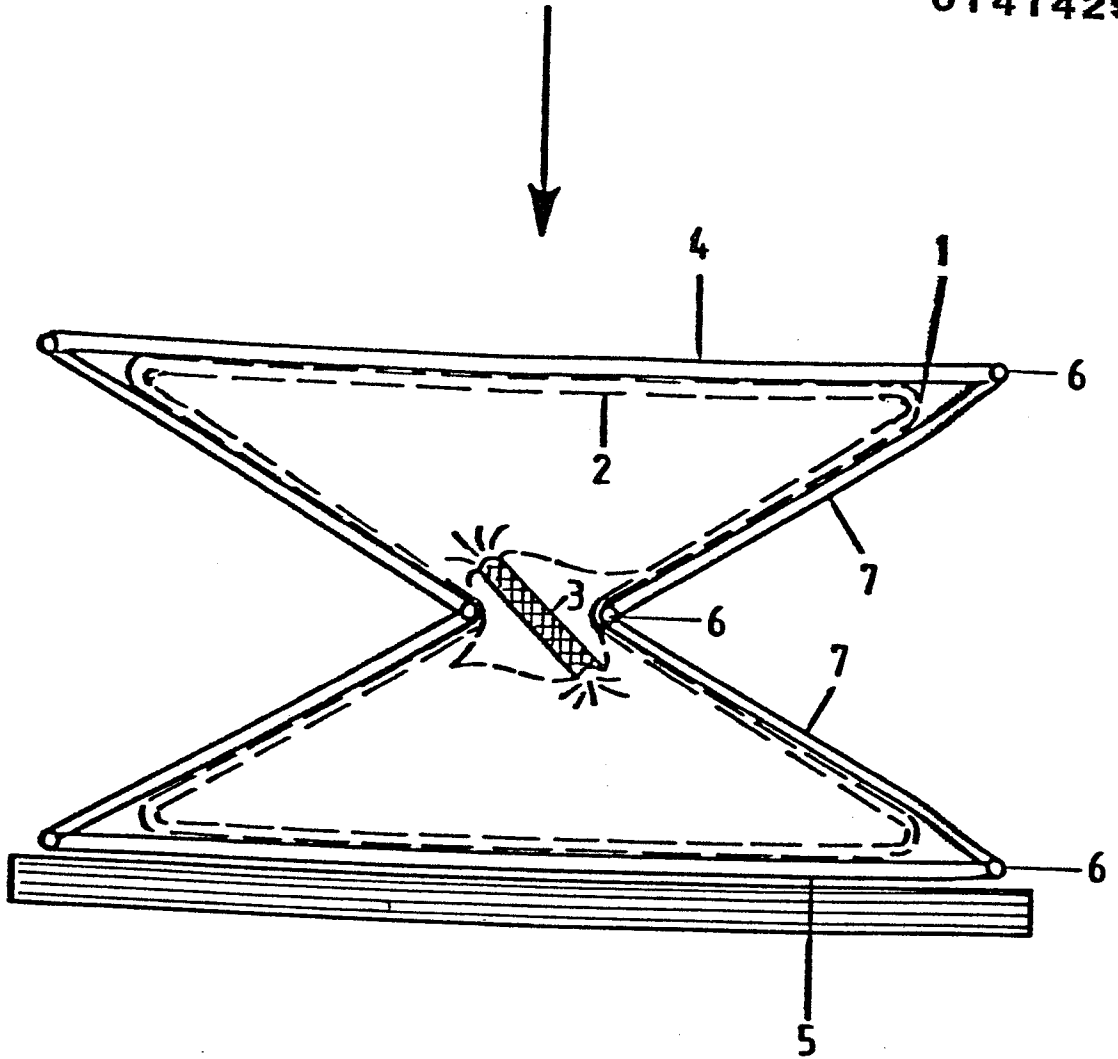


FIG. 3

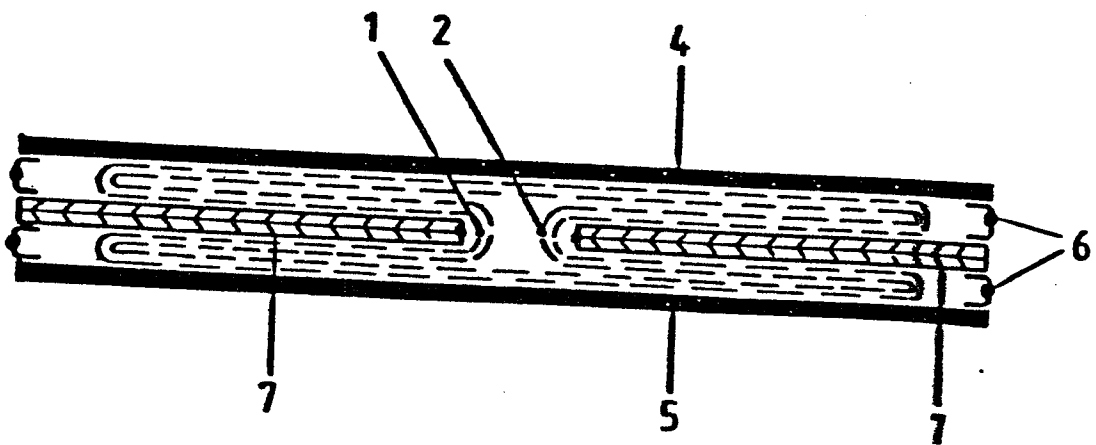


FIG. 4