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(54) An air cushioned packing device and packing method.

(57) The invention provides a packing device and packing method for packing breakable and damageable articles and plate glass in particular. The packing device of the present invention comprises at least one inflatable air cushion and a supporting structure. The packing method of the present invention is a method of using a supporting structure and at least one air cushion to pack articles and air is inflated into the air cushion to increase the air cushion's function of shock and viberation reduction. The scope of the operation air pressure within the air cushion is 0.5-0.25kg/cm (gauge pressure).

The device according to the present invention has a lot of advantages, such as higher strength, lighter weight, more convenient application, easier reclaim, higher coefficient of repetitive application and more favourable shock absorbing effect, so as to compensate the present loss.

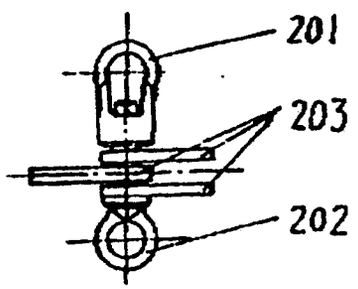

FIG. 3

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An Air Cushioned Packing Device and Packing Method

Field of the invention

The present invention relates to a device applicable to pack breakable and damageable articles, especially applicable to protect plate glass.

Backgrourd of the Invention

At present, the rate of spoilage of breakable and damageable articles, especially plate glass in the process of transportation is very high. The present conventional container for packing plate glass is made of wood and iron. The wooden container costs highly, with heavy weight, poorer strength and inconvenient packing process. Various measures should be taken for fixing and stuffing within the container, otherwise, the rate of spoilage will be very high. Moreover, it can be used but once, and its economic benefit is bad. Although stronger in strength, the iron container is heavier in weight, more expensive in cost , and inconvenient in application. Therefore, the iron containers are not welcome by the customers . There is another prior art for packing breakable and damageable articles (shown in Fig.1). In the prior art springs are used for the packed articles to be hung within the frame container so as to reduce spoilage due to shock. However, the operation of this packing method is complicated, expensive and with high rate of spoilage, therefore it is not satisfactory.

In order to overcome such drawbacks as higher rate of spoilage, higher cost, waste of wood and complicated packing process etc. in transporting breakable and damageable articles, especially plate glass, the present invention provides a new packing device and packing method thereby. The device according to the present invention has a lot of advantages, such as higher strength, lighter weight, more convenient application, easier reclaim, higher coefficient of repetitive application and more favourable shock absorbing effect, so as to compensate the present loss.

Summary of the Invention

The invention provides a packing device and packing method for packing breakable and damageable articles and plate glass in particular. The packing device of the present invention comprises at least one inflatable air cushion and a supporting structure. The packing method of the present invention is a method of using a supporting structure and at least one air cushion to pack articles and air is inflated into the air cushion to increase the air cushion's function of shock and vibration reduction. The scope of the operation air pressure within the air cushion is 0.5-0.25kg/cm^2-(gauge pressure).

At present, the overall rate of spoilage of plate glass in the process of storage and transportation is over 8% , and even as higher as 30% to 50% in some regions. By using the packing device and packing method of the present invention, the overall rate of spoilage of the plate glass can be reduced to less than 1%.

Brief Description of the Drawings

Fig. 1 is a diagrammatic sketch for the packing device of the prior art;

Fig. 2 is a structure diagram of the frame rod of the supporting structure of the present invention;

Fig. 3 is a diagrammatic sketch of the hinge joint mechanism of a flexible fixing device;

Fig. 4 is a diagrammatic sketch of a frame element comprising an air cushion and a supporting structure of the present invention;

Fig. 5 is a sectional view taken on the line I-I in Fig. 4;

Fig. 6 is a assembly diagram of the first embodiment of the present invention;

Fig. 7 is a assembly diagram of the second embodiment of the present invention;

Fig. 8 is a diagrammatic sketch of the third embodiment of the present invention;

Fig. 9 is a diagrammatic sketch of the fourth embodiment of the present invention;

Fig. 10 is a diagrammatic sketch of the fifth embodiment of the present invention.

Detailed Description of the Invention

The present invention provides a packing device for packing breakable and damageable articles particularly plate glass. The packing device comprises at least one inflatable air cushion and a supporting structure. The air cushion is a closed hollow body of various shapes. The commonly-used is, for example, a band. The design for the outline shape of the air cushion can be conducted in accordance with the structune shape and size of the packed articles. The structure of the air cushion can be a single-layer structure, being manufactured with materials having given strength, ductility, elasticity and artificial high polymer,for example, plas-

tics or rubber, used to store air and maintain air pressure in need. In order to protect the air-inflation layer of the air cushion, to prevent the air-inflation layer of the air cushion from touching and wearing out with the packed articles or the supporting structure, and to increase the rate of repeated application, protecting layers can be added to wrap up the air-inflation layer of the air cushion to form a double-layer structure or multiple-layer structure for the air cushion. The protecting layers of the air cushion can be made of the above said materials for making air cushion, also of other materials, such as wood, paper, synthetic material and fibers. The supporting structure can be made of various materials, such as steel and iron or synthetic materials. The geometric shape of the supporting structure can be designed according to the geometric shape of the articles to be packed. The supporting structure of the packing device used to pack plate glass usually adopts container structure or frame structure. The frame structure is assembled by frame rods with conventional method e.g. hinge. The frame rods have various types, for example, L-type, U-type or straight type. The function of container structure and frame structure is basically the same. Their main difference lies in that the surroundings of the container supporting structure are closed.

According to the present invention, the supporting structure and the air cushion can be made into one body, or seperated as well. The supporting structure can be fitted with the air cushion in various ways. For example, the supporting structure has channel-type part or flat-type part to fit with the air cushion. The cross-section of the channel-type part can be various forms such as bow form, flat form etc. On the air cushion, a device for air-inflation e.g. pneumatic valve can be added. Accordingly on the supporting structure to be fitted with air cushion, holes can be provided for pneumatic valves to pass through. For the packing device having frames supporting structure, fixing devices can be used to ensure the correspondant position of the packed articles and the packing devices. The fixing devices can be rigid or flexible.

According to the present invention, the packing method for packing breakable and damageable articles comprises using the packing device of the present invention, which comprises at least one inflatable air cushion and a supporting structure, to pack articles to be packed (such as plate glass), and fill the air cushion with air. Thus, it is possible for the inflated air cushion to increase its function of shock and viberation reduction, as well as clamping. The scope of the operation air pressure within the air cushion is 0.5-2.5kg/cm^2(gauge pressure).

Reference will now be made to Fig. 2 to Fig. 5. First, steel, synthetic material being in conformity with the requirements for making frame rods of the supporting structure should be chosen and be processed by rolling, pressing or other processes according to the required specification and size . The cross sections of the frame rods are formed into bow - type (308) or flat - type (309). Then the rods are bent into L-type frame rods (206, 207), then hinged plates (203) being easy to fix and convenient to operate and having through holes (204) thereon are welded according to the requirement, at the corner and along both external extremities (205, 305) of L-type frame rods (207). The hinged plates at the corner may be in pairs. A through hole is provided on the top between both hinged plates at the corner. The through hole acts as a leading hole of the pneumatic valve (304). The hinged plate at one extremity of a L-type frame rod is singular, while the hinged plate at the other extremity is in pairs. After both extremities of the L-type frame rod are matched with each other, the hinged plates will be triple. A double-layer structure air cushion is formed by an inner layer (307) and a protecting layer (306) . The inner and protecting layers are formed by extruding and processed into band (of which both extremities are sealed) with required specification and length according to the requirements of design and demand. The inner layer should be well fitted with a pneumatic valve, then the double-layer structure (302) having been fitted with inner and protecting bands is matched with L-type frame rods (301) . The said matching form (as shown in Fig. 5 and Fig. 6) is similar to that of wheel tyre and wheel rim. The extremity (303) of the double-layer structure air cushion (302) is embeded in the extremity (305) of L-type frame rods (301). Thus a frame element (Fig. 4) is formed after fitting well.

Fig. 6 illustrates the first embodiment of the present invention on application of the packing device of the present invention , the matching fashion of a certain frame element and the fixing device of certain style to be adopted should be selected according to the geometry, material, weight and size etc. of the packed articles, Fixing devices may be classified into such devices as rigid fixing device, flexible fixing device and box-type fixing device etc. The functions of fixing devices lie mainly in increasing strength, decreasing deformation and facilitating transportation. For example: the first embodiment shows the assembly of the packing device of a frame rod supporting structure according to the present invention, having a four-frame-element rigid fixing device (Fig. 6). First, three fixing key bolts (6) are inserted into key holes (204) of hinged plates (2) at the three corners of each of the four frame elements (two folding points and one extremity); while the extremites

(305) of the frame rods into which the key bolt still has not been inserted are opened, plate glass (5) is put into the device, then L-type frame rods are buckled on, furthermore, a fixing key bolt (6) is inserted into the key holes of the hinged plates on the extremities of the frame rods. Subsequently, two end protectors (7) provided with protector reenforcements (8) and made of steel and synthetic material according to requirement slip over the bolts on both extremities of the fixing key blots through the through holes (9) , then the nuts are screwed on tightly. At last, air is filled in the air cushion (3) through the pneumatic valve (4) of each frame element. The scope of the operation air pressure within the air cushion is 0.5-2.5kg/cm^2-(gauge pressure).

Fig. 7 shows the second embodiment of the present invention which illustrates the assembly of the packing device of a frame rod supporting structure of the present invention having a three - frame - element flexible fixing device . First, three pairs of hooked bolts and keys (18) as well as eye bolts and keys (202) , and eye nuts (201) are put into the key holes (204) of the hinged plates (2) at three corners (two folding points and one extremity) of each of the three frame elements and are linked with steel chains (10). The extremities (305) of the frame rods not being keyed in are opened and plate glass (5) is put into the device, then the frame rods are buckled on. Moreover, one pair of hooked bolt and key (16) as well as eye bolt and key (202, 12), eye nut (201,11) are put into the key hole of each hinged plate well buckled at the extremities of the frame rods and they are linked with steel chains. Subsequently, two end protectors (7) provided with protector reenforcements (8) made of steel and synthtic material according to the requirement are slipped over the bolts of hooked bolts and keys (16) through the through holes (9), then the nuts are screwed on tightly. At last, air is pressed into the air cushion (3) through the pneumatic valve (4) of each frame element. The scope of the operation air pressure within the air cushion is 0.5-2.5kg/cm^2(gauge pressure).

Fig. 8 is the third embodiment of the present invention. It describes another assembly form of the packing device in the frame-type supporting structure of a four-frame-element rigid fixing device. The difference between this embodiment and the first embodiment lies in that each frame-element (801) includes an air cushion (806), a U-type frame rod (801b) and a flat frame rod (801a). After the flate frame rod (801a) is opened, the packed articles can be inserted into the packing device. The fixing device is composed of a base plate (828), a cover plate (818) having locking mechanism (828) and a fixing rod (810) as well.

Fig. 9 is the fourth embodiment of the present invention. It describes the packing device of the single-frame-element supporting structure. In this embodiment, the supporting structure is a singular frame (901) ; with the air-cushion being composed of inner band (906) and protecting layer (907) . The packing device packs on the side peripheral faces of the packed articles. This packing method is comparatively suitable to small or medium-sized articles to be packed.

Fig. 10 is the fifth embodiment of the present invention. It describes a packing device of the container supporting structure. In this embodiment, the air cushion (106) is inserted in the channel-type part (103) of the container wall (101) of the supporting structure for the purpose of supporting and clamping the packed articles on the larger surface of the same packed articles. A rubber layer can be provided on the base of the container instead of an air cushion. This packing method is particularly suitable to pack large or medium-sized articles to be packed.

Claims

1. A device for packing breakable and damageable articles comprising at least one inflatable air cushion and a supporting structure.

2. A device according to Claim 1, wherein the said air cushion is made of plastics or rubber.

3. A device according to Claim 2, wherein the said air cushion is of band shape.

4. A device according to Claim 2, wherein the said air cushion is a single-layer structure or a double-layer structure having a protecting layer..

5. A device according to Claim 4, wherein the protecting layer is made of plastics, rubber, wood, paper, synthetic material or fibers.

6. A device according to Claim 2, wherein the said air cushion has a valve to maintain operation air pressure.

7. A device according to Claim 1, wherein the said air cushion is combined with the supporting structure.

8. A device according to Claim 1, wherein the said supporting structure has channel - type part matched with the said air cushion.

9. A device according to Claim 8, wherein the cross -section of the channel -type part is a bow-shape or flat -shape.

10. A device according to Claim 8, wherein the said supporting structure is a closed container structure.

11. A device according to Claim 8, wherein the supporting structure is a frame structure.

12. A device according to Claim 11, wherein the frame structure is made of L - type, U - type or straight - type rods.

13. A device according to Claim 12, wherein the said rods are hinged to each other.

14. A method for packing breakable and damageable articles, comprising :

(a) using at least one air inflatable air cushion and one supporting structure to pack articles;

(b) filling the air cushion with air.

15. A method according to Claim 14, wherein the scope of the operation air pressure within the air cushion is 0.5 -2.5 kg/cm^2(gauge pressure).

FIG. 1(c)

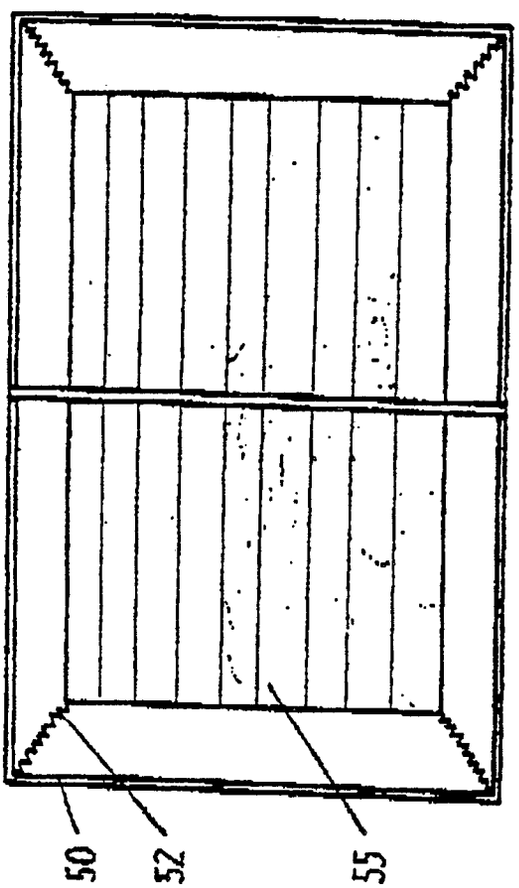

FIG. 1(a)

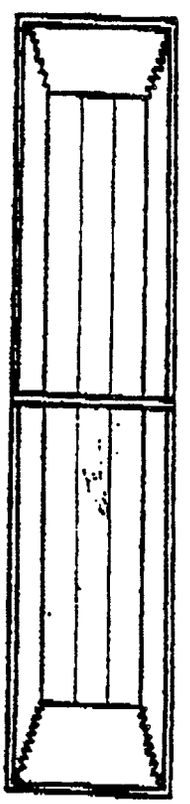

FIG. 1(b)

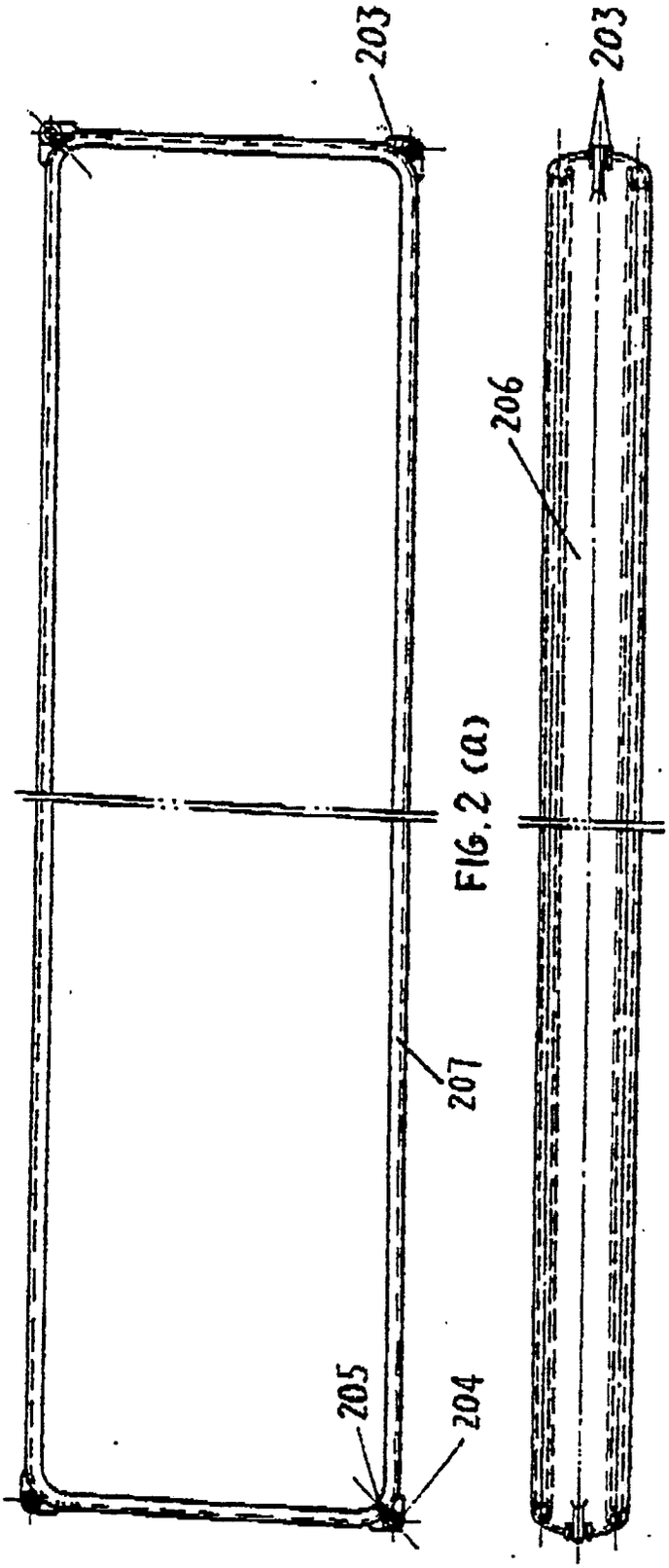

FIG. 2 (a)

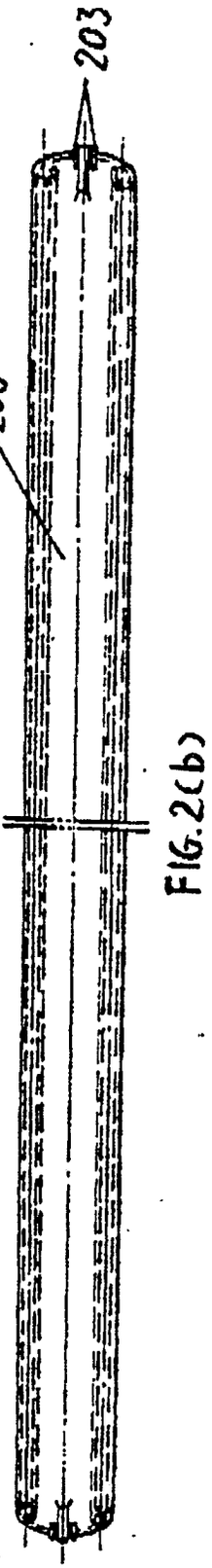

FIG. 2(b)

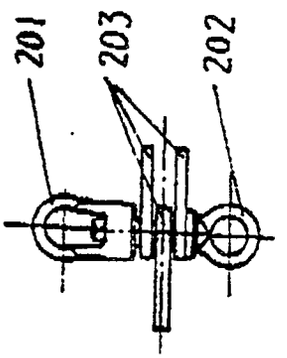

FIG. 3

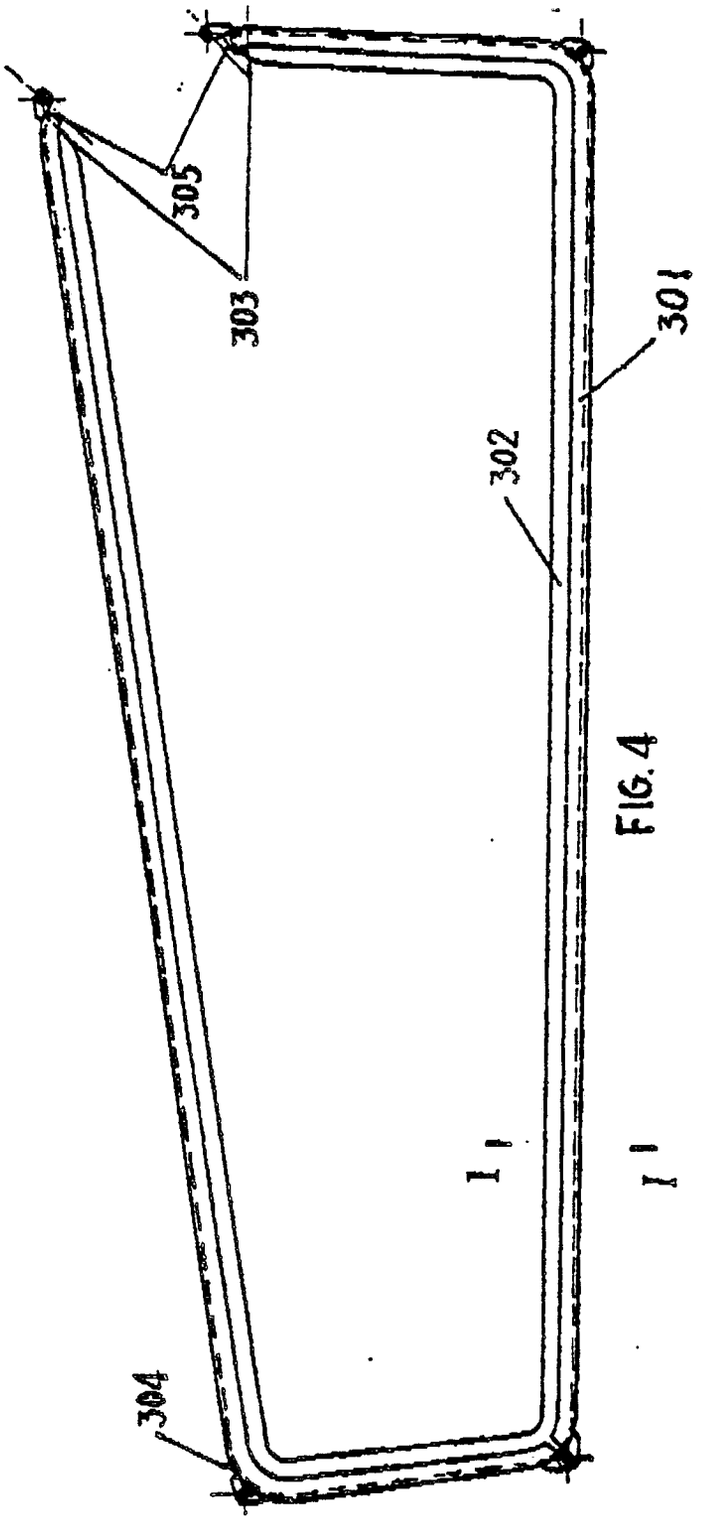

FIG. 4

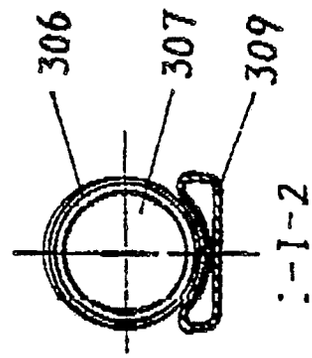

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FIG. 5 (b)

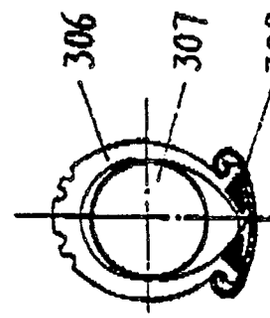

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FIG. 5 (a)

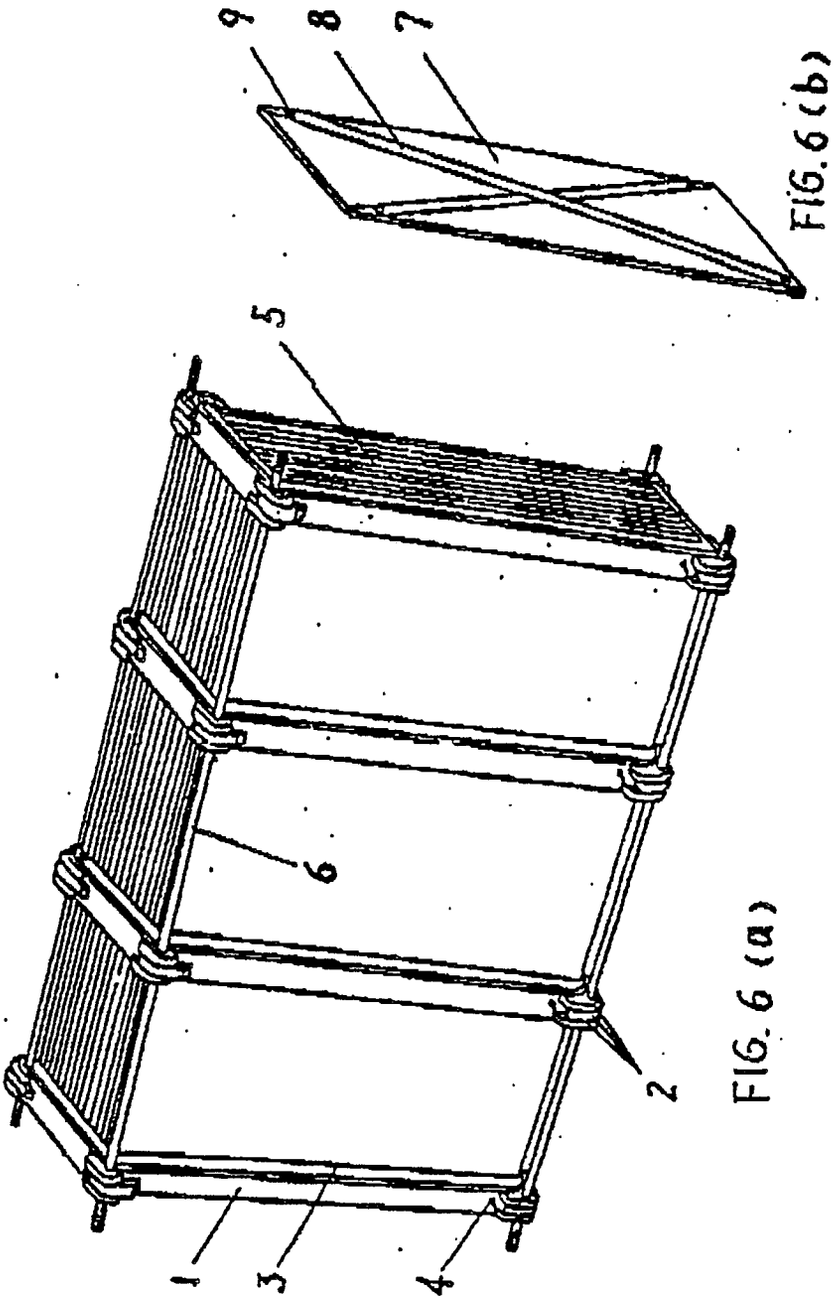

FIG. 6 (b)

FIG. 6 (a)

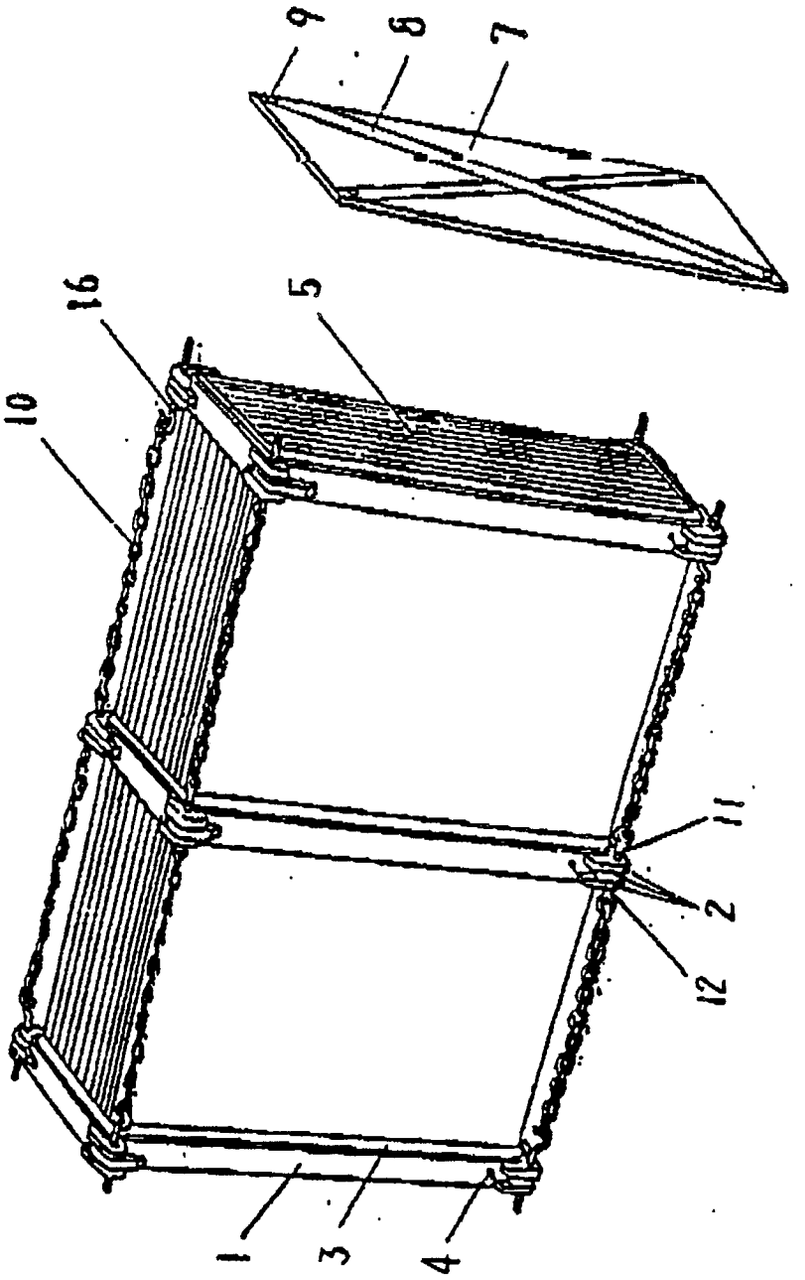

FIG. 7 (b)

FIG. 7 (a)

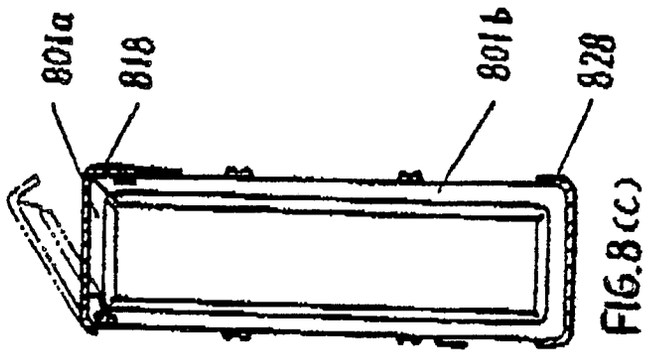

FIG.8(c)

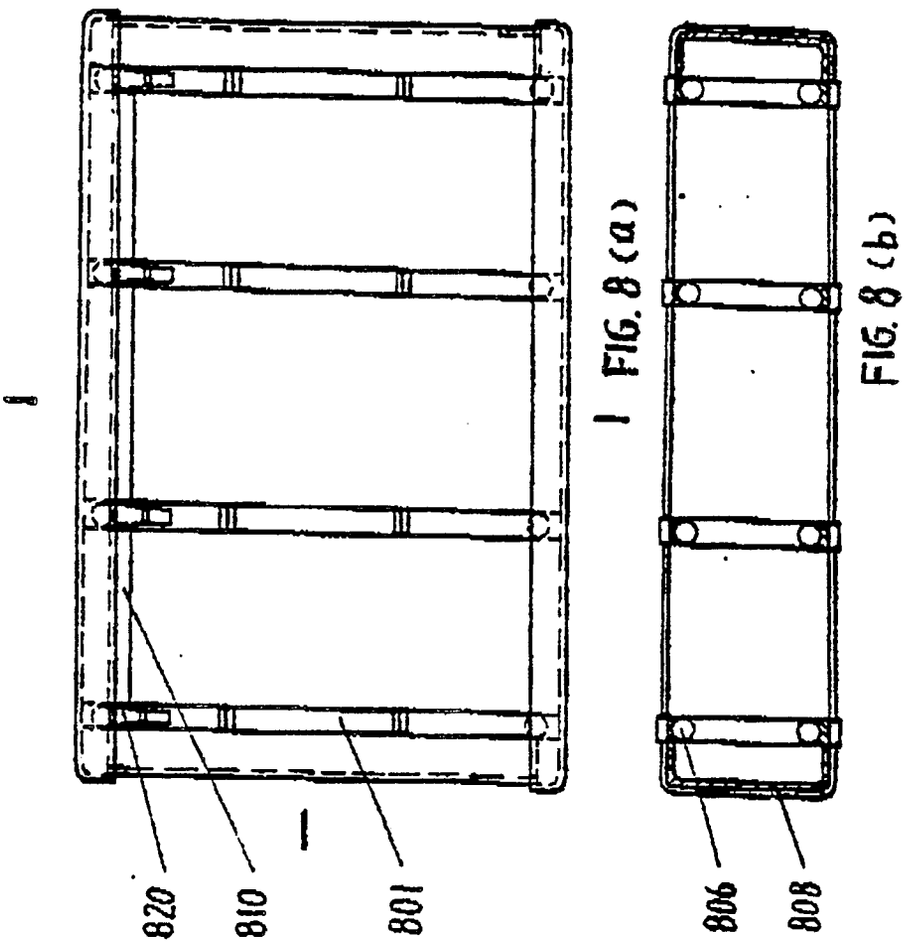

FIG. 8 (a)

FIG. 8 (b)

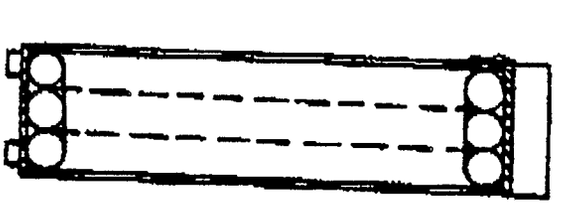

FIG. 9 (c)

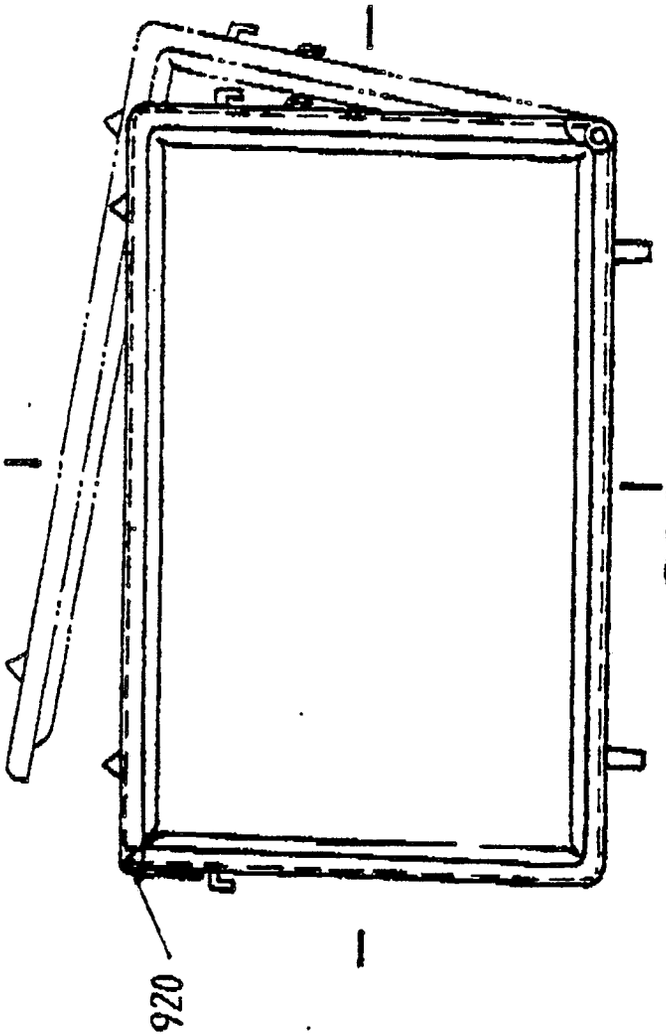

FIG. 9 (a)

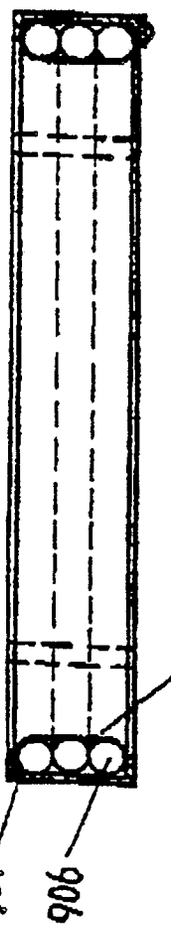

FIG. 9 (b)

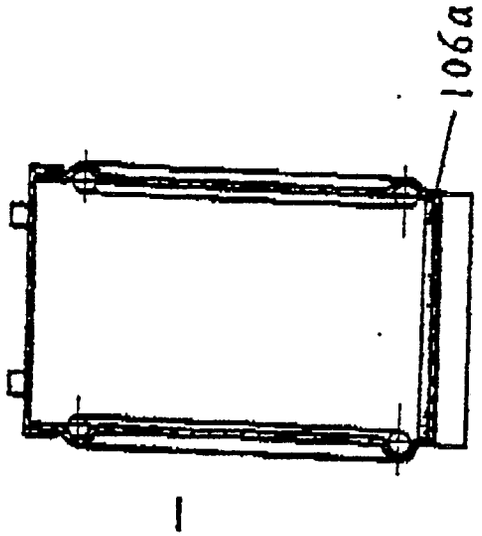

FIG. 10 (c)

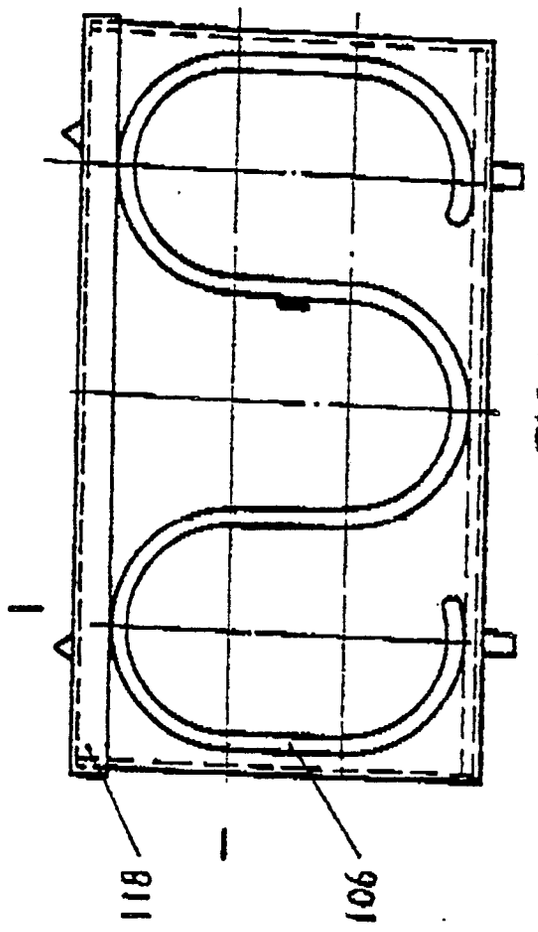

FIG. 10 (a)

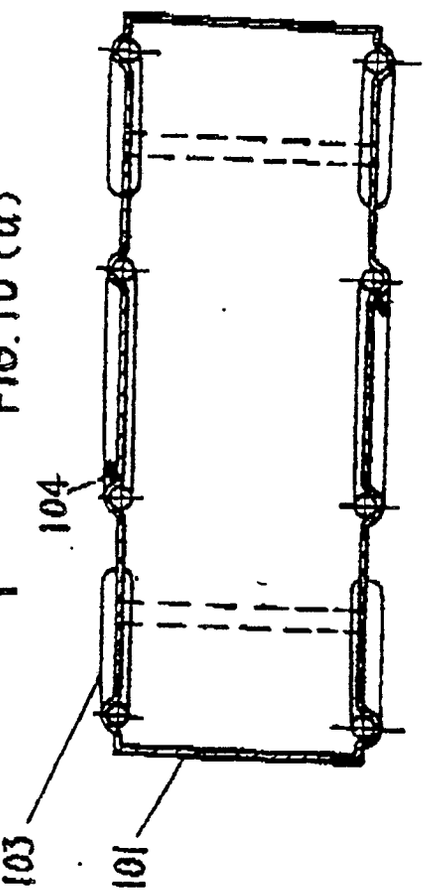

FIG. 10 (b)