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### (54) Refrigerating apparatus with plate evaporator

(57) Refrigerator or freezer apparatus with a plate evaporator (12) fastened to the wall of the storage room (10) by means of bushes (17). These bushes are appropriately shaped and allow for insertion in corresponding seats (16) in the wall of the storage room.

The evaporator (12) is attached by hooking it up to said bushes (17) through appropriately provided holes and is fastened thereto by a simple rotation of the same bushes.

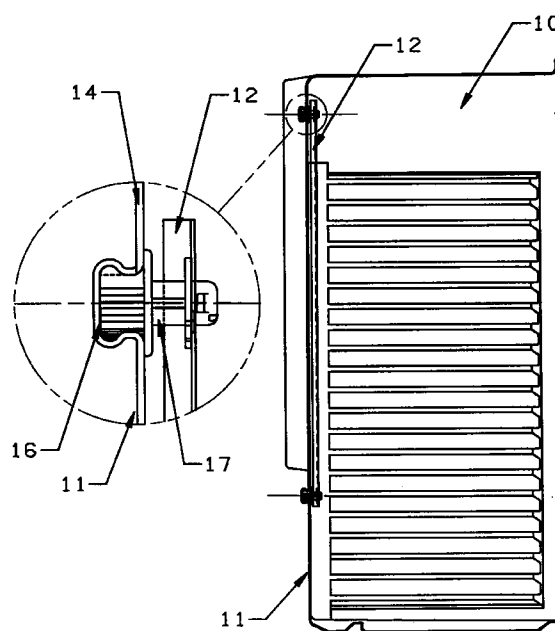


FIG. 1

**EP 0 890 805 A2**

## Description

The present invention refers to a refrigeration apparatus, such as a refrigerator or freezer apparatus, comprising at least a storage compartment cooled by at least a plate evaporator, for instance an evaporator of the so-called Roll-Bond type.

In refrigeration apparatuses of the above cited kind the plate evaporator, which may be either substantially flat or shaped to any suitable form, is generally known to be preferably attached inside the respective storage compartment by means of anchoring bushes that are inserted in corresponding recesses punched out of or drilled in the wall of said storage compartment. Said bushes usually have their rear end portion so shaped as to be adapted to engage the respective recess in a bayonet-like connection manner; their front end portion is on the contrary provided with elastic teeth for snap-fitting or similar connection mode.

The plate evaporator is provided with a plurality of through-holes allowing for insertion of said front end portions of the respective attachment bushes, which therefore secure the evaporator in position by means of said snap-fitting teeth.

Such a system for anchoring the evaporator in its position is advantageously simple and quick to be completed. However, it turns out to be undesirably unreliable, since the elasticity of the teeth of the bushes can actually allow for the evaporator plate to accidentally come loose from the bushes themselves.

Furthermore, such a system is confronted with considerable difficulties whenever the need rises for a bush to be replaced after having broken off or down, since the same bush turns in fact out to be partially embedded in the layer of foamed plastic that thermally insulates the wall to which the same evaporator is attached. Therefore, the repair work is usually carried out rather empirically.

A further drawback arises from such a system making it quite difficult to remove the evaporator plate in order to allow for the wall of the storage compartment and the rear surface of the same evaporator plate to be conveniently cleaned.

It therefore is a main purpose of the present invention to provide a refrigeration apparatus with at least a plate evaporator, in which the same evaporator can be secured to and removed from the wall of the storage compartment through the use of simple, low-cost anchoring means, in a manner that is not only convenient and quick, but also reliable, i.e. substantially free from risks of breaking off or coming loose accidentally.

Of further significance, to the purpose of the present invention, is of course also the fact that any piercing or drilling of the insulating wall of the storage compartment of the refrigeration apparatus is practically avoided, thereby doing away with all related problems and drawbacks.

According to the present invention, these aims are

reached in a refrigeration apparatus with plate evaporator embodying the features as recited in the appended claims.

Anyway, the features and advantages of the invention will be more readily understood from the description that is given below by way of non-limiting example with reference to the accompanying drawing, in which:

- Figure 1 is a schematical, cross-sectional view of the storage compartment of a refrigeration apparatus embodying the item covered by the present invention, which is a properly evidenced in an enlarged detail;
- Figures 2A and 2B are a side cross-sectional view and a front view, respectively, of the detail of the refrigeration apparatus evidenced in Figure 1, in a first phase of the assembly thereof;
- Figures 3A and 3B are views of the same detail shown in Figures 2A and 2B, however in a second phase of the assembly thereof.

With reference to Figure 1, the refrigeration apparatus can be noticed to include a storage compartment 10, on the inner surface of the rear wall 11 of which there is attached a plate evaporator 12, in particular an evaporator of the so-called Roll-Bond type.

When reference is made also to Figures 2A-2B and 3A-3B, the wall 11 can be noticed to be formed by a layer of thermally insulating material 13 enclosed between two confinement shells 14, 15. In particular, the shell 14 constituting the inner surface of the wall 11 is provided with a plurality of recesses 16, which are appropriately shaped and positioned so as to be able to act as accommodation seats for the shaped bushes 17. Said bushes are in turn preferably made of plastic material.

According to the present invention, each one of said bushes 17 has a body in which there are substantially distinguishable three main portions that are axially divided from each other by annular flanges. The rear portion 18, which is adapted for insertion in the respective accommodation seat 16 of the wall 11, is provided with two diametrically opposed bulges 19. The intermediate portion 20, which is delimited by a rear flange 21 and a front flange 22, is substantially cylindrical. The front portion or head 23 is shaped so as to be provided with a gripping rib 24 in such a manner as to enable the bush 17 to be rotated by hand, or with the use of a proper tool, as this will be described in greater detail further on.

According to a further feature of the present invention, on the rear surface of the rear flange 21 there is provided a projection 25 adapted to co-operate with at least a recess 26 that is provided in the surface 14 of the wall 11 close to the accommodation seat 16 for the bush 17. The insertion of such a projection 25 in the recess

26 precisely defines the rotation angle of the bush 17.

As it can be noticed from the sequence of the Figures, the assembly of the evaporator 12 on to the wall 11 of the storage compartment 12 includes a first phase (Figures 2A-2B) in which the bushes 17 are inserted in their respective accommodation seats 16 and secured therein. This is accomplished by bringing the rear portion 18 of each bush into alignment with the corresponding contour of the respective accommodation seat; in other words, this means that the bush shall be so oriented in a first position as to enable it to be inserted in the accommodation seat (arrow 1 in Figure 2A); it then must be brought into a second position in which it is so rotated as to enable the rear portion 18 of the bush to be secured in a bayonet-like connection manner in the same accommodation seat. In a preferred manner, a rotation by an angle of 45° is used (arrow 2 in Figure 2A). The correctness of the so established joint is practically confirmed by the projection 25 of the rear flange 21 coupling into the corresponding recess 26, thanks to the plasticity of the material of which the bush is made.

After the bushes 17 have been fastened in their respective accommodation seats in the above described manner, the plate evaporator 12 can be attached to the same bushes (Figures 3A-3B). To this purpose, appropriate perforations provided in the evaporator plate are used in such a manner as to cause the front end portions of the bushes to get inserted in said perforations (arrow 1 in Figure 3A). Finally, in order to secure the evaporator 12 on to the wall 11, the bushes 17 are rotated again, for instance by a further angle of 45° (arrow 2 in Figure 3B), in such a manner that the edges of the perforations are tightened on the evaporator plate between the front flange 22 and the rib 24 of each bush 17.

Therefore, the arrangement according to the present invention for anchoring the evaporator on to the wall of the storage compartment emerges as being particularly simple, effective and reliable. In fact, a single element, ie. the bush 17 which is easily made as an injection-moulded plastic part, enables the evaporator plate to be secured in place through just a couple of successive rotations. Such an arrangement further offers the advantage of making it possible for the plate evaporator to be quickly and conveniently removed should any need arise to have it disassembled, eg. for cleaning the space between the rear wall of the storage compartment and the back surface of the evaporator plate.

It will be appreciated that the above described arrangement may undergo a number of modifications and variants without departing from the scope of the present invention as recited in the appended claims. For instance, the bush 17 may have a body conformation which is different from the afore described one, provided that the rear portion thereof shall in any case be such as to be capable of being firmly anchored in the accommodation seat provided in the wall of the storage compart-

ment, while the front portion thereof must enable the same bush to be rotated. Furthermore the evaporator shall be secured on to the wall of the storage room by means of two distinct rotations, although the relevant rotation angles may differ from the afore indicated ones.

## Claims

1. Refrigeration apparatus, such as a refrigerator or a deep-freezer, comprising at least a storage compartment (10) cooled by at least a plate evaporator (12), said evaporator being secured to a wall (11) of the storage compartment by means of a plurality of shaped bushes (17) made preferably of plastic material, the rear end portion (18) of each bush being anchored in a respective accommodation seat (16) provided in the wall of said storage compartment, while the front end portion (23) of the bush is snap-fitted into a respective perforation in the plate evaporator, characterized in that the front end portion (23) of each bush (17) is provided with a gripping rib (24) enabling the bush to be rotated about the longitudinal axis thereof, said bush being adapted to be brought into three positions with a different angle of rotation, ie. a first position to enable the bush to be inserted in its accommodation seat (16) provided in the wall (11), a second position for securing said bush in said accommodation seat thereof, and a third position to enable the bush to snap-fit into the perforation provided in the evaporator (12).
2. Refrigeration apparatus according to claim 1, characterized in that each bush (17) is provided with a rear portion (18) that has two diametrically opposed bulges adapted to be inserted in the respective accommodation seat (16) in the wall (11), a substantially cylindrical intermediate portion, and a front portion (23) provided with a gripping rib (24), said portions being divided from each other by two circular flanges (21, 22).
3. Refrigeration apparatus according to claim 2, characterized in that on the rear surface of the rear flange (21) there is provided a projection (25) that is adapted to co-operate with at least a recess (26) provided in the wall of the storage compartment to in this way define at least said second position in which said bush is secured in said accommodation seat (16) thereof.

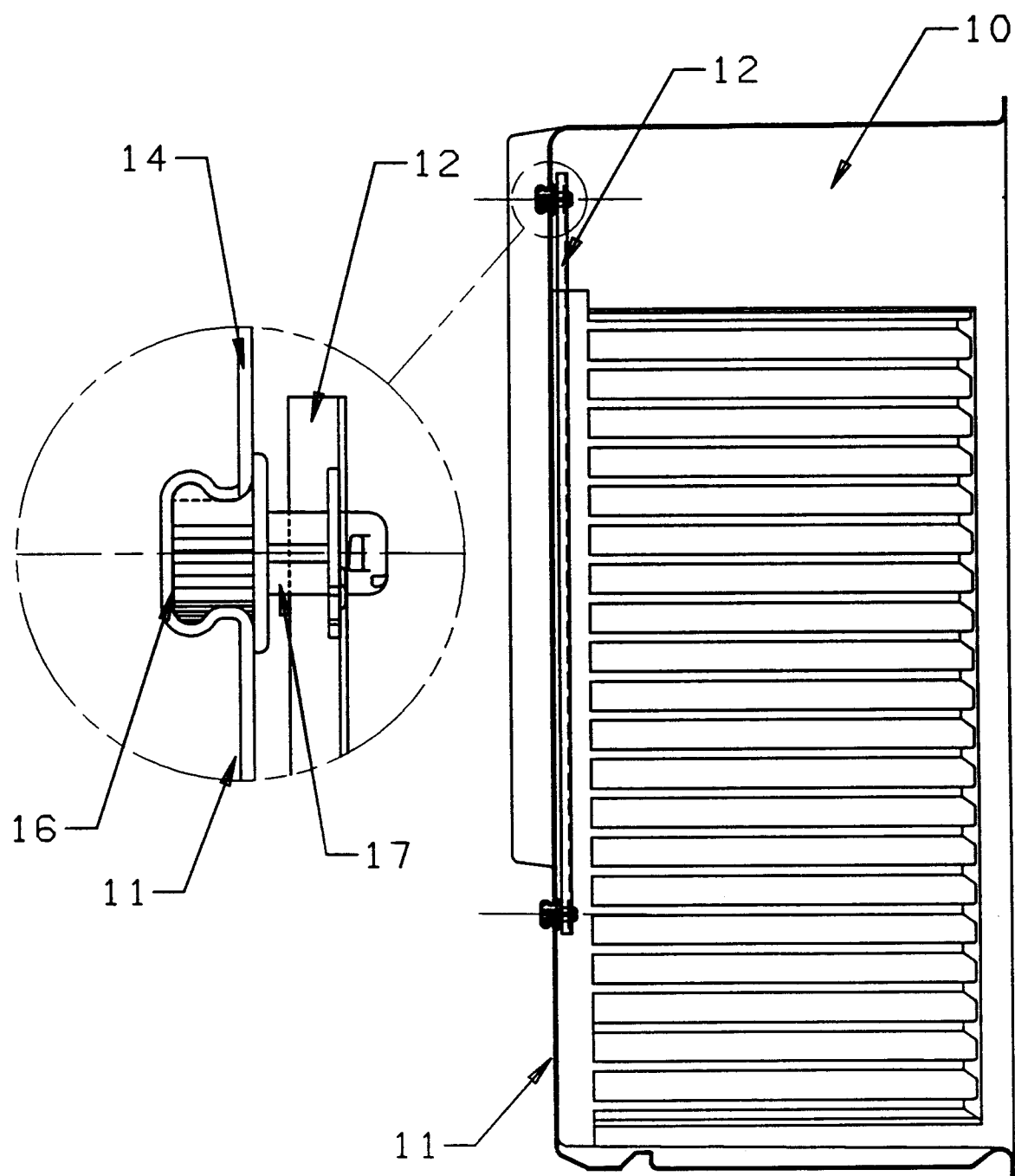


FIG. 1

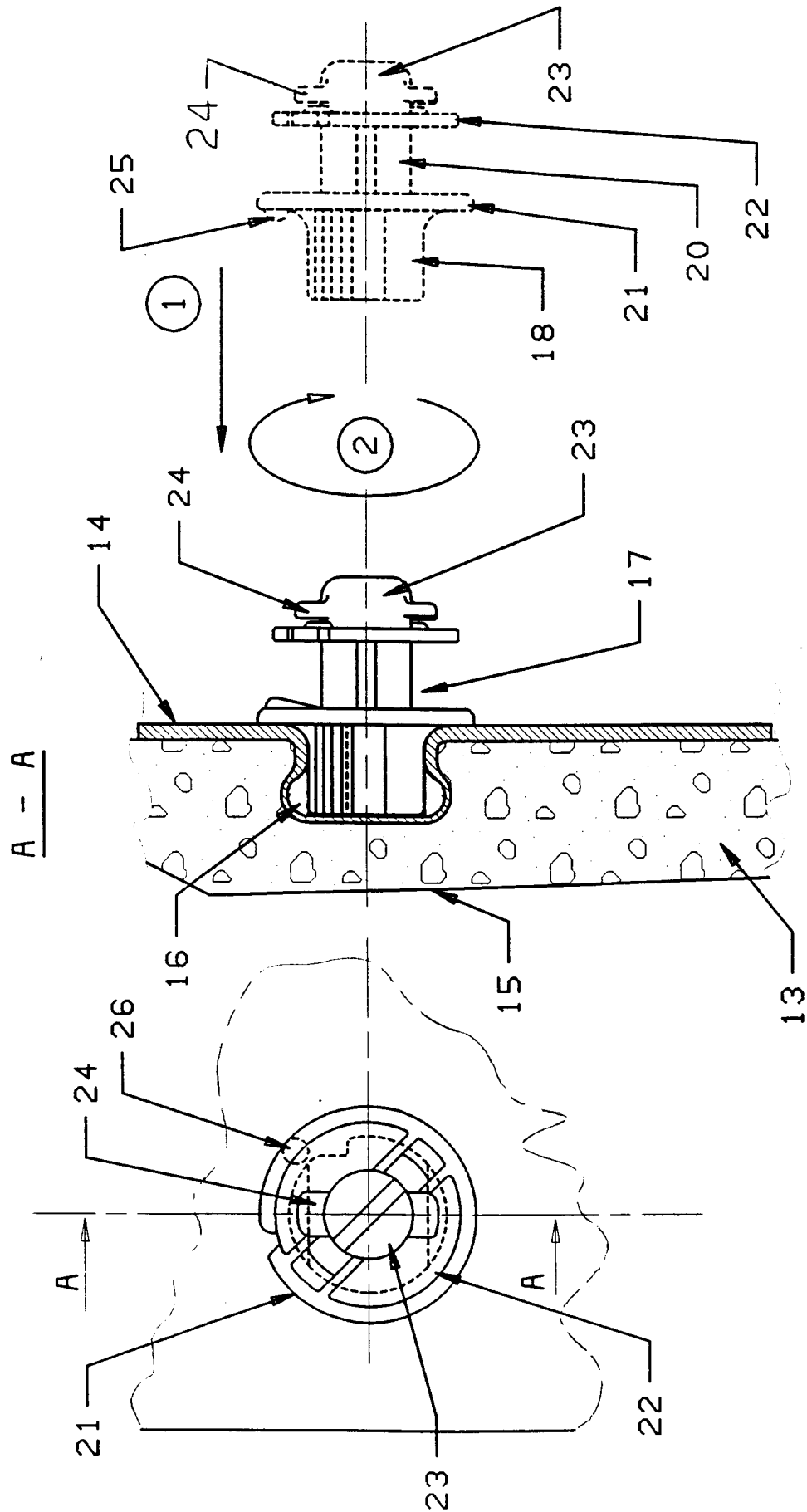


FIG. 2A

**FIG. 2B**

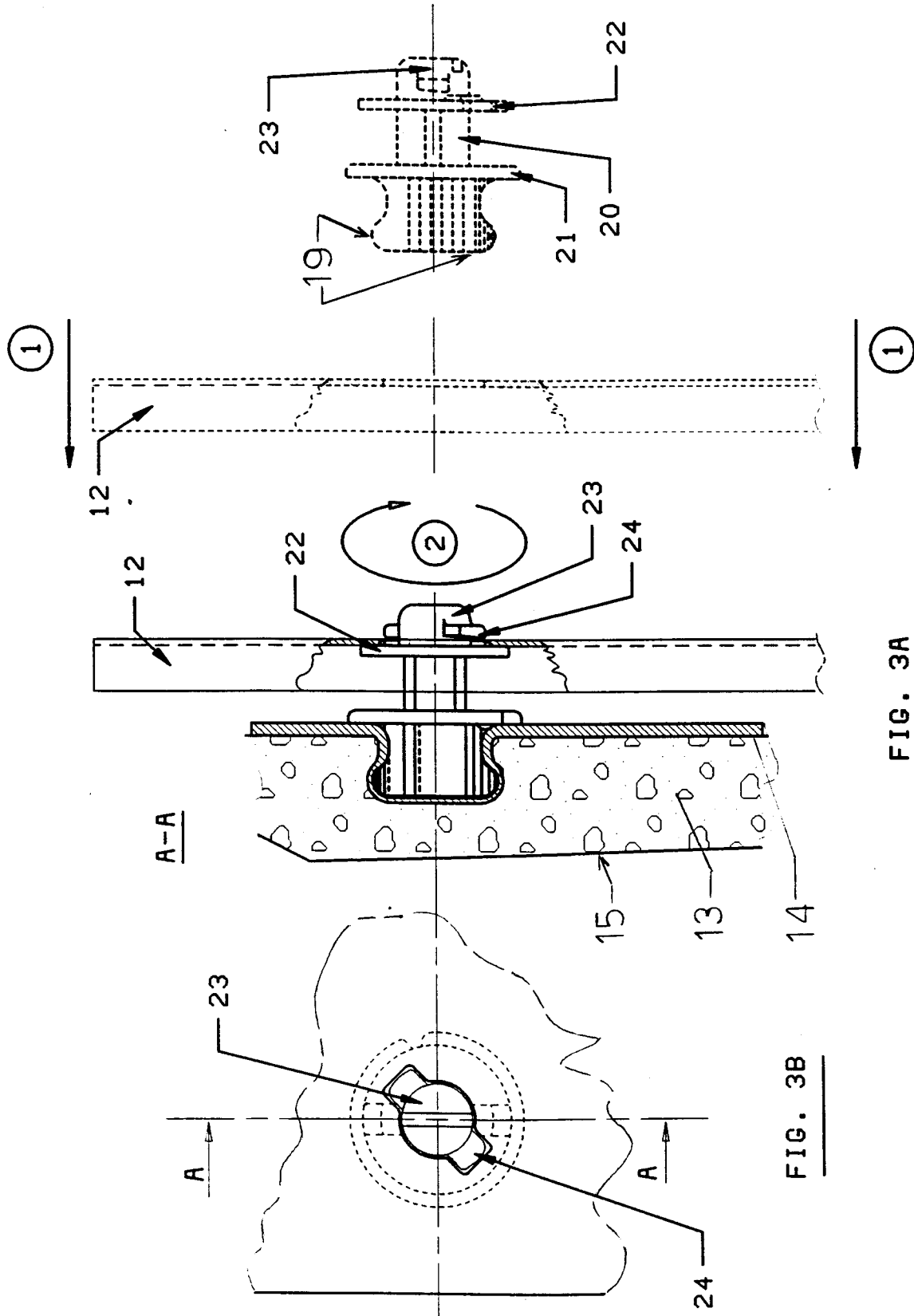


FIG. 3A

FIG. 3B