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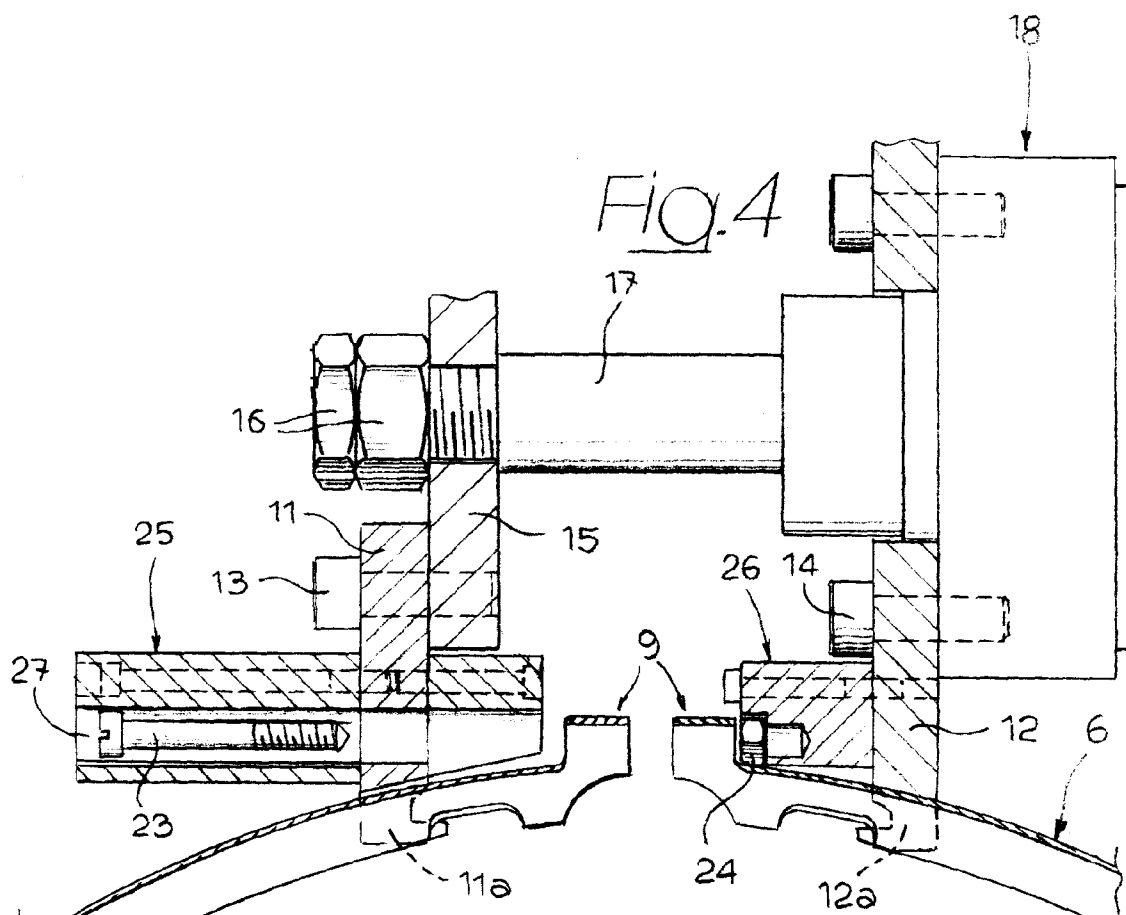
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(54) **Method for mounting a coupling ring on for a washing machine tub**

(57) When mounting a split coupling ring (6) on the two juxtaposed peripheral flanges (2a, 3a) of two elements (2, 3) constituting the tub (1) of a laundry washing

machine, a clamping tangential bolt (23, 24) is applied and tightened only once the ends (9) of the coupling ring (6) have been moved towards each other at least to a first extent by an auxiliary tool (11, 12, 18).



Description

The present invention relates to coupling split rings for coupling the peripheral flanges of two elements constituting the tub of a laundry washing machine. Such rings are constituted by a channel-like profile element bent in a ring, of metal material, having two side wings and a central bottom wall which define a substantially C-shaped cross-section, with its cavity facing towards the axis of the ring, the channel-like profile element having passages for engagement of a clamping tangential bolt at its two adjacent ends.

The invention is applicable to any split ring of the above indicated type. For instance, the invention is applicable to rings of the most conventional type in which the adjacent ends of the ring are bent outwardly, substantially at a right angle with respect to the adjacent part of the ring and have a pair of facing holes for engagement of the clamping tangential bolt. Or, the invention is applicable to rings of the type forming the subject of European patent EP-B-0 210 143, in which each end of the ring is permanently deformed so as to become radially offset outwardly with respect to the adjacent portion of the ring and the bottom wall of the profile element which connects the bottom wall of each offset end portion to that of the adjacent part of the profile element has a hole which defines a passage for engagement of the clamping tangential bolt along with the cavity of the offset end portion. Rings of this second type have found large use in recent years due to their advantages with respect to the above mentioned most conventional solution from the standpoint of reliability of the coupling and simplicity of manufacture and mounting.

When mounting the coupling rings of the above indicated type, the ring is initially arranged over the juxtaposed flanges of the elements to be coupled, whereupon the clamping bolt is screwed, so as to cause the two ends of the ring to move towards each other so as to clamp the ring on said peripheral flanges. This method implies that the coupling ring, particularly at its two ends connected by the bolt is designed and made with material and dimensions such as to ensure that the load determined by the clamping of the bolt may be discharged on the material of the ring without causing a deformation thereof. This implies the use of a sheet metal of some thickness for making the ring as well as the use of clamping bolts of some length, since the bolt must be able to engage the two ends of the ring when these are in their spaced apart position, before the ring is clamped over the flanges of the elements to be coupled.

The object of the present invention is that of providing a method for mounting coupling rings of the above indicated type which allows the structure of the ring to be rendered simpler and of lower cost.

According to the invention, when mounting the ring, after that it has been positioned on said peripheral flanges of the two elements constituting the tub of the laundry

washing machine, and before and/or simultaneously to the clamping of said tangential bolt, the two ends of the ring are moved towards each other by engaging an auxiliary tool thereon.

Due to this measure, the sheet metal used for making the ring can have a smaller thickness with respect to that of the rings used up to now. As a matter of fact, when mounting rings of the above indicated type which have been made up to now, the most critical moment from the point of view of the stress on the material of the ring is that at which the two ends of the ring are moved towards each other by clamping the tangential bolt. During this stage, the bolt exerts on the ends of the ring a load which greatly stresses the material and therefore implies the use of a sheet metal of some thickness. In the method according to the invention, the clamping bolt is not used to cause the ends of the ring to move towards each other, this movement being obtained by an auxiliary tool which pushes the two ends of the ring towards each other. Each end of the ring therefore is no longer subjected to a high tensile stress determined by the clamping bolt, so that the sheet metal of the ring may be of a reduced thickness. The bolt is applied only once the two ends of the ring have been moved towards each other, so that the material of the ring must have only a strength sufficient to support the load due to that, when mounting is completed, the bolt prevents the ring from returning to its undeformed condition. Furthermore, since the bolt is applied after that the ends of the ring have been moved towards each other, it can be provided with a length much lower than that necessary with rings which are mounted in the conventional way.

The auxiliary tool used to cause the movement of the two ends of the ring towards each other may be of any type. Preferably, however, it includes a pair of jaws adapted to respectively engage the two ends of the ring and to push them towards each other, these jaws being further provided with means for guiding and automatically loading the screw and the nut forming the clamping tangential bolt. For instance, said two jaws may be movable between an opened position and a closed position by a fluid cylinder, so as to render the mounting process of the coupling rings on the tubs of a production line of laundry washing machines fully automated.

As clearly apparent from the foregoing description, the invention simplifies the manufacture and mounting of these rings, while greatly reducing the production cost.

Further features and advantages of the invention will become apparent from the description which follows with reference to the annexed drawings given purely by way of non-limiting example, in which:

figure 1 is a cross-sectional diagrammatic view of a tub of a laundry washing machine provided with a coupling ring,
figure 2 is a perspective partial view, partially in

cross-section, of the two ends of a coupling ring of the type forming the subject of European patent EP-B-0 210 143,

figure 3 is a view of an embodiment of the apparatus used in the method according to the invention, in a first operative condition,

figure 4 is a view of the apparatus of figure 3 in a second operative condition,

and

figures 5, 6 are a view in the direction of arrow V and a cross-sectional view taken along line VI-VI of figure 3.

In figure 1, reference numeral 1 generally designates a tub of a laundry washing machine, comprising one element 2 with a substantially cup-like shape and a disk 3 which covers the mouth of the cup-shaped element at its front and has a central aperture 4 for the introduction of the laundry. At their coupling edges, the elements 2, 3 have two circumferential flanges 2a, 3a, between which there is interposed a sealing strip 5. The two flanges 2a, 3a are connected to each other by a split coupling ring 6 which may be of any known type. The drawings show, by way of example, a coupling ring 6 of the type forming the subject of European patent EP-B-0 210 143. Naturally, however, as already indicated, the method according to the invention may be adopted also with coupling rings of a type different from that shown in the drawings, as well as with a tub structure also different from that shown, in which for instance the coupling flanges are provided in an intermediate plane spaced from both the end faces of the tub or at the rear face, rather than at the front face of the tub.

The coupling ring 6 is constituted by a channel-like profile element (see figure 2) of metal material, having two side wings 7 and a central bottom wall 8 which define a substantially V-shaped cross-section with its cavity facing towards the ring axis. The ring has two end portions 9 which are permanently deformed outwardly in a radial direction, with respect to the adjacent part of the ring, with an aperture 10 formed in the portion of the bottom wall 8 which connects each offset end portion 9 to the adjacent part of the ring. In this manner, each aperture 10, along with the cavity of the offset portion 9, defines a passage for engagement of a clamping tangential bolt (not shown in figure 2).

According to the invention, the coupling ring 6 is initially provided on the two juxtaposed flanges 2a, 3a, after that the two ends 9 of the ring are moved towards each other by an auxiliary tool, which may be for instance of the type shown in figures 3, 4. Only after that the ring has been clamped above the flanges after that the ring has been clamped above the flanges 2a, 3a by said auxiliary tool, by moving the two ends 9 to positions close to each other, the clamping bolt is applied through the facing apertures of the two offset end portions 9 and is then clamped in order to hold the ring in the deformed

closed condition.

In the example illustrated in the annexed drawings, the auxiliary tool used to cause the two ends 9 of the ring to move towards each other comprises two jaws 11, 12 respectively fixed by screws 13, 14 to a plate 15 connected by nuts 16 to the stem 17 of a hydraulic cylinder 18, and to the body 19 of cylinder 18. The plate 15 is further guided on a cylindrical column 20 which engages respective bushes 21, 22 supported by plate 15 and the plate constituting jaw 12. The hydraulic cylinder 18 is displaceable between an extended condition (figure 3), corresponding to the spaced apart condition of the two ends 9 of the coupling ring 6, and a retracted condition (figure 4) in which the ends 9 of the coupling ring 6 are close to each other. The jaws 11, 12 have lower ends 11a, 12a adapted to come into engagement with abutment surfaces 11b, 12b formed adjacent to the ends of the ring, so as to be able to push said ends towards each other when the hydraulic cylinder 18 is moved from the extended condition shown in figure 3 to the retracted condition shown in figure 4.

Once the apparatus is in the closed condition shown in figure 4, with the ends 9 of the ring in positions close to each other, these ends can be locked in this condition by tightening a tangential bolt comprising a screw 23 and a nut 24. Preferably, with jaw 11 there is associated a device 25 for automatically loading and guiding screws 23 (see also figure 5), whereas with jaw 12 there is associated a device 26 for automatically loading and guiding nuts 24. When the apparatus is in the condition shown in figure 4, a motorised screwdriver can be inserted through a cavity 27 in which there is arranged the screw 23, so as to cause this screw to move forwardly and engage nut 24, thus providing locking of the coupling ring 6 in the clamped condition. Once the screw is tightened, the auxiliary tool can be opened and raised with respect to the ring. In case of application to an assembling line for tubs of laundry washing machines, when the apparatus is raised, the unit constituted by the tub with the ring mounted thereon can be moved forwardly and a new tub is brought and positioned below the apparatus for mounting the coupling ring. The apparatus can then be lowered again in the opened condition shown in figure 3, and then closed to cause the ends of the new coupling ring to move towards each other, as already described above.

It is clearly apparent, however, that the auxiliary tool illustrated herein is given purely by way of example, and that any other assembling structure (e.g. a toggle-type device) can be used. The basic concept of the present invention is anyhow that of providing a tool which is able to cause the two ends of providing a tool which is able to cause the two ends of the coupling ring to move towards each other once the ring has been positioned above the peripheral flanges of the tub of the laundry washing machine, so that the clamping tangential bolt is not used to cause this movement, but simply to hold

the ring in the closed condition, once it has been brought in this condition by said auxiliary tool.

In the above described example, the auxiliary tool is operated only once, whereupon the clamping bolt is tightened.

However, according to the invention, it is also possible to operate the auxiliary tool a first time and then tightening the bolt until reaching a given load.

At this point, the auxiliary tool is operated a second time, to move further the two ends of the ring towards each other, so as to cause a simultaneous lowering of the load on the screw. After this second operation of the auxiliary tool, the bolt can be tightened again until reaching again a given load, and this alternated operation of the auxiliary tool and the bolt can be repeated again a number of times until reaching the desired clamping of the ring.

In this manner, a very strong clamping of the ring can be obtained, while the bolt is never subjected to a stress greater than an admissible predetermined value.

Naturally, while the principle of the invention remains the same, the details of construction and the embodiments may widely vary with respect to what has been described and illustrated purely by way of example, without departing from the scope of the present invention.

In particular, as already indicated, the method is applicable to coupling rings of any type, also different from that shown by way of example in the annexed drawings.

Claims

1. Method for mounting a split coupling ring (6) on two juxtaposed peripheral flanges (2a, 3a) of two elements (2, 3) constituting the tub (1) of a laundry washing machine, said ring (6) being constituted by a channel-like profile element, bent in a ring, of metal material, having two side wings (7) and a central bottom wall (8) which define a substantially C-shaped cross-section, with its cavity facing towards the axis of the ring (6); said channel-like profile element (6) having respective passages (10) for engagement of a clamping tangential bolt (23, 24) at its two ends (9) adjacent to each other, characterized in that after that the ring (6) has been positioned on said flanges (2a, 3a), and before and/or simultaneously to the tightening of said tangential bolt (23, 24), the two ends (9) of the ring (6) are moved towards each other by engaging an auxiliary tool (11, 12, 18) thereon.
2. Method according to claim 1, characterized in that said auxiliary tool comprises a pair of jaws (11, 12) displaceable between an opened condition and a closed condition by a fluid cylinder (18), adapted to engage respective ends (9) of the coupling ring (6) to push these ends towards each other.
3. Method according to claim 2, characterized in that said jaws (11, 12) are provided with means for automatically loading and guiding the screw (23) and the nut (24) constituting said clamping bolt.
4. Method according to any of the previous claims, characterized in that the coupling ring (6) is of a type comprising offset end portions (9) radially deformed outwardly with respect to the adjacent parts of the coupling ring (6) and having passages (10) for engagement of the clamping bolt.
5. Method according to claim 1, wherein said auxiliary tool is operated only once, whereupon the clamping bolt (23, 24) is tightened.
6. Method according to claim 1, wherein said auxiliary tool (11, 12, 18) and the clamping bolt (23, 24) are operated alternatively until reaching complete clamping of the ring.

Fig. 1

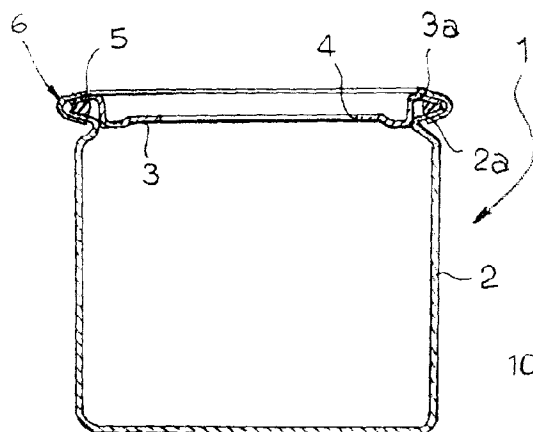


Fig. 2

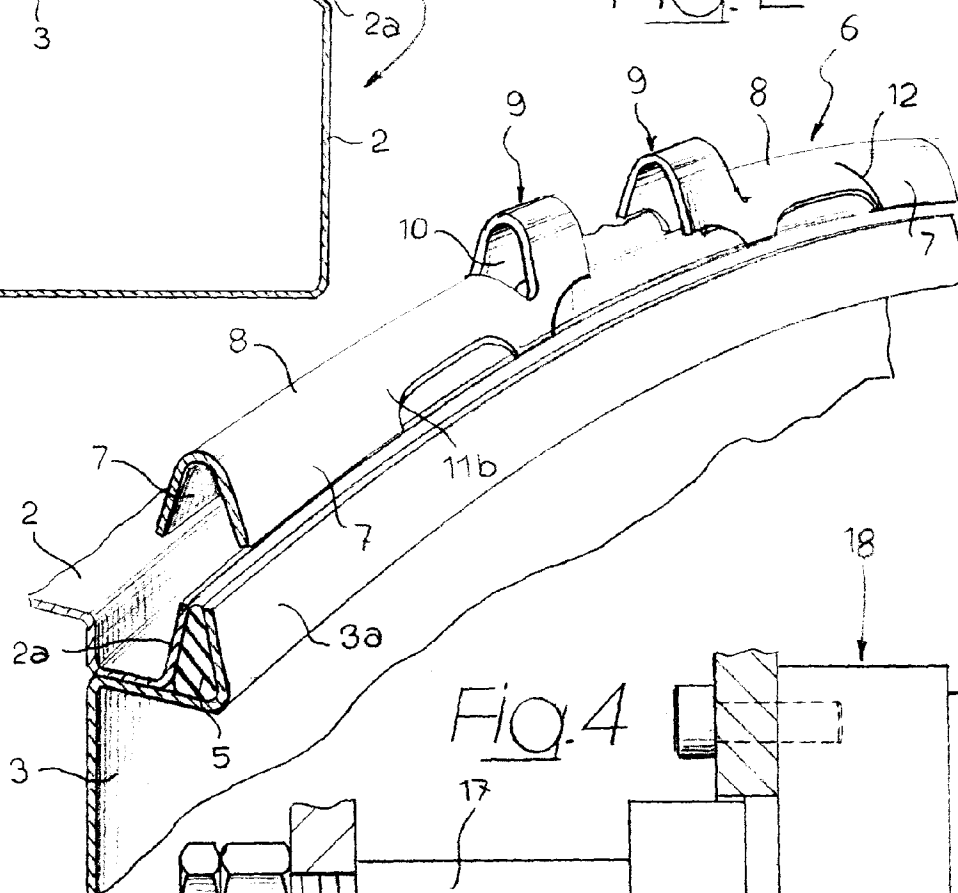
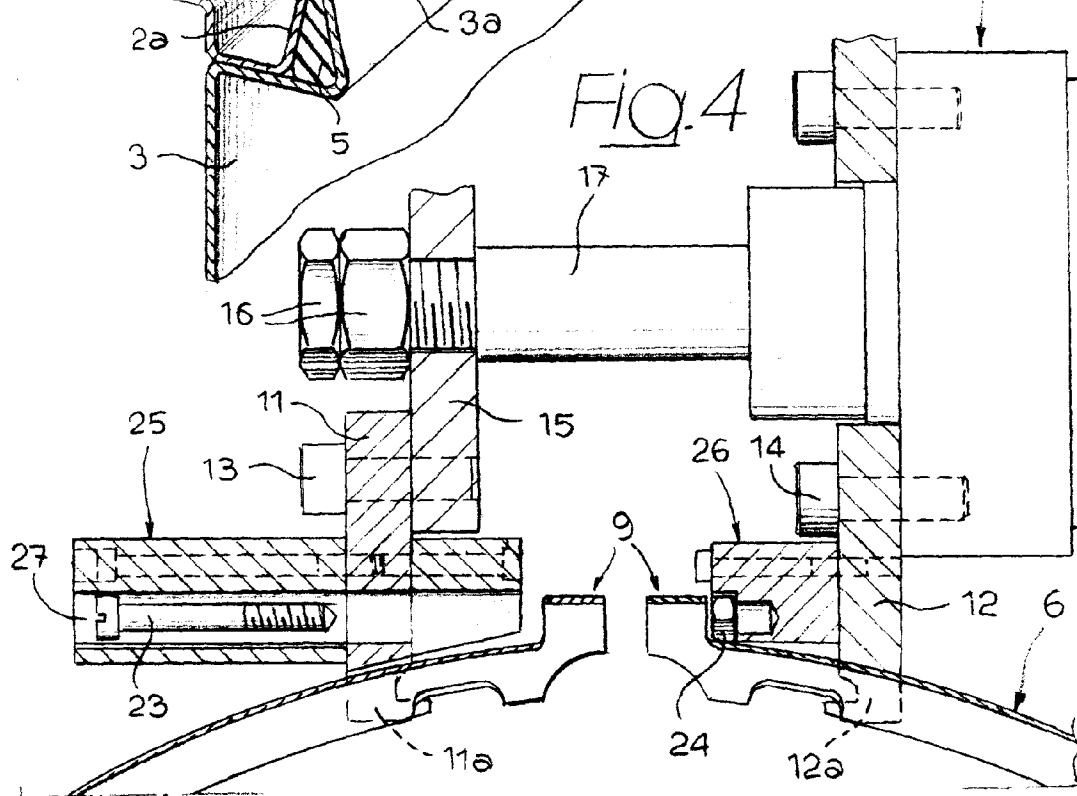


Fig. 4



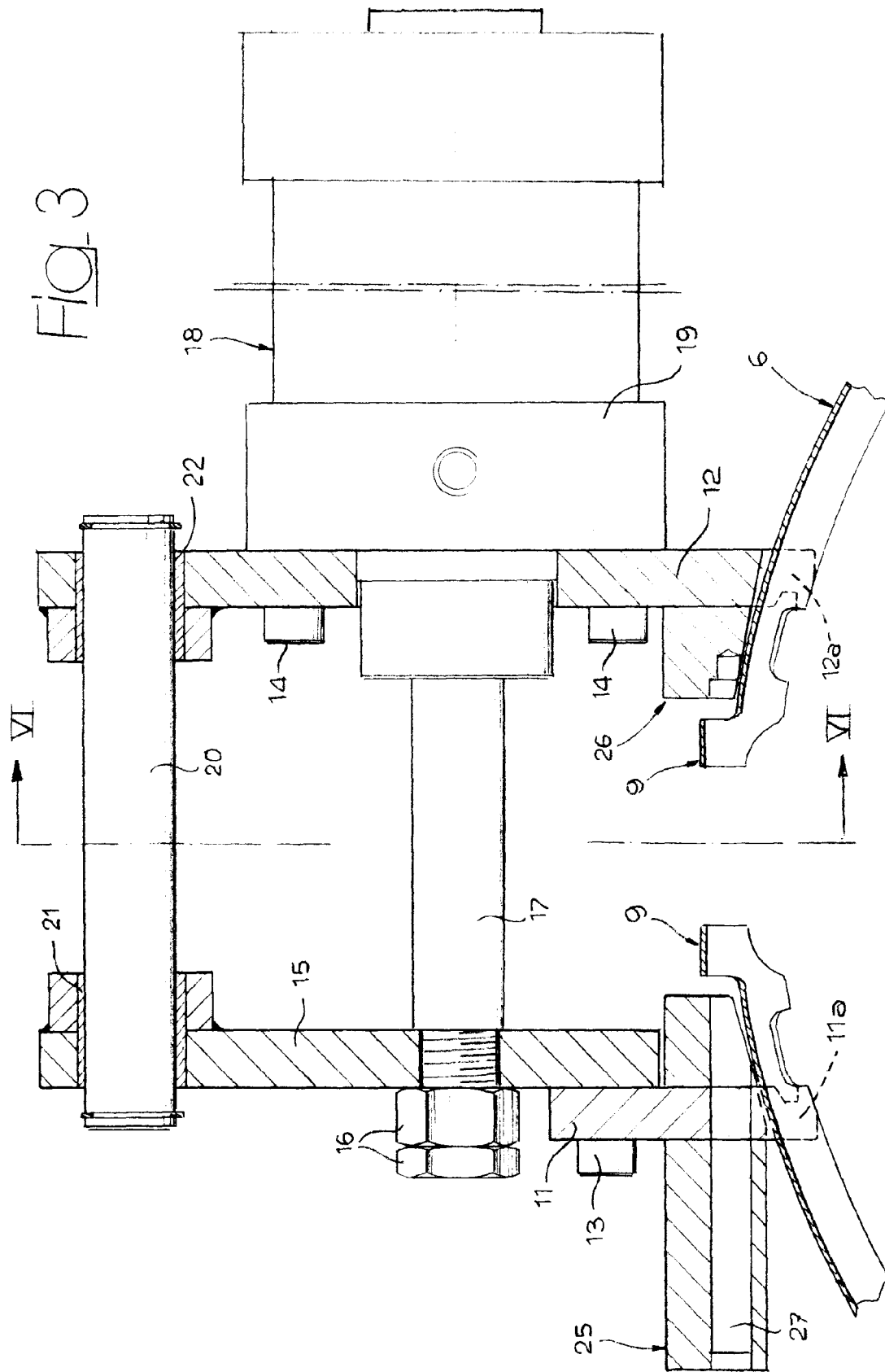


Fig. 5

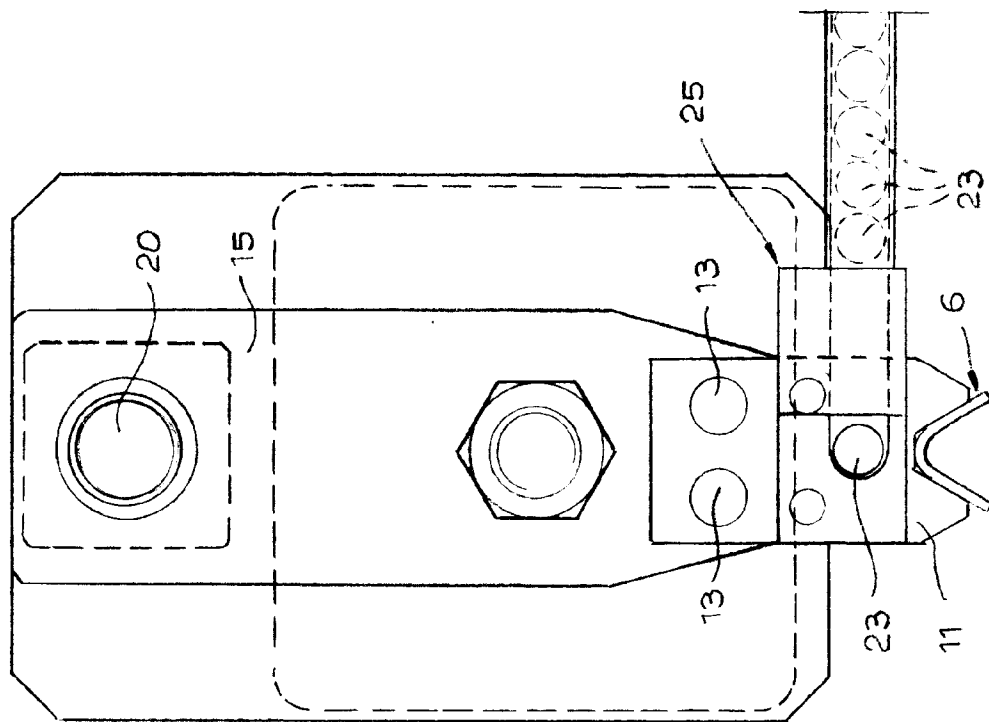


Fig. 6

