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(54) Dishwashing machine with height adjustable baskets

(57) Dishwashing machine of the type comprising a removable basket (2), where during its use rollers (10) associated to the basket side walls (2) are engaged in guides (13) associated to the side walls of a washing tub housing the basket, said dishwashing machine comprising a device for height adjustment of said basket (2) within said tub, said device comprising a first section (1) related to the basket (2) and a second section (9)

related to the rollers (10), where height adjustment is obtained through a translation motion of said first section (1) related to the basket (2) with respect to said second section (9) related to the rollers (10). Articulation levers (11), pivoted between said first section (1) and said second section (9) are provided, so that said translation motion is substantially a circular motion.

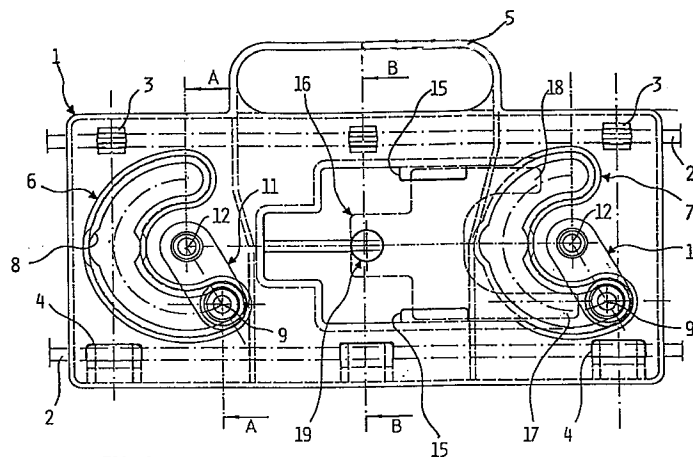


FIG. 1

EP 0 788 763 A2

Description

This invention concerns a dishwashing machine of the type comprising at least a basket that can move freely in both horizontal and vertical directions.

It is known that such dishwashing machines are usually equipped with two baskets, i.e. an upper and a lower basket, both removable, where the height of the upper basket can be adjusted, as the latter can take a higher and a lower position according to the requirements of the crockery load.

The horizontal motion is obtained according to the known art by fastening some horizontal rails to the washing tub, on which rollers are sliding whose axis are clamped to the basket side walls.

The vertical motion is normally obtained by interposing a further element conceived in different ways between the roller axis and the basket to allow height adjustment.

For instance, DE 42 27 585 A1 describes a dishwashing machine with a height adjustable basket, having plates fastened to the basket side walls. Said plates have nearly vertical slits acting as sliding guides; the axis of the rollers running over the rails fastened to the side walls of the washing tub slide within said guides, which are substantially V-shaped in their lower side for locking purposes. The shape of the sliding guides allows two safe balanced positions, a high one on the upper end of the V notch and a low one on the other guide end.

However, although this realization may be favourable under many aspects, the problem arises in that the basket weight is entirely resting on the roller axis, thus increasing the risk for their failure.

Moreover, the vertical slits allow a free non-braked basket fall when the latter is released from its balanced position.

Finally, the V-shape of the lower section of the sliding guide requires the basket to be further lifted by a few centimeters and removed to the same extent when releasing the basket from its high position locking.

This operation may lead to a possible impact of any large dishes with the washing tub ceiling and the edge between the tub ceiling and its walls, causing a possible cracking of the crockery or an interference with likely dishwasher elements housed on the tub ceiling, eg. the sprayers.

It is the object of this invention to solve the above mentioned issues and provide for a dishwashing machine equipped with a basket that can be height adjusted through a simple, efficient and sturdier system.

To this purpose, it is the main object of this invention to provide a dishwashing machine equipped with a height adjustable basket, whose adjusting system has suitable means to distribute the basket weight over a plurality of supports and allow safe predetermined basket movements.

Another object of this invention is to provide a dishwashing machine equipped with a height adjustable

basket whose adjusting system has efficient safe locking means for the basket.

A further object of this invention is to provide a dishwashing machine equipped with a height adjustable basket whose adjusting system allows simple ergonomic operations.

To achieve the above purpose it is the object of this invention to provide a dishwashing machine comprising the features as expressed in the annexed Claims.

Any further purposes, features and advantages of this invention will be apparent from the following detailed description and annexed drawings, which are supplied by way of non limiting example, wherein :

- 15 - Fig. 1 shows schematically a front view of a height adjusting device of a basket, with the basket in its high position, developed according to a first embodiment of this invention;
- Fig. 2 shows schematically a front view of the device shown in Fig. 1 with the basket in its bottom position;
- Fig. 3 shows a section along the axis A-A of the device shown in Fig. 1;
- Fig. 4 shows a section along the axis A-A of a variation to the device shown in Fig. 1;
- Fig. 5 shows a section along the axis B-B of the device shown in Fig. 1;
- Fig. 6 shows schematically a front partial view of another variation to the device shown in Fig. 1;
- 30 - Fig. 7 shows a section according to the axis A-A of the device shown in Fig. 6;
- Fig. 8 shows schematically a front view of a device to adjust the basket height in its high position, according to a second embodiment of this invention;
- 35 - Fig. 9 shows schematically a front view of the device shown in Fig. 8 with the basket in its bottom position;
- Fig. 10 shows schematically a front view of a device to adjust the basket height in its high position, according to a third embodiment of this invention;
- Fig. 11 shows schematically a front view of the device shown in Fig. 10 with the basket in its bottom position;
- 45 - Fig. 12 shows a section along the axis A-A of the device shown in Fig. 8;
- Fig. 13 shows a section along the axis B-B of the device shown in Fig. 8;
- Fig. 14 shows a section along the axis A-A of the device shown in Fig. 10;
- Fig. 15 shows a section along the axis B-B of the device shown in Fig. 10;
- Fig. 16 shows a section of a detail of the device shown in fig. 10;
- 55 - Fig. 17 shows schematically an exploded view of a variation to the present invention;
- Fig. 18 shows schematically an exploded view of an assembly detail of the variation according to Fig. 17.

Fig. 1 shows a plate 1 fastened to a basket 2 by jaw couplers 3 and single couplers 4.

According to this invention a plate 1 is fastened by means of said couplers to each side wall of the basket 2.

As it can be seen, the plate 1 is configured in its upper section like a handle 5, whereas its lower section has two slits 6 and 7, in the form of circumference arches with a notch 8 in their intermediate section. An axis 9 of a roller 10 as shown in the section of Fig. 3 is free to slide within said slits 6 and 7.

The axis is bound through an articulation lever 11 to a pin 12, which is screwed by a screw 21 on the plate 1 as it can be seen in the section of Fig. 3.

Fig. 3 also shows how the roller 10 is free to move inside a rail 13 sliding externally over two wheels 14 fastened to the side wall of the dishwasher washing tub.

As it can be seen in Figs. 1 and 5, the plate 1 also has guides 15 incorporating a locking element 16, which has substantially the shape of a foil. Such a locking element 16 is configured asymmetrically, with a longer end 17 and a shorter one 18. The locking element 16 is further provided with a button 19 to hinder an undesired sliding of the locking element 16 in the guides 15.

In Fig. 1 the basket 2 is shown in its high position.

As it can be seen, the end 17 of the locking element 16 hinders one of the axis 9 from moving inside the relevant slit 7. The shape of the end section of the slits 6 and 7 ensures by itself a safe balanced position to the basket, however the locking element 16 makes sure that the basket 2 can be moved only if desired. In this case, by pressing the button 19 the element 16 can be released by letting it slide in the guides 15. Thus, each axis 9 is free to rotate around the relevant pin 12 through the articulation lever 11. As a result, when pulling the basket, the axis 9 overcome the dead center of the slits 6 and 7 and by traveling over the circumferences they reach the other end of said slits 6 and 7, where they reach again a safe balanced position.

Then the locking element 16 can slide again inside the guides 15, and its end 18 will lock the motion of the axis 9 (as shown in Fig. 2).

An advantage of the embodiment suggested above is that the circumference arch configuration of the slits 6 and 7 allows to move the basket 2 from its high position to its low position with a minimum vertical effort on the handles 5.

A further advantage is given by inserting the articulation levers 11 to connect the axis 9 to the pins 12 screwed on the plate 1. Therefore, said articulation lever 11 allows distribution of the basket weight 2 on the axis 9 and on the pins 12, so that the axis themselves will be less mechanically stressed and consequently less subject to failure. Moreover, the articulation lever 11 causes a further constraint for the axis 9 when running a circumferential path, thus causing a safe coupling between the slits 6 and 7 and the axis 9, and allowing the basket motion 2 without jamming.

The use of the articulation lever 11 simplifies the

device assembly as it is possible to make the notch 8 in the slits 6 and 7 through which the axis 9 will be inserted, said notch 8 having a suitable size to allow the passage of the larger section of axis 9. During rotation around the pin 12, in line with the notch 8, the slits 6 and 7 cannot restrain a likely side motion of the axis 9, which is anyway restricted by the constraint caused by the articulation lever 11. Thus, no risks of disconnection between the roller 10 and the plate 1 will ensue and at the same time assembly will be easier.

Assembly is made by inserting the axis 9 through the notch 8 in the slits 6 or 7, i.e. through a release insertion of the roller 10 on the axis 9. Finally, a pin 20 is inserted inside the axis 9, as shown in Fig. 3, whose dual purpose is to lock the release insertion and strengthen the axis 9, Fig. 4 shows an optional embodiment for pin 12 insertion in the articulation lever 11; in this instance, instead of a screw tightening 21, a release connection 22 is used, which is simpler from an assembly viewpoint.

Fig. 2 shows the same plate 1 of Fig. 1, however with the basket 2 in its bottom position. It can be seen how the axis 9 brought to the upper end of the slit 7 is locked by the end 18 of the locking element 16.

Fig. 6 shows another embodiment of this invention with reference to the configuration of the slits 6 and 7.

According to this variation, there is no notch 8 of Fig. 1 and the axis 9 show a round section with milled edges for their free insertion in the slits 6 and 7 during assembly. After insertion, said axis 9 are rotated by 90° to remain bound in the slits 6 and 7. Such a variation allows the axis 9 to be engaged in the slits 6 and 7 for the whole circumference arch and reduces further the risk of the axis 9 coming off the slits 6 and 7.

Fig. 7 shows the section of the change shown in Fig. 6, where the tightening of the pin 12 and of the articulation 11 on a nut 23 with the screw 21 is highlighted. This assembly procedure ensures higher strength characteristics.

Fig. 8 shows a second possible embodiment of this invention.

In this embodiment the width of the semicircular slits 6 and 7 is further reduced, since the articulation levers 11 are fastened to the roller axis 10 by the screws 30, which act as a pin.

Moreover, another semicircular slit 31 is provided on the plate 1 wherein a pin 32 is sliding. A tie rod 33 is fastened to the pins 30 of the slits 6 and 7 and to the pin 32 of the slit 31, thus coupling their movements.

A locking element 34, also inserted on pin 32 in a perpendicular direction is sliding vertically in the guides 35. Said locking element 34 is provided with grooves 36 to lock the pin 32 motion in its high and bottom positions on the ends of the slit 31. Moreover, the locking element 34 has a spring 37 housed in a rectangular seat 38 defined between the plate 1 and the locking element 34. As it can be seen, specifically in Fig. 13, the end of the locking element 34 is folded at right angle to configure gripping means 39.

When the position of the basket 2 has to be displaced, for instance from its high position to its bottom position, the gripping means 39 is pulled upwards, thus releasing the pin 32 (this operation can be carried out in a rather easy way with one finger by handgripping the handle 5). The pins 30 and 32 are then free to slide in the slits 6, 7 and 31 and such a motion can be obtained by a least pulling of the handles 5.

When the pins 30 and 32 have reached the other end of the slits 6, 7 and 31 moving integrally through the tie rod 33, and since the gripping means 39 has been previously released, the reaction of the spring 37 causes the locking element 34 to automatically engage again the pin 32 in one of the grooves 36. Retainers 40 are also provided to avoid side movements of the articulation levers 11 when the basket 2 is in one of said two positions.

It should be noted how in this embodiment the slits 6, 7 and 31 have exactly a semicircular configuration, with their ends in line with the dead centers, i.e. on the balance points.

Previously, the embodiment of Fig. 1 was shown with the slits 6 and 7 extending to the lower section over the dead center. The solution comprising the slits having exactly a semicircular configuration has the advantage of saving the space in line with the slit section over the dead center during the basket motion, thus allowing a longer basket to the prejudice of a higher stability deriving from the position over the dead point. At any rate, both advantages can be available, i.e. a long basket and a long slit with intrinsically safe positions by providing the couplings 3 and 4 between the basket 2 and the plate 1 with a lengthwise clearance, sized to allow the horizontal displacement of the basket and recover the room not available due to the longer slits 6, 7 and 31.

Figs. 12 and 13 show the section according to the axis A-A and B-B of fig. 8.

Fig. 12 shows the detail of the screw 30 acting as a pin inside the axis 9 of the roller 10. Fig. 13 shows the coupling system of the spring 37 and the configuration of the tie rod 33 suitable to run above the pin 12.

Fig. 10 shows the plate 1 of an embodiment where the slits 6 and 7 of Fig. 1 or the slits 6, 7 and 31 of Fig. 8 are not available.

In this instance, the articulation levers 11 are located on the plate side 1 facing the rails 13, and the axis 9 of the rollers 10 are integral with the articulation levers 11 or even obtained on the same part. Retainers 41 are located along the track of the articulation lever 11 to restrain the perpendicular motion to the plate 1, since the slits 6, 7 and 31 exerting this function in the embodiments described above are not available.

This embodiment shows the assembly of the spring 37 to let it execute an extending motion instead of a compressive motion of Fig. 8 when it recalls the locking element 34 to the locking position.

Displacement of the basket 2, for instance from top to bottom, occurs by pulling the gripping means 39

upwards and releasing the pin 32 from the groove 36 of the locking element 34.

Assuming that the axis 9 of the rollers 10 vertically fastened in the rail 13 represent the fulcrum of the articulation levers 11, the latter make a clockwise rotation leading the plate 1 and consequently the basket 2 to the bottom position shown in fig. 11, where it can be seen how the articulation levers 11 are in their high position and the locking element 34 after release of the gripping means 39 is returned by the spring 37 to engage the pin 32 again and consequently lock the tie rod 33.

Figs. 14 and 15 show the sections according to the axis A-A and B-B of Fig. 10.

Fig. 14 shows how the articulation lever 11 is bound to the plate 1 by the screw 30 - nut 23 system, which in this case has been adequately chosen for its sturdiness, whereas the function of the retainers 41 to form a second binding point for the articulation lever 11 is apparent. Fig. 15 highlights the coupling between the pin 32 of the tie rod 33 and the groove 36 of the locking element 34.

Fig. 16 shows the detail of the spring 37, which in this case is working under traction and is bound between the locking element 34 and the plate 1.

Fig. 17 shows a further possible embodiment of this invention, where the basket 2 does not consist entirely of metal wire elements as typically known in the art, but it has a bottom 42 made from metal wire and a frame 42 in plastic material, which consists of a front wall 44, a rear wall 45 and two side walls 46, where said side walls 46 have in their lower section facing the frame inside 43 coupling means for its coupling with the bottom.

As highlighted by the parts represented by dashed lines, each side wall 46 has a plate 1 of the height adjusting device according to this invention, which can be obtained in the element 46 itself through the same moulding operation.

As said above, the frame 43 can be moulded in plastic material as separate pieces corresponding to the walls 44-46, that are assembled together.

To this purpose, as highlighted in Fig. 18, the ends of each wall 44-46 are configured to obtain some notches for the angular coupling of the walls. As it can be seen, a pin 47 is favourably provided to warrant a safe coupling between two walls, which pin is suitable for insertion into the throughholes 48 obtained on some tailpieces 49, which form a complementary wall profile.

According to the above description the characteristics of this invention as well as its advantages will be apparent.

Specifically, the following points should be underlined:

- improved performance of the mechanical motion through introduction of the articulation levers, whose action is first to distribute the basket weight on the roller axis and on the pins bound to the plate to reduce the failure risk for such elements, and secondly to obtain a safe rotary motion of the plate

connected with the basket around the roller axis, to avoid jamming or disconnection of the axis from the slits. A further advantage along with the semicircular slits is a braked motion, specifically from the high position to the bottom one, thus reducing shocks and impact both for the mechanical parts and the crockery.

- functionality, since the semicircular slits allow to displace the basket from the high position to the bottom position simply drawing the basket to the front with a natural ergonomic movement through appropriate handles on the dishwasher front side and with the basket removed from the washing tub.
- safety, first of all because the height adjusting operation is possible only with the basket completely removed; i.e. an intrinsic safety factor to avoid impacts of the crockery with the tub ceiling or walls. Secondly, all suggested embodiments provide locking devices for the basket in the high and low positions respectively, without just relying on the fact that said position are safe balanced positions within the slits; in other words, the locking devices hinder any casual basket movement, such as oscillations, and release it only when it is necessary to change its height position.
- simple manufacture and assembly, as well as the fact that a substantial part of the height adjustment device can be directly integrated with a plastic side wall of the basket through the moulding operation of thermoplastic material.

Obviously, many changes are possible for the man skilled in the art to the dishwashing machine described by way of example, without departing from the novelty principles of the innovative idea, and it is also clear that in practical actuation of the invention the components and materials detailed above may differ from the ones described above and be replaced with technical equivalent elements.

As an example, the function of the locking element 34 in Fig. 8 may be easily inverted by upturning its position and maintaining the gripping means 39 on the uppermost end towards the handle 5, so that the plate may be released by pressing instead of pulling the means 39.

A further change with reference eg. to the second or third embodiments of this invention may provide the use of locking elements allowing to lock the roller axis in different positions along the slits for intermediate height adjustments.

Claims

1. Dishwashing machine of the type comprising a removable basket (2), where during its use rollers (10) associated to the basket side walls (2) are engaged in guides (13) associated to the side walls of a washing tub housing the basket, said dishwashing machine comprising a device for height

adjustment of said basket (2) within said tub, said device comprising a first section (1) associated to the basket (2) and a second section (9) associated to the rollers (10), where height adjustment is obtained through a translation motion of said first section (1) associated to the basket (2) with respect to said second section (9) related to the rollers, characterized in that articulation levers (11) pivoted between said first section (1) and said second section (9) are provided, so that said translation motion is substantially a circular motion.

2. Dishwashing machine according to Claim 1, characterized in that said second section (9), on which the articulation levers (11) are pivoted, consists of the roller (10) axis.
3. Dishwashing machine according to Claim 1 or 2, characterized in that the axis (9) of the rollers (10) are engaged and/or movable within first guiding means (6, 7, 41), specifically defined in said first section (1).
4. Dishwashing machine according to Claim 3, characterized in that said first guiding means (6, 7, 41) define a circumference arch.
5. Dishwashing machine according to Claim 3 or 4, characterized in that said first guiding means comprise slits (6, 7).
6. Dishwashing machine according to Claim 5, characterized in that said slits (6,7) are configured as a circumference arch with an angle of at least 180°.
7. Dishwashing machine according to Claim 3 or 4, characterized in that said first guiding means have projections defined in said first section (1).
8. Dishwashing machine according to Claim 5, characterized in that said slits (6,7) have a notch (8) for an easier assembly.
9. Dishwashing machine according to at least one of the preceding Claims, characterized in that said axis (9) are inserted in said slits (7,7).
10. Dishwashing machine according to Claim 1, characterized in that locking means (16,34) for the basket (2) are provided in the planned work positions.
11. Dishwashing machine according to Claim 10, characterized in that said locking means (16,34) are suitable to hinder the motion of at least one of said articulation levers (11).
12. Dishwashing machine according to Claim 10, characterized in that said locking means (16) slide in respective second guiding means (15,35), with

either vertical or horizontal sliding motion.

13. Dishwashing machine according to Claim 10, characterized in that said locking means (34) are submitted to the action of an elastic element (37), in particular to recall to their locking position. 5
14. Dishwashing machine according to Claim 1, characterized in that said articulation levers (11) are fastened to said first section (1) through threaded clamping means (21) or release couplers (22). 10
15. Dishwashing machine according to Claim 1, characterized in that at least said first section (1) is integrated in a plastic side wall (46) of a basket (2) by the moulding of plastic material. 15
16. Dishwashing machine according to Claim 1, characterized in that said first section (1) is related to the basket (2) by coupling means (3,5). 20
17. Dishwashing machine according to Claim 16, characterized in that said coupling means (3,4) have a lengthwise clearance allowing the relevant sliding of the basket (2) with respect to said first section (1). 25
18. Dishwashing machine according to Claim 1, characterized in that means (41) are provided to limit side inclination of said articulation levers (11). 30
19. Dishwashing machine according to Claim 10, characterized in that said locking means (16,34) allow intermediate height adjustments for the basket (2). 35

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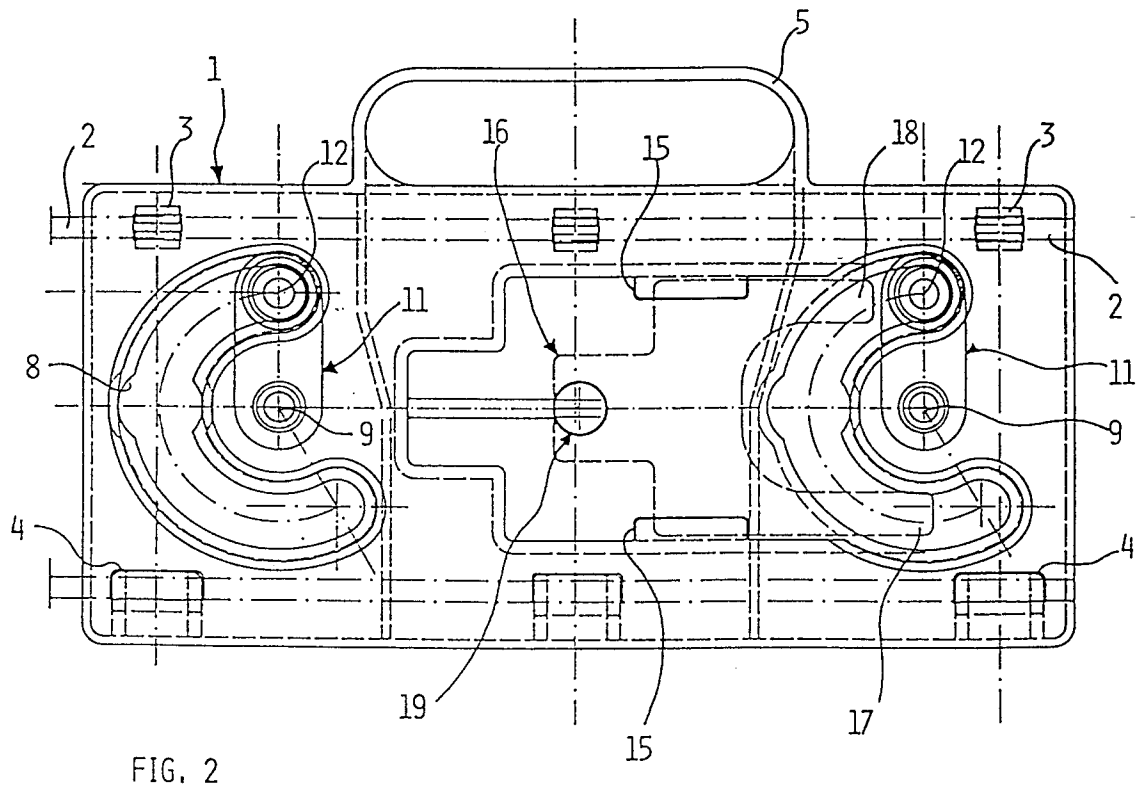
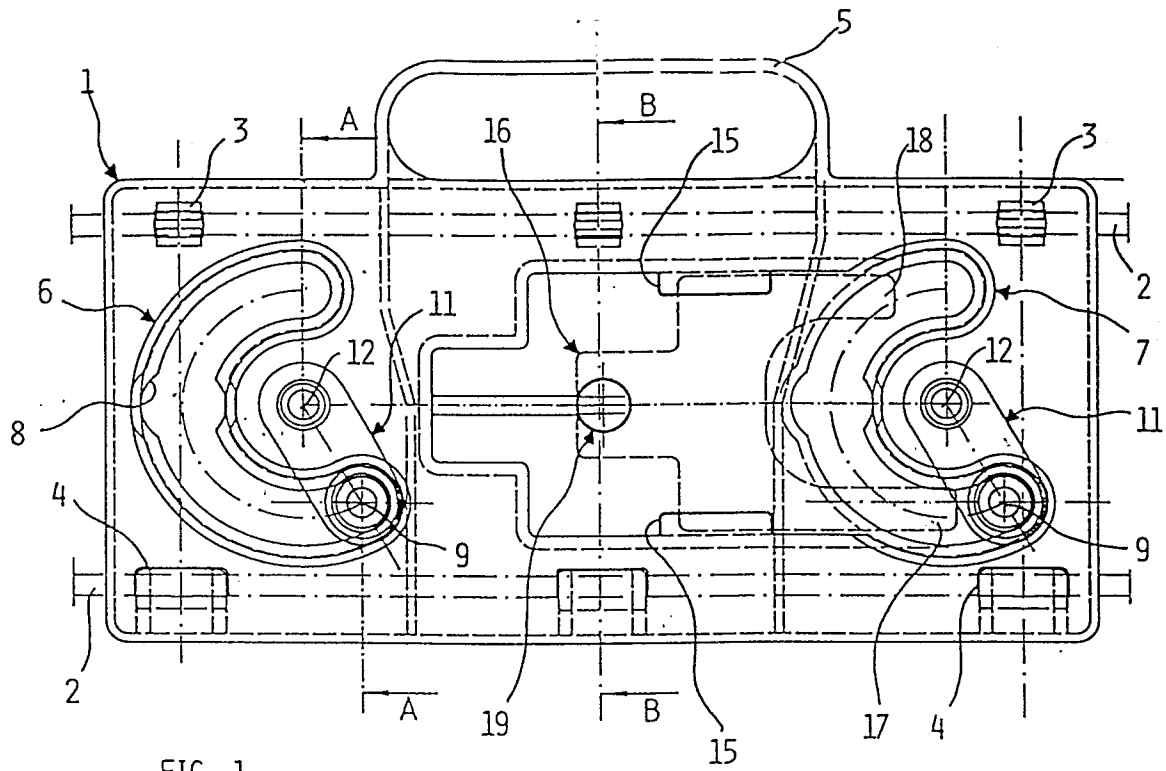


FIG. 3

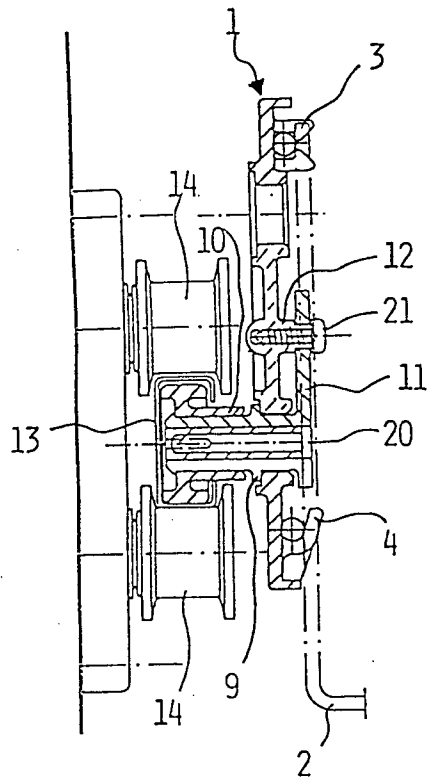


FIG. 4

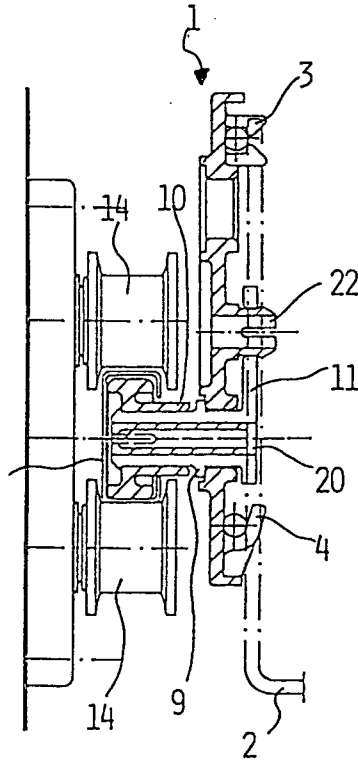


FIG. 5

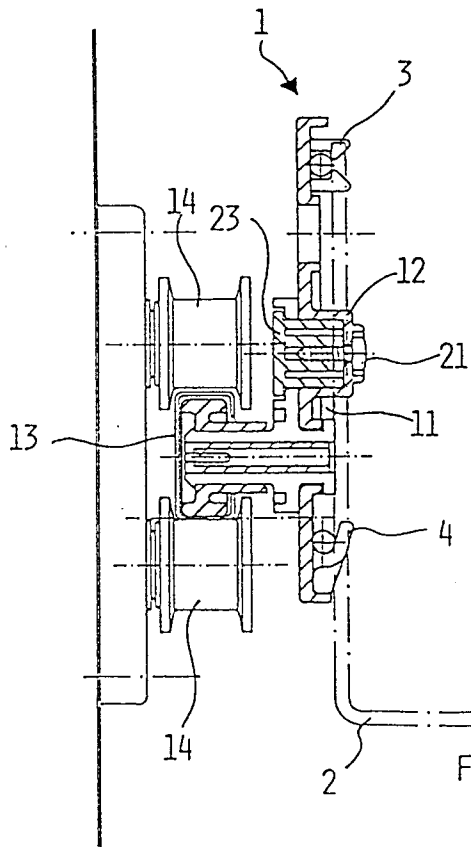
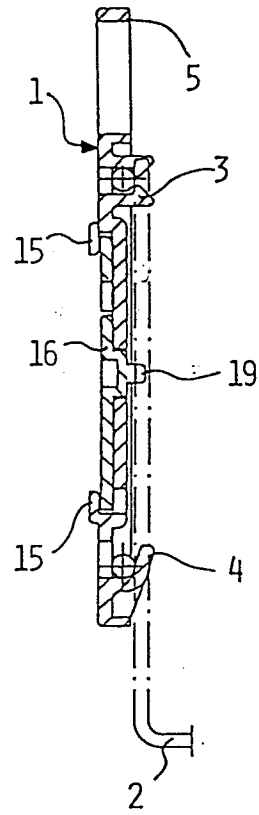


FIG. 7

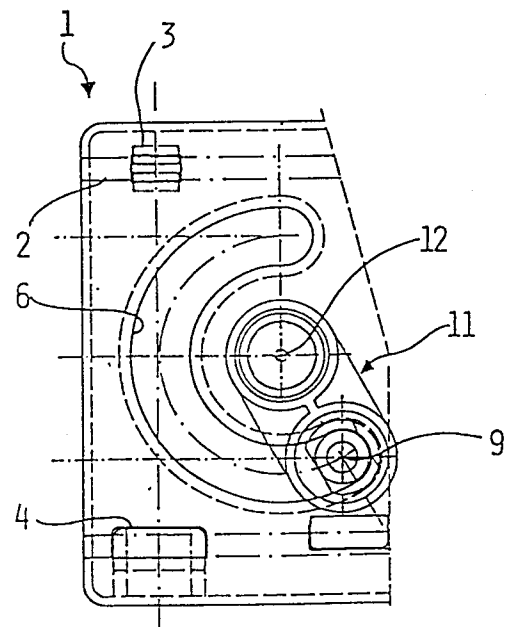


FIG. 6

FIG. 8

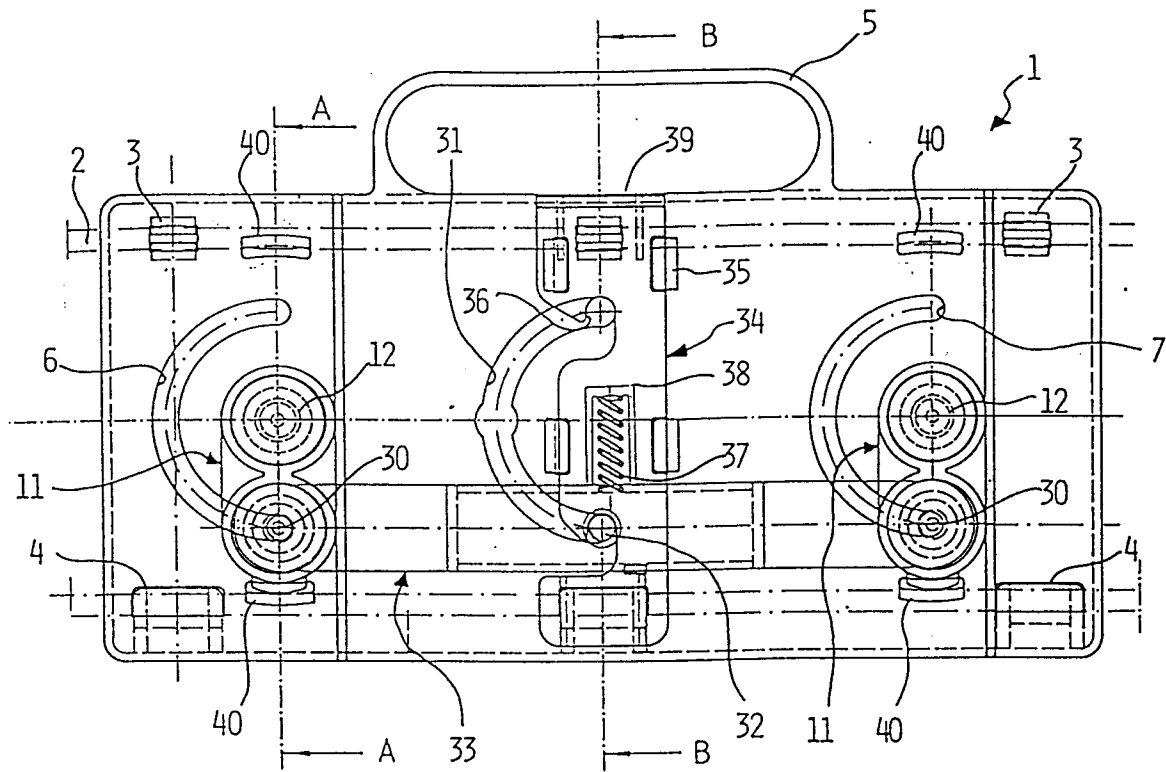


FIG. 9

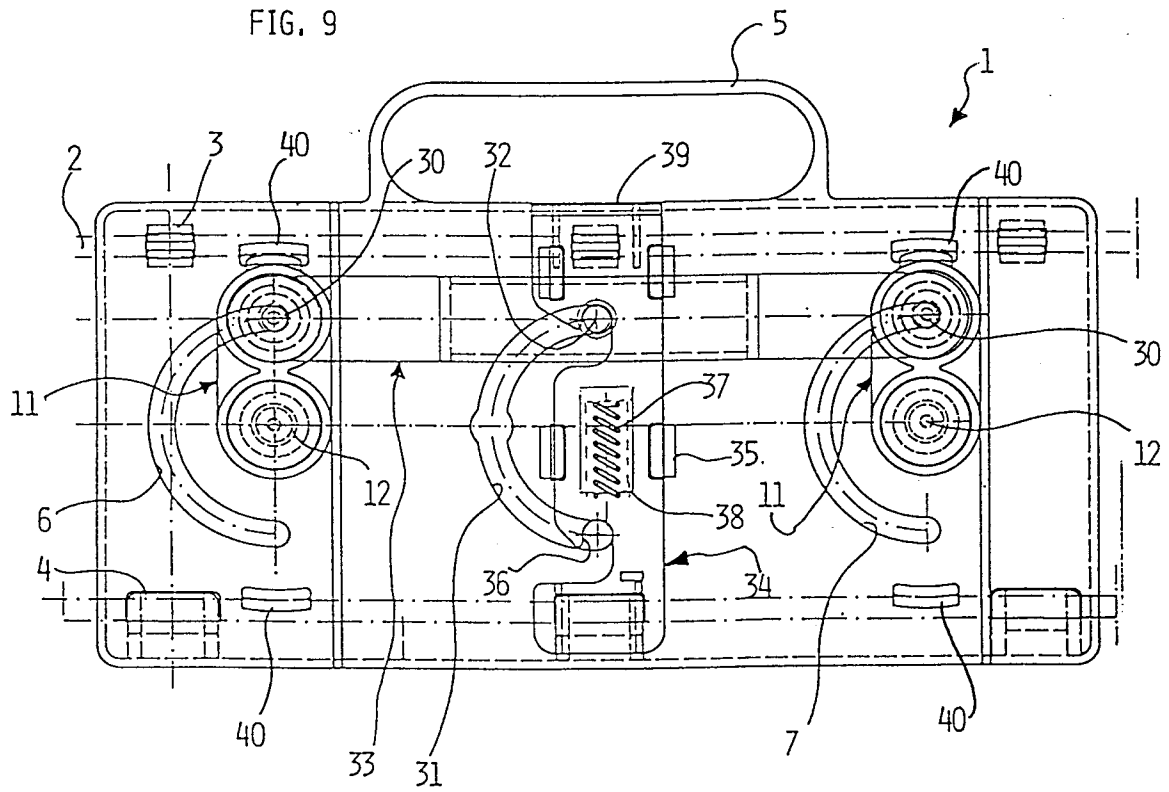


FIG. 10

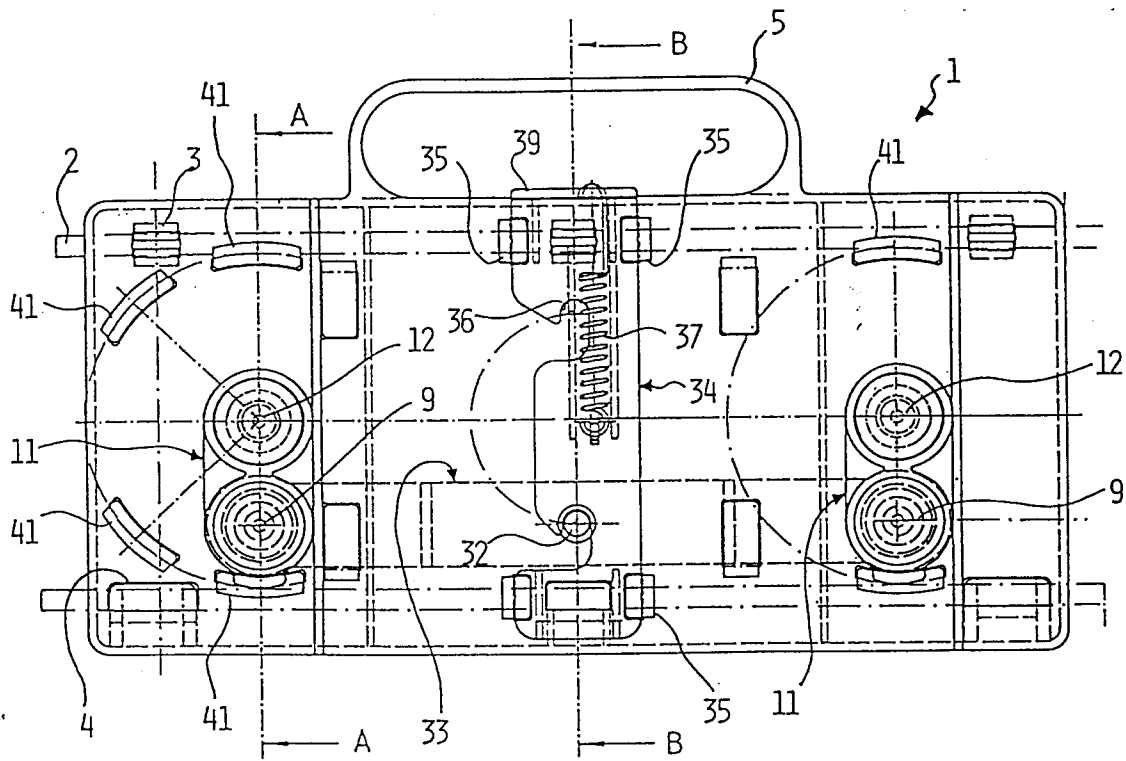


FIG. 11

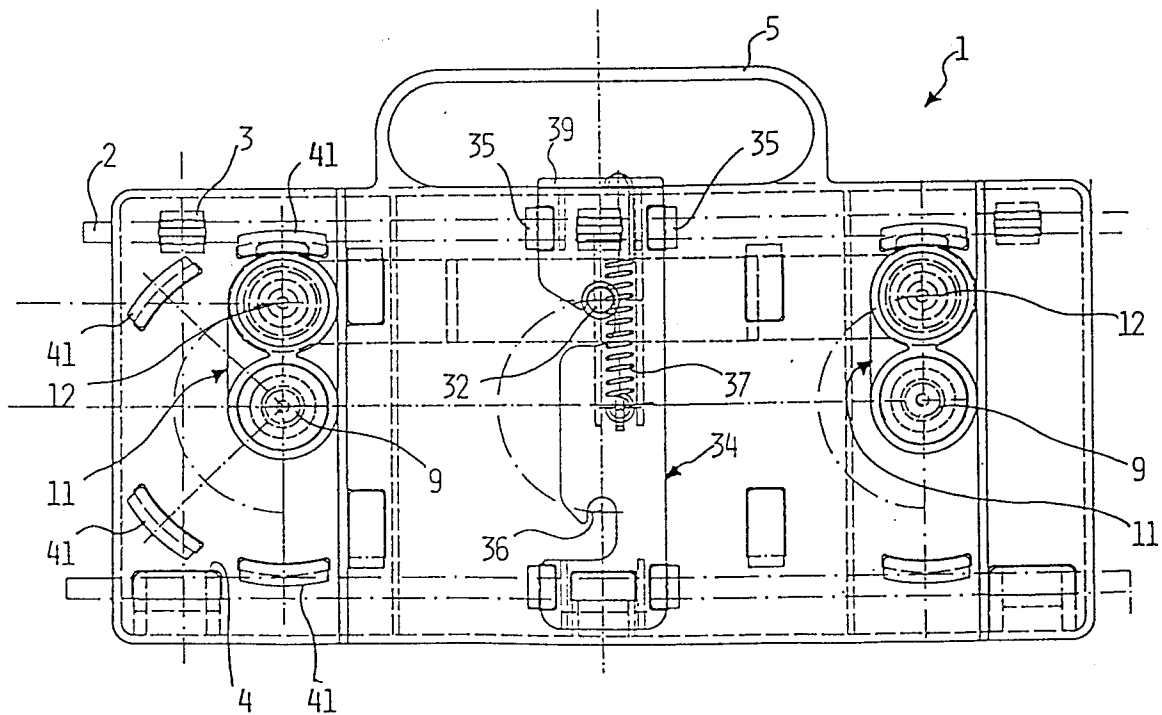


FIG. 12

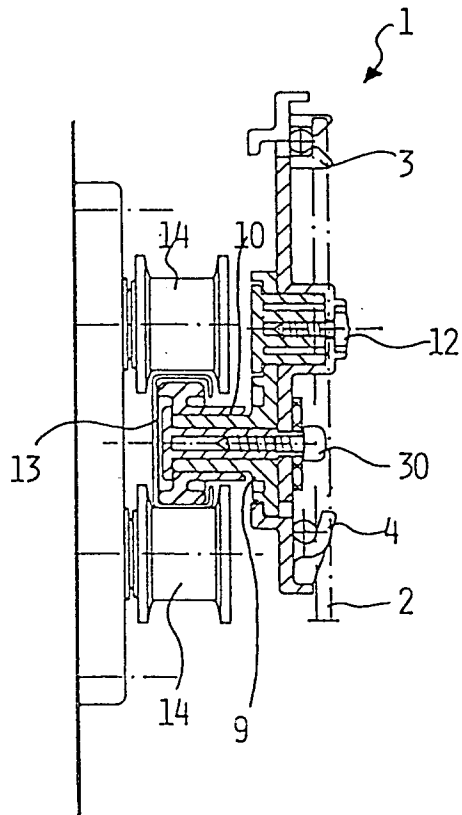


FIG. 13

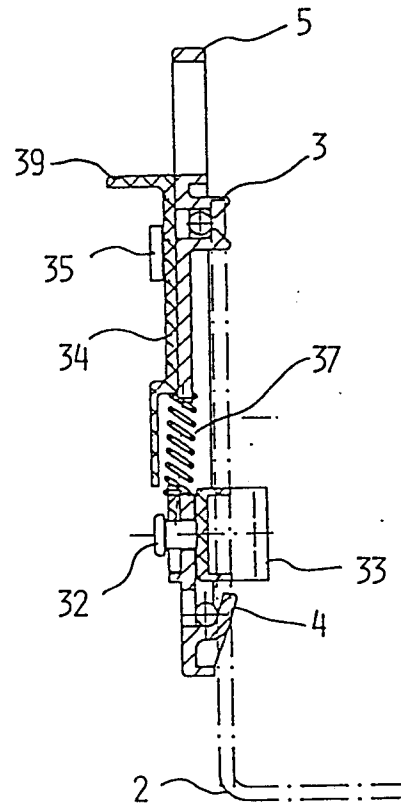


FIG. 14

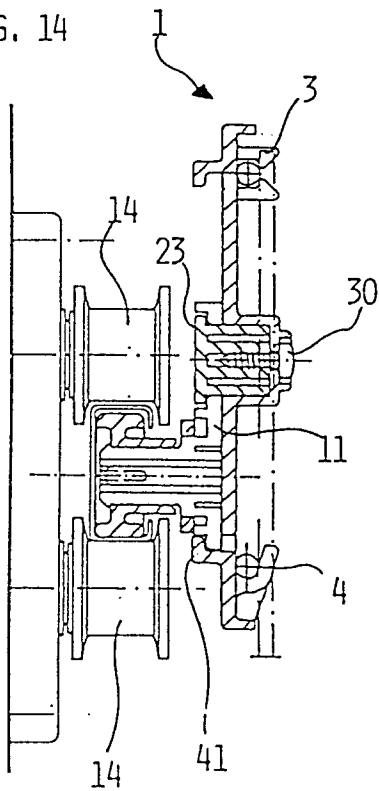


FIG. 15

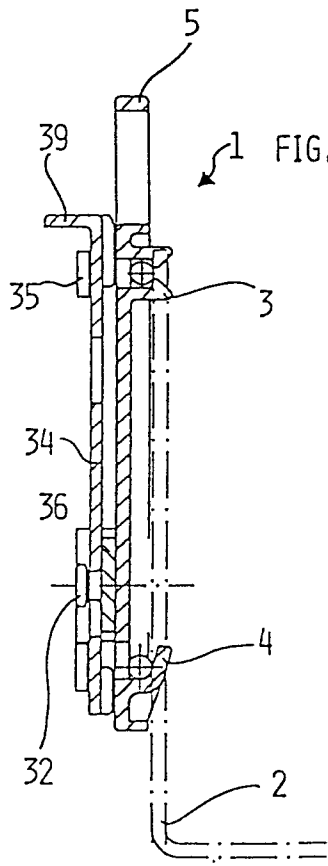
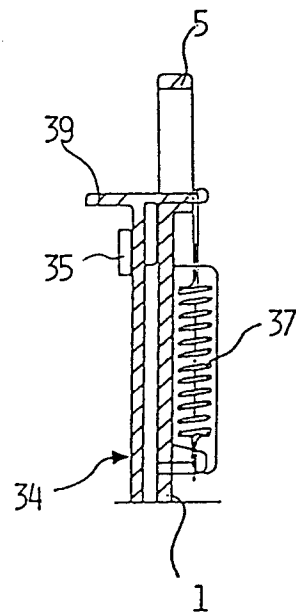


FIG. 16



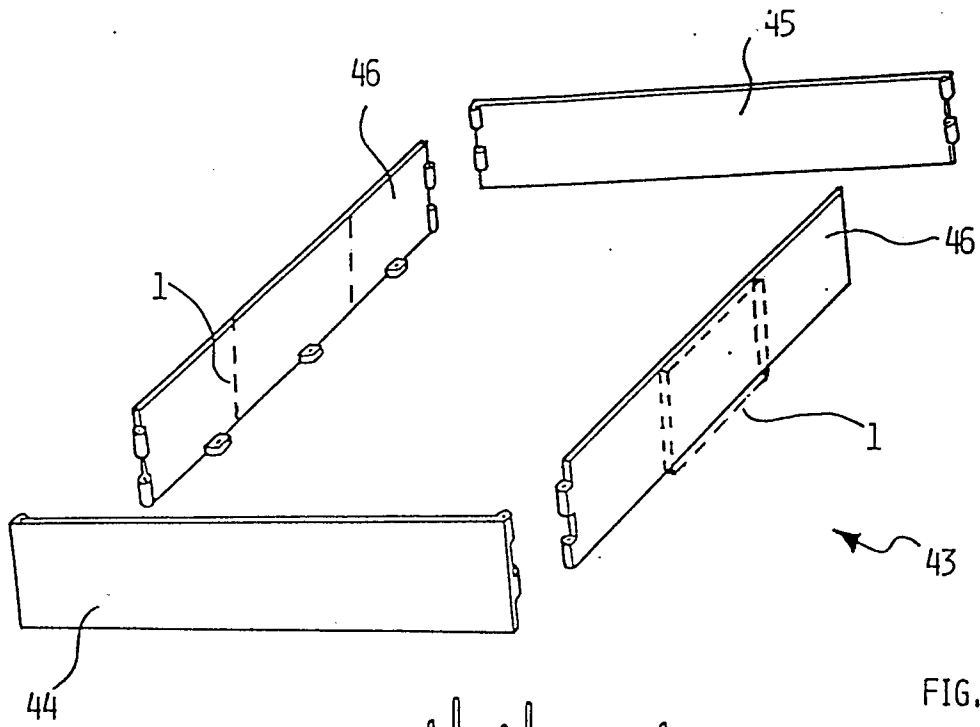


FIG. 17

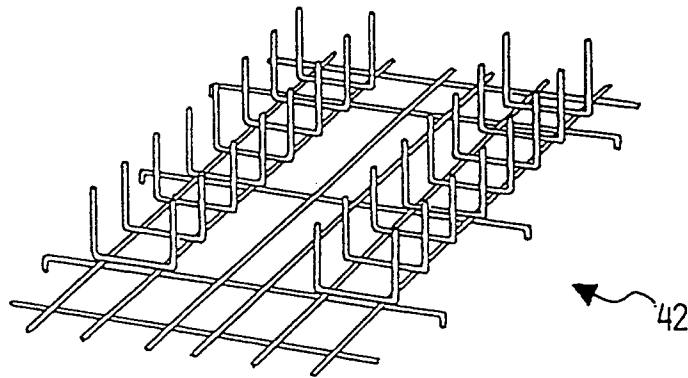


FIG. 18

