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(54) **Connecting member for modular components in construction games.**

(57) A connecting member for modular components (2, 3) in construction games is described. It comprises plate-like portions (5, 7) provided with through holes (6, 8) for enabling the engagement of first (2) and second (3) modular components by means of threaded elements (9a, 9b). Said plate-like portions (5, 7) exhibit the same width as the modular components and are provided with rim reliefs (10, 11) which, by abutting against the sides of the modular components (2, 3) prevent the latter from rotating.

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The present invention relates to a connecting member for modular components in construction games, of the type comprising: one plate-like portion provided with at least one through hole to allow the engagement of one modular component by means of threaded elements; and a second plate-like portion provided with at least a second through hole to allow the engagement of a second modular element by means of threaded elements.

It is known that there are construction games substantially comprised of a number of different modular components mostly consisting of rod-like elements and plates provided with holes spaced apart a predetermined distance from each other. These components lend themselves to be connected together, with the aid of threaded elements, according to the desired order to give rise to fancy constructions or models reproducing architectural structures, motor-vehicles, equipments or machineries existing in the real world.

The mutual connection between the different modular components is mostly carried out by exclusively adopting threaded elements operating through holes provided in the components themselves, the latter having been previously approached with the holes of two contiguous components in register with each other. This solution often gives rise to some problems due to the fact that, as the components need to be arranged in an approached relation, it is impossible to connect them consecutively while keeping them in the same lying plane. On the contrary, the components are always partly overlapped and mutually offset by an amount corresponding to their thickness.

In order to eliminate this drawback, additional connecting members are often used which are adapted to be connected, still by means of threaded elements, to the ends of rod-like or differently-shaped elements to be mutually joined. These connecting members which are made in different structural configurations, are also adapted to carry out the member connection according to different angles or at all events so as to meet particular mounting requirements.

It has been noted however that known connecting members exhibit some problems in terms of practical use in that for their fastening to any modular component the use of at least two bolts with the respective tightening nuts is required. In fact should only one bolt be employed, the two mutually connected parts would rotate with respect to each other about the bolt base.

The main object of the present invention is substantially to solve the problems of the known art by providing a connecting member which, being formed with different shapes to be used in turn depending upon requirements, is adapted to connect two modular components in the desired way

with the aid of only two bolts or equivalent threaded elements associated with respective tightening nuts.

Another object of the present invention is to provide a connecting member adapted to connect two modular components in such a manner that they lie in the same plane and keep a predetermined angle arrangement with respect to each other.

The foregoing and further objects which will become more apparent from the present description are substantially attained by a connecting member for modular components in construction games, characterized in that at least said first plate-like portion exhibits the same width as the first modular component and is provided with at least a rim relief projecting from the plate-like portion itself at right angles thereto and arranged to abut against one side of the modular component and prevent the rotation thereof about the axis of the threaded elements in the direction of said relief.

Further features and advantages will be best understood from the detailed description of some embodiments of a connecting member for modular components in construction games according to the present invention, given hereinafter by way of non-limiting example with reference to the accompanying drawings, in which:

- Fig. 1 is a perspective partly exploded view showing one embodiment of the present invention by which the connection of two rod-like modular components disposed consecutively is achieved;
- Fig. 2 is a perspective view of a second embodiment of the invention by which the mutual connection of two rod-like components capable of rotating about an axis at right angles to the axis of the threaded elements is achieved;
- Fig. 3 is a perspective and partly exploded view of a third embodiment of the invention by which the mutual connection of two rod-like components capable of rotating about an axis parallel to the axis of the threaded elements is achieved;
- Fig. 4 is a perspective and partly exploded view of a fourth embodiment of the invention by which the mutual connection of two rod-like components so as to form a right angle is achieved;
- Fig. 5 is a perspective and partly exploded view of yet another embodiment of the invention to be used for the engagement of a rod-like component to a plate-shaped component according to an angle of 90° ;
- Fig. 6 is an exploded perspective view of one embodiment of the connecting member to connect end to end two rod-like elements

disposed at 90° relative to each other;

- Fig. 7 is an exploded perspective view of still another embodiment of the connecting member for connecting two rod-like elements at an angle of 90° .

Referring to the drawings, a connecting member for modular components in construction games in accordance with the invention has been generally identified by reference numeral 1.

The connecting member is designed to carry out a mechanical connection between one modular component 2 and a second modular component 3 which, as shown in Figs. 1 to 4, 6 and 7, can for example exhibit a rod-like configuration with a flattened section having predetermined width and thickness, or a plate-like configuration as shown with reference to the second component in Fig. 5. At all events, components 2, 3 are provided with a number of through holes 4 spaced apart from each other by the same predetermined distance.

The connecting member 1 comprises one plate-like portion 5 provided with one through hole 6 and preferably having the same width as the first modular component 2, as well as a second plate-like portion 7 in turn provided with a second through hole 8 and preferably having the same width as the first plate-like portion 5. As can be easily understood from the accompanying drawings, the first and second plate-like portions 5, 7 can be connected to the first component 2 and the second component 3 respectively by means of threaded elements 9a, 9b which operate through the through holes 6, 8 and 4 formed in the plate-like portions and at the ends of the modular elements.

In an original manner, in accordance with a preferred embodiment of the invention, at least one plate-like portion 5 is provided with two rim reliefs 10 projecting at right angles from the plate-like portion itself and arranged such as to engage the first component 2 at the opposite sides 2a thereof. In this manner the rim reliefs 10 advantageously prevent the component 2 to be subjected to rotating about the axis of the threaded elements 9a, 9b, once it has been engaged with the connecting member 1. It is to be noted that a sole rim relief can be provided as well, in which case the rotation of component 2 is prevented in the way of the relief only.

As can be easily understood from a comparison of the accompanying figures, the plate-like portions 5 and 7 can be mutually connected according to different modalities, depending upon the type of connection it is wished to accomplish between the modular components 2, 3.

In the embodiment shown in Fig. 1, the first plate-like portion 5 and second plate-like portion 7 are disposed in coplanar relation with respect to

each other with an interruption therebetween. Advantageously, also the second plate-like portion 7 which exhibits the same width as the first plate-like portion 5 or at all events a width equal to that of the second component 3, is provided with a pair of second rim reliefs 11 projecting at right angles from the opposite sides thereof. As previously said with reference to the first rim reliefs 10, the second reliefs 11 as well are adapted to engage the second component 3 at the opposite sides 3a thereof, in order to prevent the same from carrying out angular rotations about the axis of the threaded elements 9.

With the aid of the connecting member shown in Fig. 1 it is possible to connect the modular components 2, 3 one after the other, in a coplanar relationship. This can be advantageously achieved by the use of only two bolts, identified at 9a, and corresponding tightening nuts 9b. In the embodiment shown in Fig. 2, instead, the plate-like portions 5, 7 are consecutively disposed and linked to each other by a pivot 12, at the respective opposite ends so that they can rotate with respect to each other according to an axis at right angles to the axes of the threaded elements 9a, 9b. In this case as well the second plate-like portion 7 has the same width as the first plate-like portion 5 and is provided with second rim reliefs 11 projecting from the opposite sides thereof, in the same manner as the first rim reliefs 10.

It is clear that by adopting this solution it is possible to consecutively connect two modular rod-like components 2, 3 at the respective ends offering them the possibility of rotating relative to each other according to an axis parallel to their lying planes.

Also in this case the action of the rim reliefs 10, 11 on the sides 2a, 3a of the modular components 2, 3 enables the mutual connection of the latter to be achieved by the use of only two bolts 9a and respective tightening nuts 9b while the modular components are prevented from rotating about the axes of the respective threaded elements.

Referring now to Fig. 3, in the embodiment shown the plate-like portions 5, 7 are mutually connected at the respective opposite ends so that they can rotate relative to each other according to an axis parallel to the axes of the threaded elements 9a, 9b. To this end, the first plate-like portion 5 is preferably provided with a pivot 13 divided into four sectors 13a which are elastically deformable and adapted to be snap-fitted, by means of coupling lugs 13b exhibited by each sector 13a, in a corresponding housing formed at one end of the second plate-like portion 7. The plate-like portions 5, 7 are also provided with opposite collars 14 extending concentrically with the pivot 13 and act-

ing against each other so that the plate-like portions 7 are spaced apart, with reference to their lying plane, by an amount equal to the thickness of the modular components 2, 3 to be connected.

In this case as well the plate-like portions 5, 7 have the same width which is coincident with the width of the modular rod-like components 2,3.

In addition, both plate like-portions 5, 7 are provided with rim reliefs 10, 11 projecting according to respectively opposite directions. The connecting member 1 according to the above shape can advantageously connect, still by the use of only two bolts 9a and respective tightening nuts 9b, two modular components 2, 3 in such a manner that they can be held in coplanar relation and take different angular positionings while moving in the same lying plane.

In the embodiment shown in Fig. 4 the connecting member 1 is such arranged that it can connect two rod-like components 2, 3 according to a mutual 90° orientation. To this end the plate-like portions 5, 7 having the same width as the modular components 2, 3 and both provided with the rim reliefs 10, 11 are rigidly connected so as to form a right angle. The fastening of components 2, 3 to the connecting member 1 takes place, in this case too, through two bolts 9a and respective tightening nuts 9b engaged in the region of holes 4, 6 and 8 formed at the ends of the modular components 2, 3 and on the plate-like portions 5, 7.

The connecting member 1 shown in Fig. 5, on the contrary, allows the connection at a right angle between one modular rod-like component 2 and a second modular plate-like component 3. To this end the plate-like portions 5, 7 are rigidly connected in the same manner as described with reference to Fig. 4 but in this case the second plate-like portion 7 is devoid of the respective rim reliefs 11 which enables it to correctly act in abutment against the surface of the second component 3. At all events the second plate-like portion 7 should preferably have the same width as the first plate-like portion 5. This expedient advantageously enables a rigid connection, still with the aid of a sole bolt 9a, between the connecting member viewed in Fig. 5 and another connecting member identical with it or similar to one of the embodiments referred to in Figs. 1 to 4. Actually, the second plate-like portion 7 of the connecting member shown in Fig. 5 is adapted to be fitted, in place of a rod-like component 2 or 3, between the rim reliefs 10 or 11 belonging to another connecting member.

In the example shown in Fig. 6 the connecting members 1 are such arranged that they can connect end to end the first component 2 and the second component 3 disposed at an angle of 90° relative to each other. Said connecting members, suitably shaped depending upon requirements, are

disposed parallelly and close to each other, being spaced part by an amount corresponding to the thickness of the modular components 2, 3. To this end the plate-like portions 5 and 7 are of one piece construction so that they can define a containing plate 15, whereas the connecting member 1 is formed with a pair of such plates 15.

Advantageously the connecting member 1 is also comprised of at least one stop wall 16 and at least a second stop wall 17 disposed between the containing plates 15 and each designed to act in abutment against one side 2a, 3a of one of the modular components 2, 3 in order to define a predetermined mutual orientation therebetween. Preferably the stop walls 16, 17 also perform the function of rigidly connecting the containing plates 15.

In the embodiment shown in Fig. 6 the stop walls 16, 17 extend between two side edges 15a, 15b of the containing plates 15 and are provided to be oriented so as to form a right angle. In addition each stop wall 16, 17 appears offset relative to one of the through holes 6 and 8 belonging to each plate 15, by an amount equal to half the width of the corresponding modular component 2.

In this way, the stop walls 16, 17 are adapted to supply the modular components 2, 3 with an abutment housing, said modular components being introduced into the connection through the wide access opening 19 defined by the containing plates 15.

The presence of opening 19 also permits the modular components 2, 3 to be oriented, should the necessity arise, according to angles different from the one dictated by the stop walls 16, 17.

In the embodiment shown in Fig. 7 the connecting member 1 is particularly conceived to enable the first modular component 2 to be connected at right angles to the second modular component 3 starting from any point of the longitudinal extension thereof.

To this end between the containing plates 15 provision is made for a pair of first stop walls 16 parallel to and symmetrically disposed relative to holes 6 and 8 through which the threaded elements 7a, 7b engaging the first component 2 operate. In other words, the first stop walls 16 are so arranged that they act on the opposite sides of the first modular element 2 in order to fix it according to a predetermined orientation. Also provided are two second stop walls 17, each of them extending at right angles to one of the first stop walls 16, in alignment with the other second wall 17 and spaced apart therefrom. The second stop walls 17 are arranged so as to act in abutment along the side 3a of the second modular component 3, the modular components being therefore oriented at right angles relative to each other.

As can be seen from Fig. 7, preferably the containing plates 15 should be shaped so as to exhibit each a semicircular portion 20 to which the first and second stop walls 16 and 17 are fastened. This semicircular portion 20 has a base side 20a along which the second stop walls 17 are aligned, at the opposite ends thereof. The containing plates 15 are in addition provided with respective extensions 21 departing from a central area of the respective base sides 20a. Extensions 21 are designed to overlie the second modular component 3 at the opposite sides thereof and are provided with respective holes 8 enabling the engagement of the threaded elements 9a, 9b.

The present invention attains the intended purposes.

As a matter of fact, the inventive connecting member exhibits construction expedients capable of enabling two modular components to be connected with the aid of only two bolts and respective tightening nuts, independently of the connection type to be achieved. In this regard attention must be drawn to the fact that, in the known art, any connection of the modular components by intermediate connecting members needed the help of at least four bolts and respective tightening nuts.

In addition it is to be pointed out that the connecting member in question enables two or more modular components to be connected while keeping them in the same lying plane and defining a predetermined mutual orientation of the components themselves without requiring the use of additional elements as in the known art.

Finally, it is to be said that the connection in question advantageously occurs with the aid of a sole bolt 7a and respective tightening nut 7b for each modular component 2, 3.

Obviously many modifications and variations can be made to the invention as conceived, all of them falling within the scope of the inventive idea as defined in the appended claims.

Claims

1. A connecting member for modular components in construction games, comprising: one plate-like portion (5) provided with at least one through hole (6) to allow the engagement of one modular component (2) by means of threaded elements (9a, 9b); and a second plate-like portion (7) provided with at least a second through hole (8) to allow the engagement of a second modular component (3) by means of threaded elements (9a, 9b), characterized in that at least said first plate-like portion (5) exhibits the same width as the first modular component (2) and is provided with at least a rim relief (10) projecting from the plate-like portion (5) itself at right angles thereto and arranged to abut against one side (2a) of the modular component (2) and prevent the rotation thereof about the axis of the threaded elements in the direction of said relief (10).
2. A connecting member according to claim 1, characterized in that the second plate-like portion (7) has the same width as the second modular component (3) and is provided with at least two rim reliefs (11) projecting at right angles from the opposite sides of the second plate-like portion (7) for engagement with the second modular component (3) at the opposite sides thereof.
3. A connecting member according to claim 1, characterized in that the second plate-like portion (7) has the same width as the first plate-like portion (5).
4. A connecting member according to claim 1, characterized in that the first and second plate-like portions (5, 7) are rigidly and unitary connected to each other and disposed in coplanar relation.
5. A connecting member according to claim 1, characterized in that the first and second plate-like portions (5, 7) are rotatably connected to each other according to an axis at right angles to the axes of the threaded elements (9a, 9b).
6. A connecting member according to claim 1, characterized in that the first and second plate-like portions (5, 7) are rotatably connected to each other according to an axis parallel to the axes of the threaded elements (9a, 9b).
7. A connecting member according to claim 6, characterized in that said plate-like portions (5, 7) lie in planes which are mutually offset by an amount equal to the thickness of said modular components (2, 3), said second plate-like portion (7) being provided with respective rim reliefs (11) oriented in an opposite direction relative to the rim reliefs (10) of the first plate-like portion.
8. A connecting member according to claim 1, characterized in that said first and second plate-like portions are rigidly and unitary connected to each other and define a single containing plate (15), said connecting member being formed with a pair of containing approached plates (15) disposed in parallel relation and spaced apart from each other by a distance equal to the thickness of said modular compo-

nents (2, 3), said containing plates (15) being connected by at least one stop wall (16) and at least a second stop wall (17), each of them being arranged so as to be brought into abutment against one side of one of said modular components (2, 3) which are fitted between said containing plates. 5

9. A connecting member according to claim 8, characterized in that said stop walls (16, 17) are so arranged that they come into abutment with said modular components (2, 3) when the latter are oriented according to a 90° angle. 10

10. A connecting member according to claim 1, characterized in that said stop walls (16, 17) extend along two edges of said containing plates (15), an access opening for the modular components to be fitted between the containing plates being formed on the sides of said plates which are not engaged by said stop walls (16, 17). 15 20

11. A connecting member according to claim 8, characterized in that disposed between the containing plates (15) are one pair of parallel stop walls (16), designed to act on the opposite sides of the first modular element (2) in order to fix it according to a predetermined orientation, and a second pair of stop walls (17) each of them extending at right angles from one of the first stop walls (16), in alignment with the other one (17) of the second stop walls and spaced apart therefrom, said second stop walls (17) being arranged so as to come into abutment with the second modular component (3), along one side thereof in order to keep it oriented relative to the first modular component (2) in accordance with a predetermined orientation. 25 30 35 40

12. A connecting member according to claim 11, characterized in that said containing plates (15) are so shaped that they exhibit respective semicircular portions (20) carrying the stop walls (16, 17) and designed to receive the first modular component (2) in engagement, said semicircular portions (20) having respecting base sides from a central area of which respective extensions (21) between which the second modular component (3) is fitted, depart. 45 50

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FIG. 1

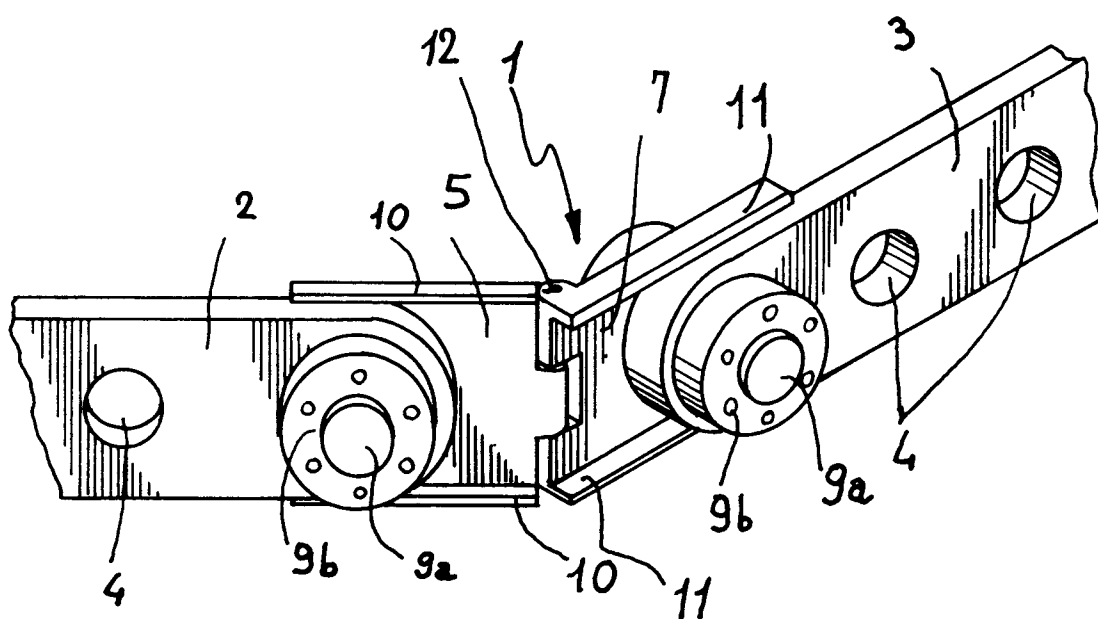
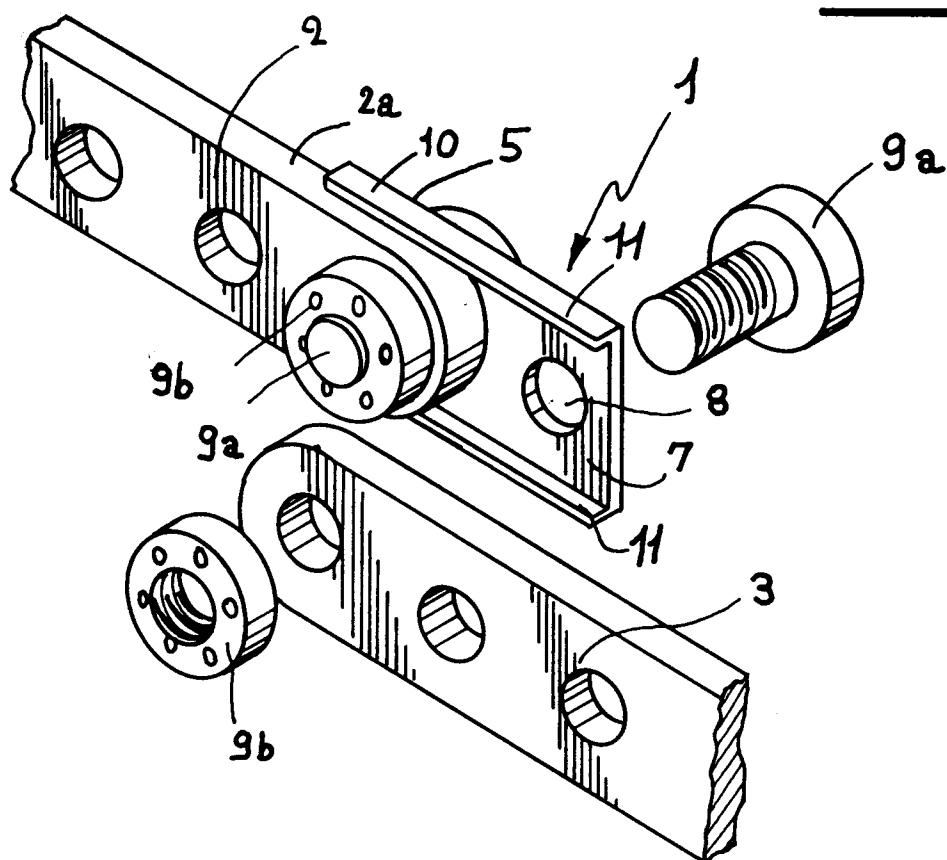


FIG. 2

FIG. 3

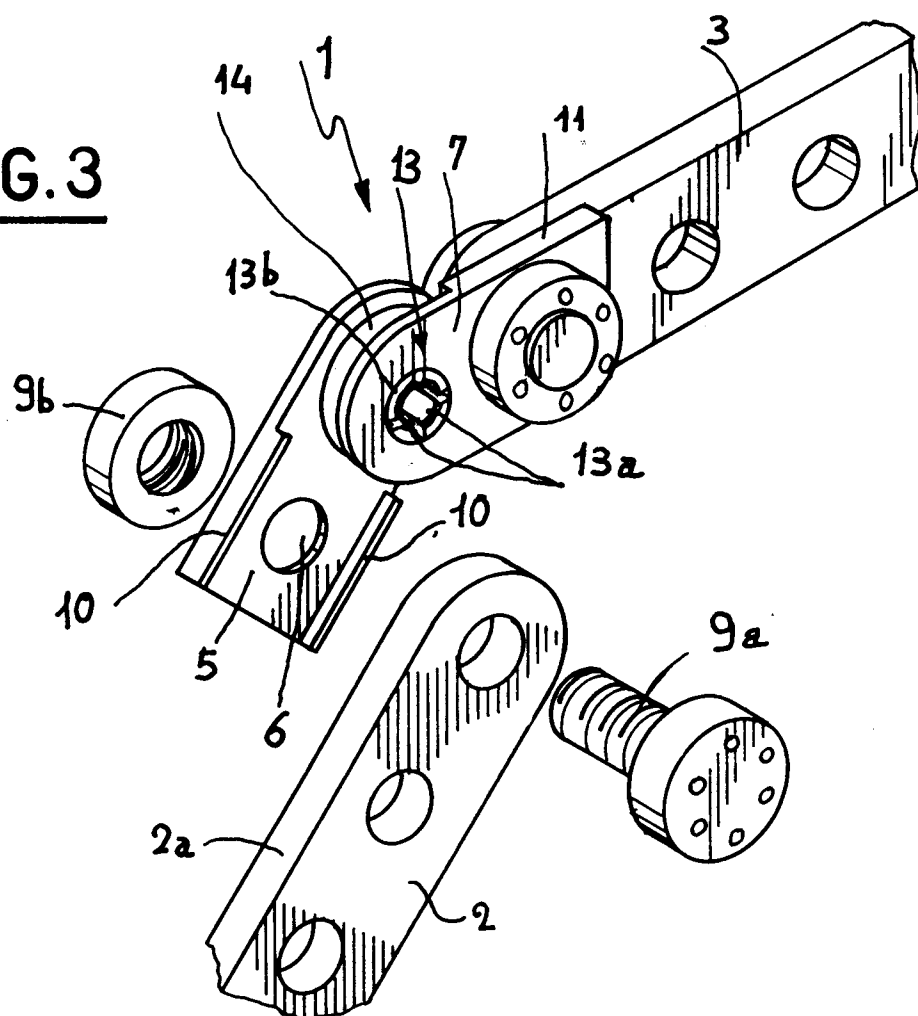
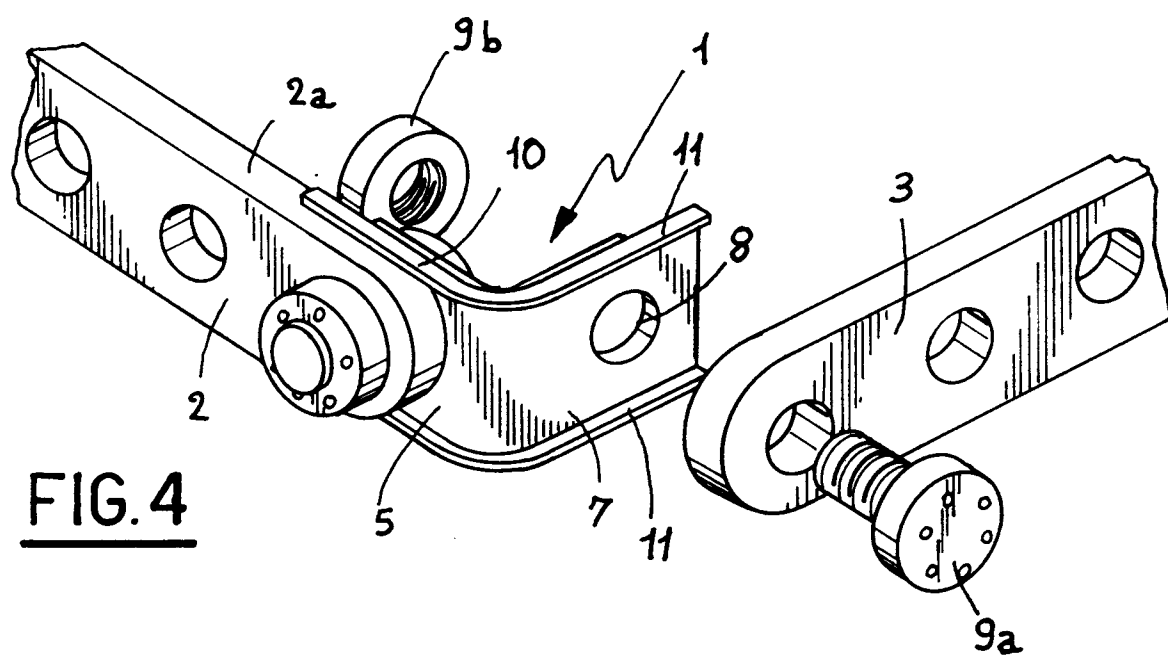


FIG. 4



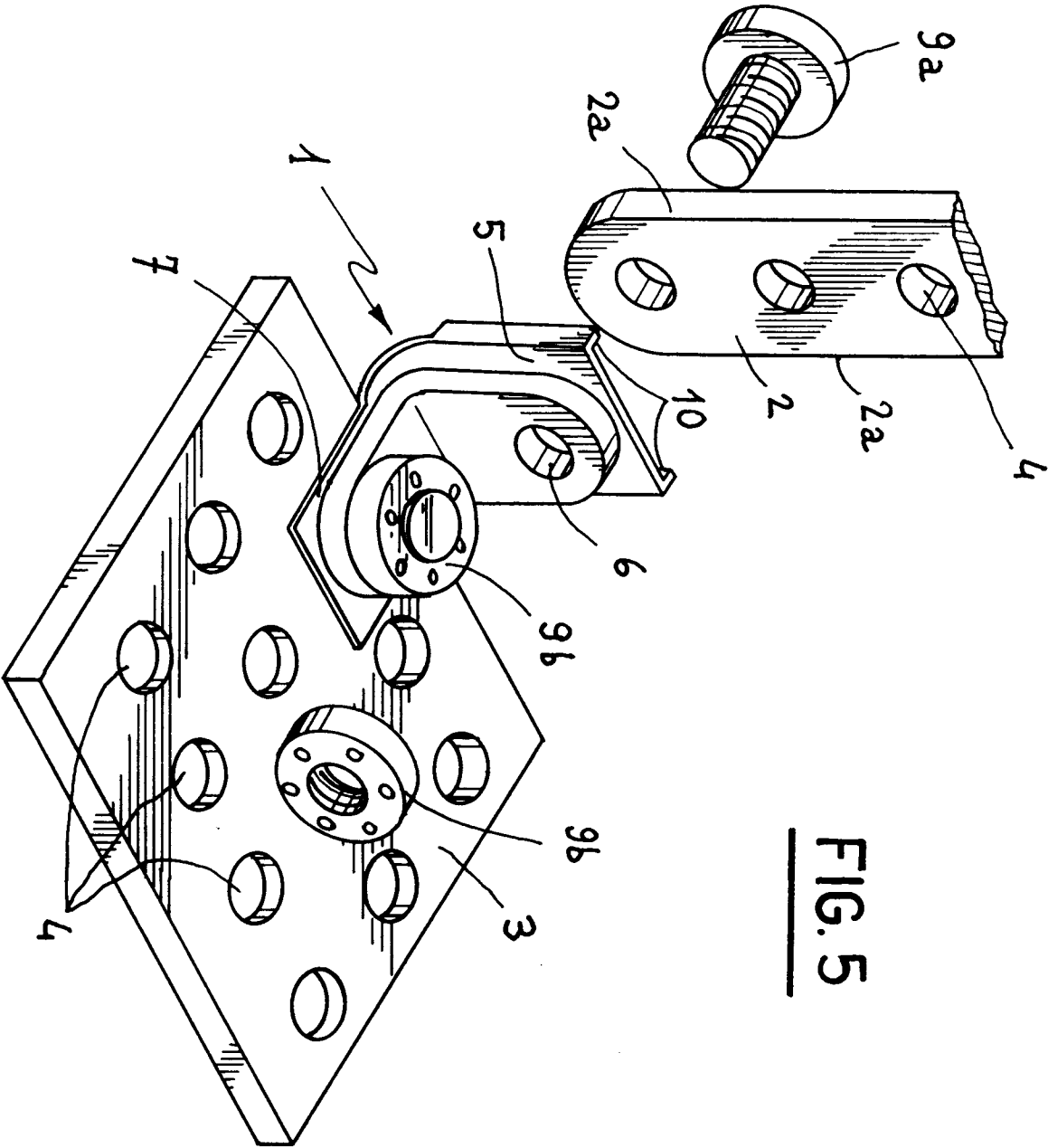


FIG. 5

FIG. 6

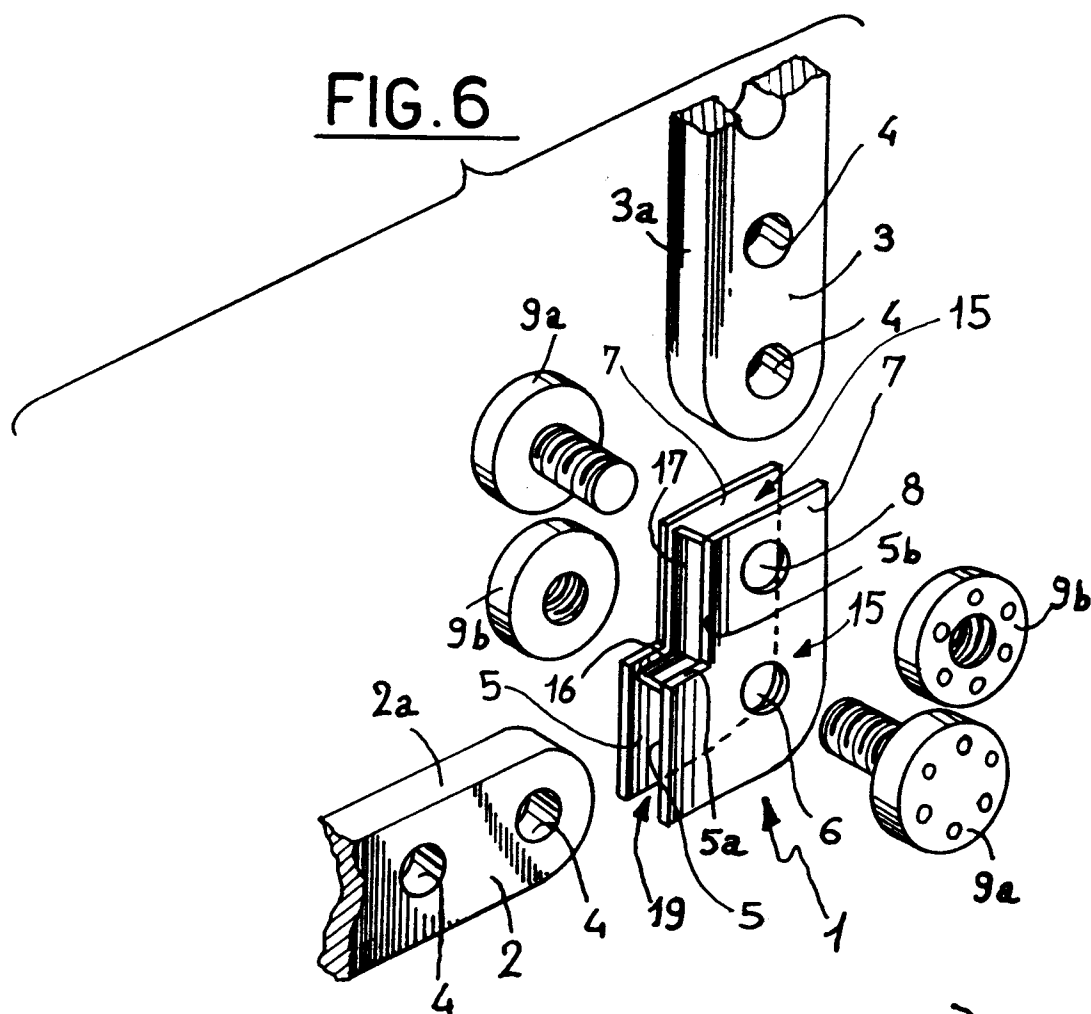
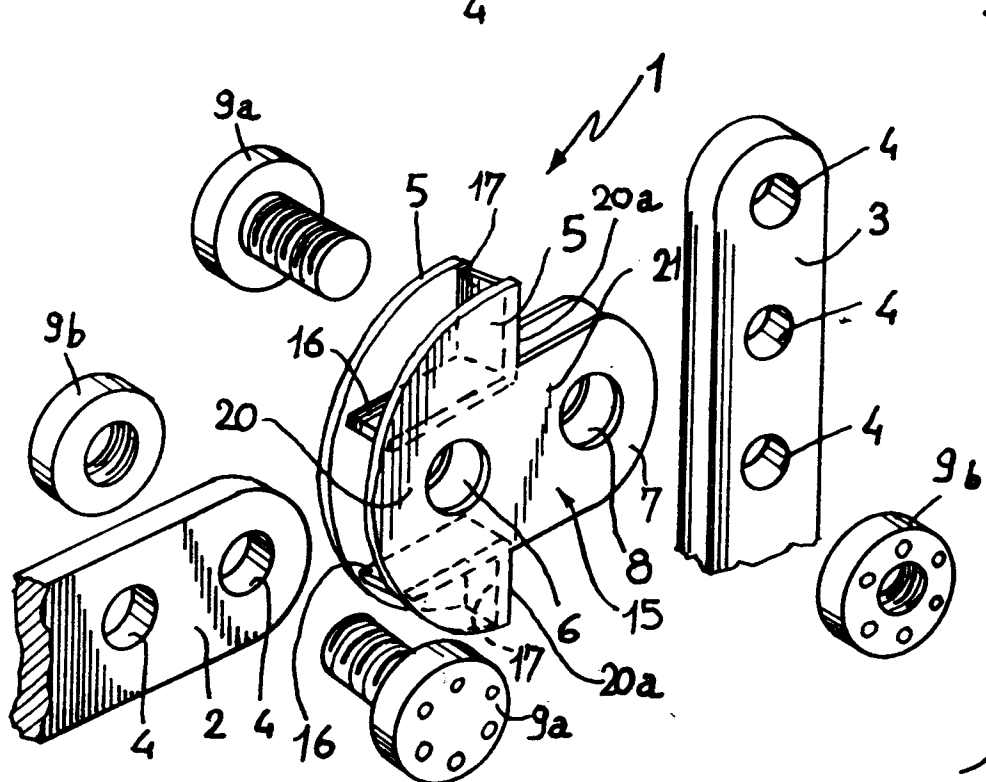


FIG. 7





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