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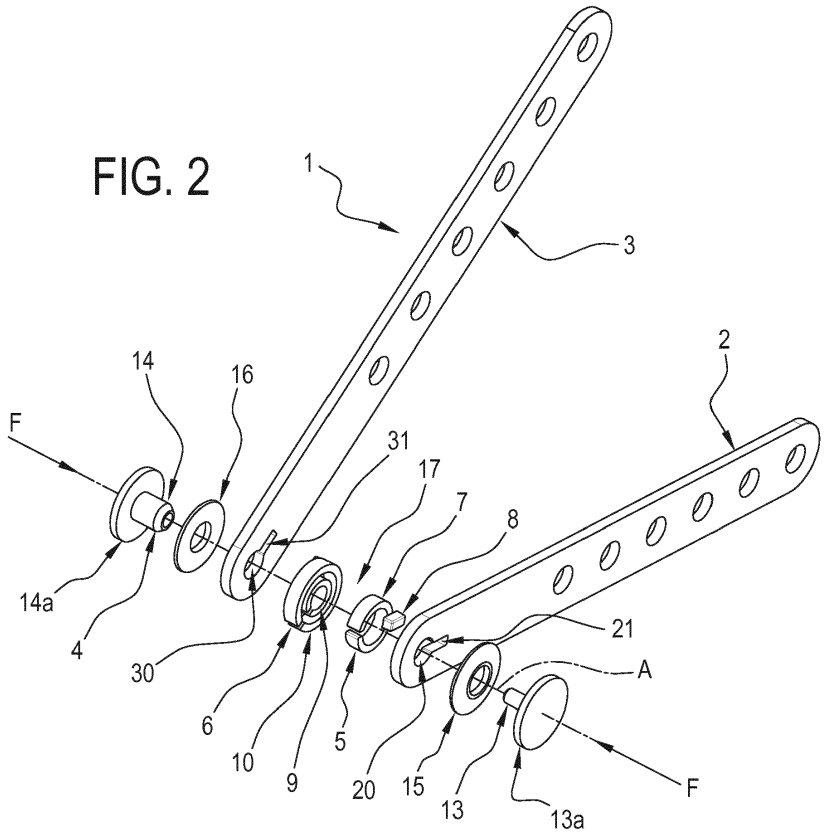
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(54) **ARTICULATED STRUCTURE**

(57) Described is an articulated structure comprising a first element (2) and a second element (3) which are pivoted to each other by means of a pin (4) to make the first and the second elements (2, 3) movable relative to each other in tilting fashion around a predetermined axis of rotation (A), friction means (17) operatively positioned between the first and second element (2, 3) to obstruct the reciprocal rotation.

FIG. 2



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Description

[0001] This invention relates to an articulated structure.

[0002] More specifically, this invention relates to an articulated structure equipped with a friction member.

[0003] Yet more specifically, this invention relates to an articulated structure equipped with a friction member and integrated in lighting structures, such as spotlights and lighting projectors.

[0004] In the production of a lighting system which comprise a multiplicity of spotlights or the like, for example inside a store or a display area, the spotlights are usually inserted in rectilinear guides which simplify both the positioning that the powering. Once positioned, the spotlights must then be oriented to direct the light beam in the desired direction.

[0005] In order to allow this orientation, the spotlights are usually connected to the guide by supports, such as arms or articulated arms.

[0006] The supports, although they provide a certain versatility in the orientation of the spotlights, are not free from drawbacks.

[0007] A first drawback consists in the fact that many of these supports have friction connections and joints for friction which must therefore be loosened before the adjustment and subsequently tightened once the desired configuration has been identified.

[0008] Moreover, the mechanical means designed for the above-mentioned tightening by friction are often bulky and not always pleasing in appearance.

[0009] A further drawback connected to the use of the supports of known type is due to the fact that sometimes the spotlight is not easily accessible, thereby making the above-mentioned loosening and tightening operations even more difficult..

[0010] Moreover, the supports of know type are often mechanically complex, costly and difficult to manufacture.

[0011] The aim of this invention is to provide an articulated model which is able to overcome the drawbacks of the prior art and which is at the same time practical to use and simple to make.

[0012] A further aim of this invention is to provide an articulated structure which is easy to adjust and which is stable in its configuration.

[0013] A further aim of this invention is to provide an articulated structure which is inexpensive to make.

[0014] Another aim of the invention is to provide a method for assembling an articulated structure which is simple and practical to implement.

[0015] The technical features of the invention, with reference to the above aims, are clearly described in the claims below and its advantages are more apparent from the detailed description which follows, with reference to the accompanying drawings which illustrate a preferred, non-limiting embodiment of the invention by way of example and in which:

- Figure 1 is a schematic side elevation view of a preferred embodiment of an articulated structure according to this invention;
- Figure 2 is an exploded schematic view of the articulated structure of Figure 1;
- Figure 3 is schematic rear elevation view of the articulated structure of Figure 1;
- Figure 4 is a cross section view through the line IV-IV of Figure 3;
- Figure 5 is a partly exploded schematic view of the articulated structure of the preceding drawings;
- Figure 6 is a schematic perspective view of a detail of the articulated structure of the preceding drawings.

[0016] As illustrated in Figure 1, the numeral 1 denotes in its entirety an articulated structure made in accordance with this invention.

[0017] The articulated structure 1 according to the invention is advantageously used to support lighting devices, not illustrated, such as spotlights and the like.

[0018] With reference to Figures 1 and 2, the articulated structure 1 comprises a first element 2 with an elongate shape and a second element 3 also with an elongate shape.

[0019] The first and second elements 2, 3 are advantageously made of sheet metal.

[0020] According to different embodiments of the invention, not illustrated, the elements 2, 3 are made by casting, in configurations which are also not flat.

[0021] The two elements 2, 3 shown in the accompanying drawings are of equal length and substantially coincident.

[0022] Advantageously, the first and second elements 2, 3 are equal and interchangeable.

[0023] According to different embodiments of the invention, not illustrated, the elements 2, 3 have different lengths.

[0024] The above-mentioned first element 2 and second element 3 are pivoted to each other by a pin 4, shown in Figure 4.

[0025] The pivot pin 4 makes the first and second elements 2, 3 movable relative to each other in a tilting fashion about a predetermined axis of rotation A, coinciding with a central axis of the pin 4.

[0026] As shown in Figure 2, at the relative longitudinal ends close to the pivot, the two first and second elements 2, 3 have respective circular through holes 20, 30 designed to allow the insertion of the pin 4.

[0027] A respective rectangular cavity 21, 31, extending in a radial direction, originates from each of the holes 20, 30.

[0028] As illustrated in Figure 2, the articulated structure 1 comprises, operatively positioned between the two first and second elements 2, 3, a first friction member 5 with a circular extension and a second friction member 6 with a circular extension.

[0029] With reference in particular to Figure 6, the first

friction member 5 comprises an annular C-shaped wall 7. In other words, the annular wall 7 has the form of a cylindrical ring without an axial extension portion.

[0030] The first friction member 5 also comprises a tab 8 protruding in an axial direction from the annular wall 7 and integral with the latter.

[0031] The tab 8, as clearly shown in Figures 2 and 3, is configured to be inserted in the respective cavity 21 which is exactly shaped to match, for making the first friction member 5 integral with the first element 2 relative to the rotation of the latter about the axis A.

[0032] With reference in particular to Figures 2, 4 and 6, the second friction member 6 comprises two concentric annular walls 9, 10, respectively smaller and larger, both C-shaped.

[0033] Exactly as described above with reference to the first friction member 5, the two smaller and larger annular walls 9, 10 both have the shape of a cylindrical ring without a portion with axial extension.

[0034] The second friction member 6 also comprises a tab 11 protruding in an axial direction from the annular walls 9, 10 and integral with them.

[0035] More specifically, the tab 11 rigidly connects the two smaller and larger annular walls 9, 10, guaranteeing also their concentricity.

[0036] The tab 11 is configured to be inserted in the respective cavity 31 which is exactly shaped to match, for making the section friction member 6 integral with the second element 3 relative to the rotation of the latter about the axis A.

[0037] The above-mentioned first and second friction members 5, 6 interpenetrate with each other in the direction of the predetermined axis of rotation A.

[0038] As illustrated in Figure 5, the annular wall 7 of the first friction member 5 is inserted between the two smaller and larger annular concentric walls 9, 10 of the second member 6, in a concentric fashion.

[0039] In short, due to the rotation restriction by the tabs 8, 11, a reciprocal rotation of the elements 2, 3 about the predetermined axis A will result in a reciprocal rotation also of the respective first and second friction members 5,6.

[0040] Under these circumstances, the mutual rubbing of the cylindrical surfaces of the annular walls 7, 9, 10 facing each other generates respective friction forces which therefore tend to obstruct the above-mentioned rotation.

[0041] The expression "cylindrical surfaces" is used to mean the approximately cylindrical inner and outer faces (apart from, that is, the missing portion) of the annular walls 7, 9, 10 of the friction members 5, 6.

[0042] In use, for the purposes of assembling the articulated structure 1, use is made of a rivet 12 for clamping all the components of the articulated structure 1 in a pack.

[0043] Advantageously, the rivet 12 is of the expansion type and comprises a male element 13 and a female element 14, both these male and female elements 13, 14 having respective heads 13a, 14a.

[0044] The rivet 12 defines, with its elements 13, 14, the above-mentioned pivot pin 4.

[0045] More specifically, as illustrated in Figures 2 and 4, the two first and second friction members 5, 6 interpenetrate with each other in such a way that their axial dimension reduces to that of only one of the two, after which the respective tabs 8, 11 are inserted in respective cavities 21, 31 of the first and second elements 2, 3, located with the holes 20, 30 coaxial with each other and the annular walls 7, 9, 10.

[0046] Two Belleville springs 15, 16 are positioned outside the first and second elements 2, 3, coaxial with the holes 20, 30.

[0047] The Belleville springs 15, 16 usefully perform the purpose of eliminating any possible axial clearances in the assembly of the articulated structure 1.

[0048] The above-mentioned Belleville springs 15, 16 are interposed between a respective head 13a, 14a of the rivet 12 and the outer surfaces of the first and second elements 2 and 3.

[0049] Lastly, as clearly illustrated in Figure 4, the two elements 13, 14 which make up the rivet 12, are positioned with the male element 13 inserted inside female element 14.

[0050] The female element 14 is positioned with a relative outer cylindrical surface facing an inner cylindrical surface of the smaller annular wall 9 of the second friction member 6.

[0051] The tightening in a pack by the rivet 12 is advantageously actuated by a compression of the two elements 13, 14 in the direction of the axis of rotation A, as indicated by the arrows F in Figure 2; this compression is achieved with a suitable press not illustrated.

[0052] This compression, on the basis of the operating principle of the rivet 12, determines a radial expansion of the rivet 12, the expansion of which is transmitted to the adjacent smaller annular wall 9.

[0053] Thanks to the relative "C" shape, the smaller annular wall 9 acts like a spring, deforming elastically when opening and transmitting in turn the deformation to the adjacent annular wall 7 of the first friction member 5.

[0054] Similarly, the annular wall 7 of the first friction member 5 deforms elastically and transmits the relative deformation to the larger annular wall 10 which in turn will undergo any elastic deformation.

[0055] The described succession of deformations therefore brings the surfaces in contact with the annular walls 7, 9, 10 to generate a mutual rubbing together, at a rotation of the elements 2, 3, which generates respective friction forces resulting from the above-mentioned rotation.

[0056] The above-mentioned first and second friction members 5, 6 thus define, for the articulated structure 1, respective friction means 17 which are operatively positioned between the first and second elements 2, 3 to obstruct the reciprocal rotation.

[0057] The above-mentioned rivet 12, with its male and female elements 13, 14 and Belleville springs 15, 16 de-

fine, in their entirety for the articulated structure 1, respective means 18 for clamping in a pack, in the direction of the predetermined axis of rotation A, the first and second elements 2, 3 and the first and second friction members 5, 6 interposed between them.

[0058] The invention also relates to a method for assembling an articulated structure and comprises a plurality of steps.

[0059] A first step consists in preparing a first element 2 and a second element 3 with an elongate shape which are pivoted to each other by means of a pin 4, to make the first and the second elements 2, 3 movable relative to each other in tilting fashion around a predetermined axis of rotation A.

[0060] A subsequent step comprises preparing a first friction member 5 with a circular extension, which is integral in rotation with one of the above-mentioned first and second elements 2, 3, and a second friction member 6 with a circular extension, which is integral in rotation with the other of the above-mentioned first and second elements 2, 3, with the first and second friction members 5, 6 interpenetrating with each other in the direction of the predetermined axis of rotation A.

[0061] The method according to the invention therefore requires positioning an expansion rivet 12, passing centrally inside the first and second friction members 5, 6, and pressing the expansion rivet 12 to close the articulated structure 1 tightly in a pack and to radially force the friction members 5, 6 so as to increase the friction force generated on respective surfaces in mutual contact.

[0062] Advantageously, the friction members 5, 6 are made by casting, and are preferably made of zama.

[0063] This invention achieves the preset aims and brings important advantages.

[0064] The articulated structure 1 according to the invention is exceptionally compact at the pivot and the friction members have a limited size.

[0065] Moreover, the articulated structure 1 does not require any adjustment in use of the friction force which is determined in advance also as a function of the diameter of the rivet which can also vary as a function of the load which the articulated structure 1 is designed to support.

[0066] Experimentally, by means of special duration tests, it has been seen that the friction action between the friction members 5, 6, thanks to the forced clamping actuated by means of expansion rivets, is particularly durable over time.

Claims

1. An articulated structure comprising

- a first element (2) and
- a second element (3), which are pivoted to each other by means of a pin (4) to make the first and the second elements (2, 3) movable relative to each other in tilting fashion around a predetermined axis of rotation (A),
- friction means (17), which are operatively positioned between the first and second elements (2, 3) to prevent the reciprocal rotation of them, **characterised in that** the friction means (17) comprise a first friction member (5) with a circular extension, which is integral in rotation with one of the first (2) and second (3) elements, and a second friction member (6) with a circular extension, which is integral in rotation with the other of the first (2) and second (3) elements, the first and second friction members (5, 6) being at least partly fitted together in the direction of the predetermined axis of rotation (A) and configured to have respective cylindrical portions in mutual contact.

2. The articulated structure according to claim 1, **characterised in that** the first and second friction members (5, 6) are interposed between the first and second elements (2, 3) in the direction of the predetermined axis of rotation (A).

3. The articulated structure according to claim 1 or 2, **characterised in that** the first friction member (5) comprises an annular wall (7) and the second friction member (6) comprises two annular walls (9, 10), respectively small and large, which are concentric to each other, the annular wall (7) of the first member (5) being configured to be at least partly inserted between the two concentric annular walls (9, 10) of the second element (6), concentrically to them.

4. The articulated structure according to claim 3, **characterised in that** the annular walls (7, 9, 10) of the first and second friction members (5, 6) are C-shaped.

5. The articulated structure according to claim 3 or 4, **characterised in that** the first friction member (5) comprises a tab (8) protruding in an axial direction from the space of the annular wall (7), which is integral with it and extending radially, the tab (8) being configured to be inserted into a relative matching cavity (21) made in the first element (2) to make the first friction member (5) integral in rotation with the first element (2).

6. The articulated structure according to any of claims 3 to 5, **characterised in that** the second friction member (6) comprises a tab (11) protruding in an axial direction from the space of the of the small and large annular walls (9, 10), which is connected to both of the small and large annular walls (9, 10) and extending radially, the tab (11) being configured to be inserted into a relative matching cavity (31) made in the second element (3) to make the second friction

member (6) integral in rotation with the second element (3).

7. The articulated structure according to any one of the preceding claims, **characterised in that** it comprises means (18) for closing the first and second elements (2, 3) and the first and second friction members (5, 6) interposed between them tightly in a pack, in the direction of the predetermined axis of rotation (A).

8. The articulated structure according to claim 7 when it depends on claim 3, **characterised in that** the closing means (18) comprise an expansion rivet (12), which passes through the inside of the small annular wall (9) of the second friction member (6) and is configured to radially force the small annular wall (9).

9. The articulated structure according to claim 8, **characterised in that** the closing means (18) comprise at least one Belleville spring (15, 16) interposed between a head (13a, 14a) of the rivet (12) and one of the first and second elements (2, 3).

10. The articulated structure according to claim 8 or 9, **characterised in that** the rivet (12) comprises a male element (13) and a female element (14), both the male and female elements (13, 14) having respective heads (13a, 14a).

11. The articulated structure according to any of claims 8 to 10, **characterised in that** the rivet (12) defines the fulcrum pin (4) of the first and second elements (2, 3).

12. The articulated structure according to any one of the preceding claims, **characterised in that** the first and second elements (2, 3) have an elongate shape.

13. A method of assembling an articulated structure comprising the steps of:

- preparing a first element (2) and a second element (3), which are pivoted to each other by means of a pin (4) to make the first and the second elements (2, 3) movable relative to each other in tilting fashion around a predetermined axis of rotation (A),
- preparing a first friction member (5) with a circular extension, which is integral in rotation with one of the first and second elements (2, 3), and a second friction member (6) with a circular extension, which is integral in rotation with the other of the first and second elements (2, 3), the first and second friction members (5, 6) being at least partly fitted together in the direction of the predetermined axis of rotation (A),
- positioning an expansion rivet (12) passing centrally through the inside of the friction members (5, 6) with a circular extension,
- pressing the expansion rivet (12) to close the articulated structure tightly in a pack and to radially force the friction members (5, 6) so as to increase the friction force generated on respective surfaces in mutual contact.

FIG. 1

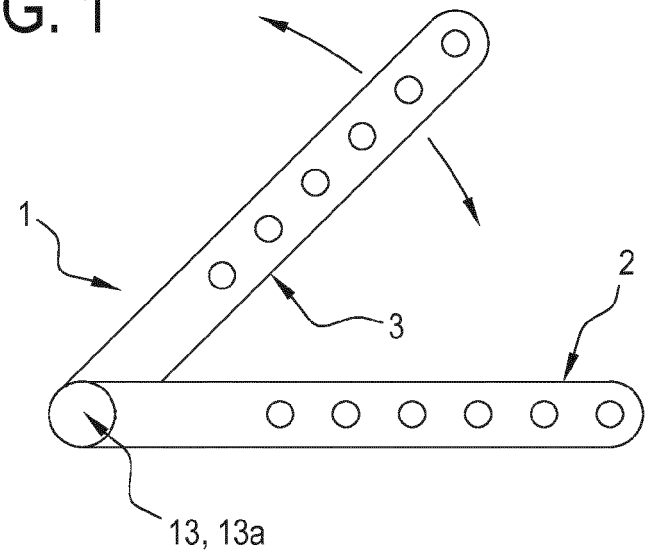


FIG. 2

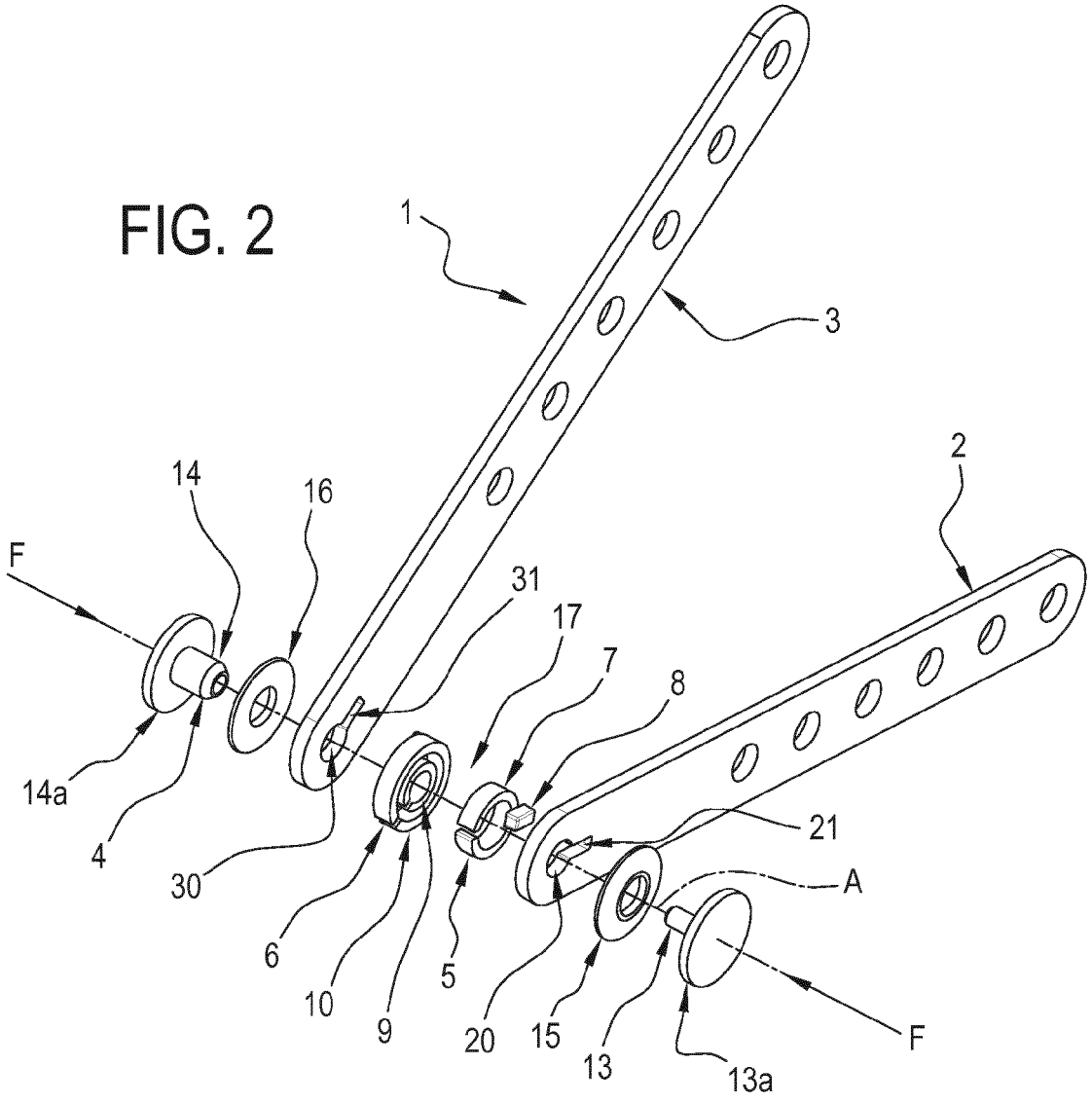


FIG. 3

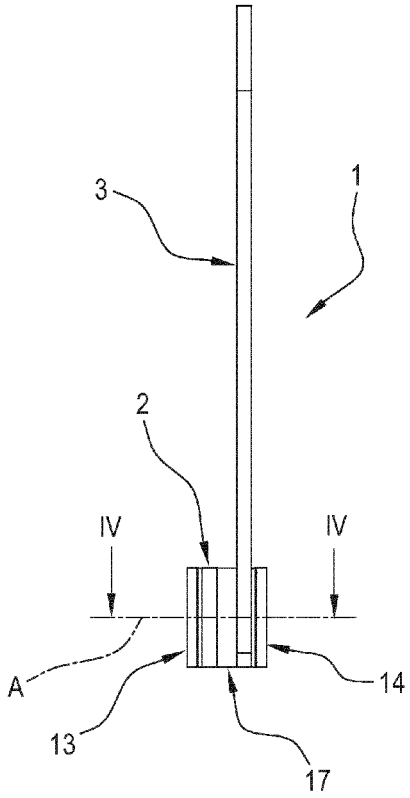


FIG. 4

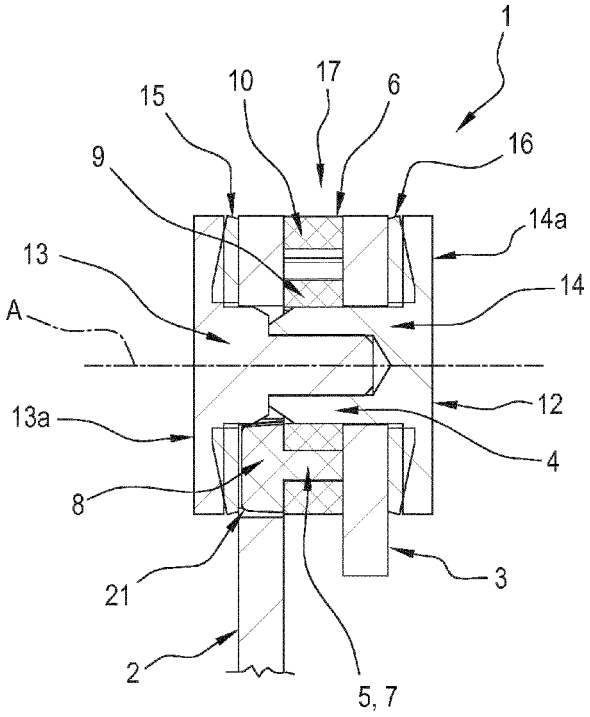


FIG. 5

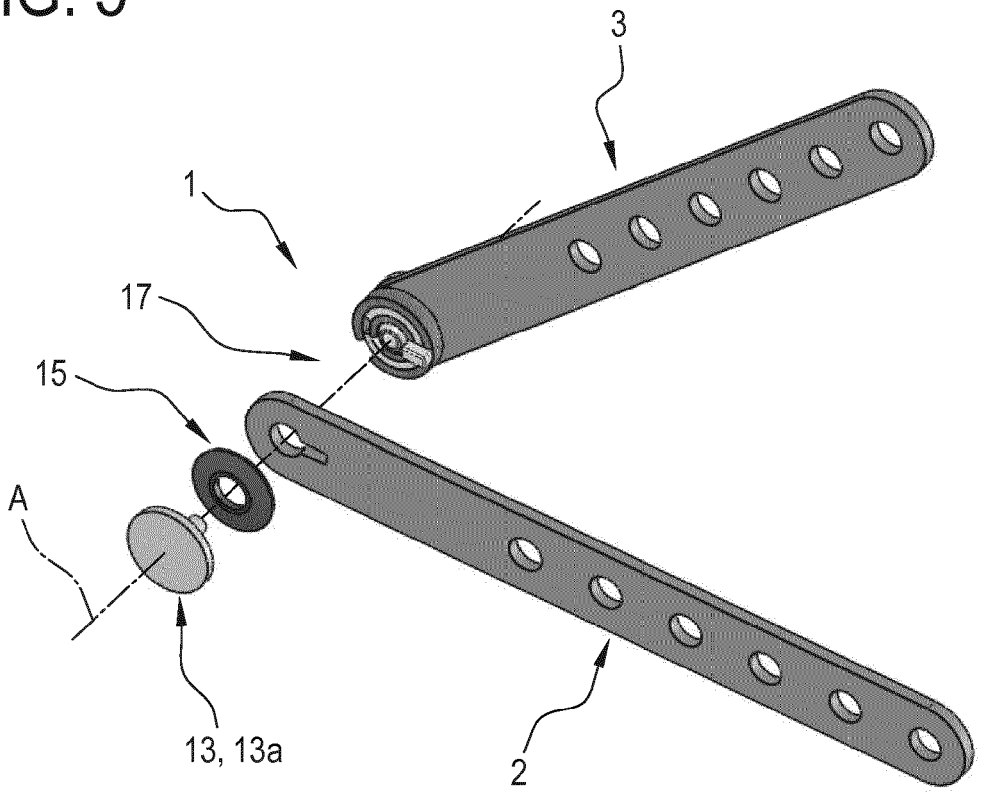
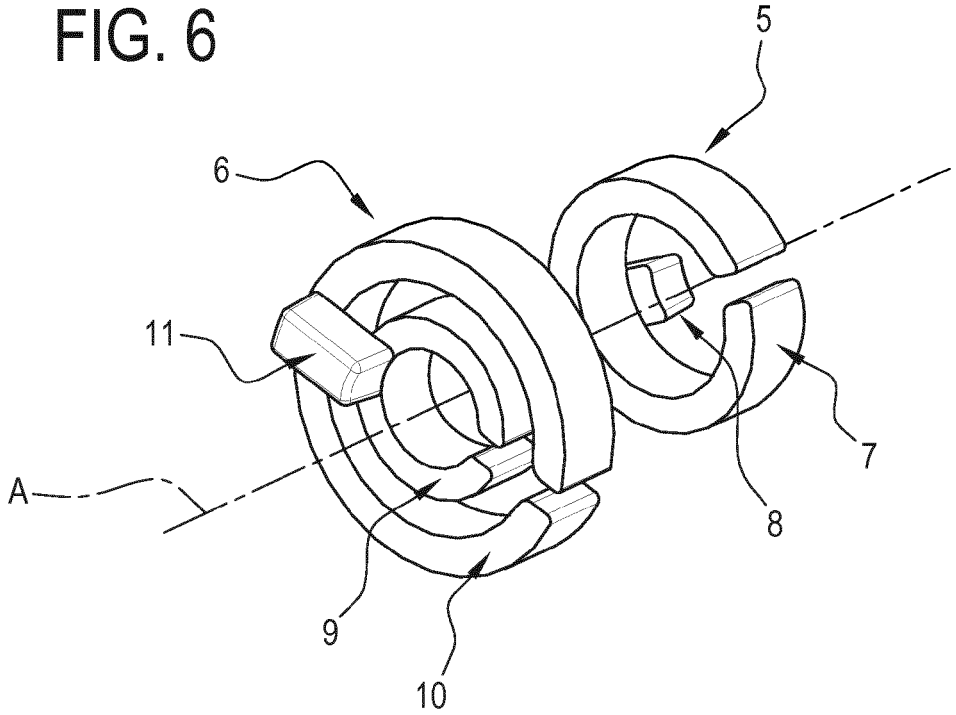


FIG. 6



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EUROPEAN SEARCH REPORT

Application Number
EP 17 16 5928

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 334 417 C (HELMHOLZ & PAULI) 17 March 1921 (1921-03-17) * the whole document *	1,2,7,12	INV. F21V21/26
X	US 2006/096444 A1 (SATO NAOKI [JP] ET AL) 11 May 2006 (2006-05-11) * paragraph [0022] - paragraph [0040] * * figures 1-4 *	1,2,7,12	
A	DE 10 90 759 B (HILLEBRAND EGON) 13 October 1960 (1960-10-13) * the whole document *	1-13	

TECHNICAL FIELDS SEARCHED (IPC)

F21V
F16M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	7 June 2017	Demirel, Mehmet

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07-06-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 334417 C	17-03-1921	NONE	
US 2006096444 A1	11-05-2006	JP 4313329 B2	12-08-2009
		JP 2006154716 A	15-06-2006
		US 2006096444 A1	11-05-2006
DE 1090759 B	13-10-1960	NONE	

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