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(54) **Canopy structure**

(57) A canopy structure comprising a cloth (100) and a frame (101) supporting the cloth, which frame comprises a first (3) rod as well as a number of second rods (4), which are at least almost all hingedly connected at their one end to central hinge means (8,11) and which extend from the central hinge means in various substantially radial directions and are directed substantially transversely to the first rod and are connected at their other end by means of a circumferential belt to each other, at least one selected second rod being distinguished from the other second rods in that a first end

thereof is separately slideable along the first rod from a position in which the selected second rod is substantially unloaded by normal forces, to a tensioned position which is located nearer but not beyond the dead centre, the collapse or pass-through position, which is, for instance, determined by a plane through the second ends of three of the second rods, in which tensioned position the radial distance between both ends of the selected second rod is enlarged, in which moreover means are present for fixing the first end of the selected second rod with regard to the first rod in the tensioned position.

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Description

The invention relates to a canopy structure with a frame supporting a cloth. Suchlike structures can have the shape of a canopy such as an umbrella or a parasol, there then being a central rod, or can be tent-shaped, in which case there will usually be several support poles at the corners of the tent.

It is desirable for suchlike canopy structures that after erection they are taut. An object of the invention is to provide a canopy structure with which this can easily be achieved.

In accordance with the invention a canopy structure is provided for that purpose, comprising a cloth and a frame supporting the cloth, which frame comprises a first rod as well as a number of second rods, which are at least almost all hingedly connected at their one end to central hinge means and which extend from the central hinge means in various substantially radial directions and are directed substantially transversely to the first rod and are connected at their other end by means of a circumferential belt to each other, at least one selected second rod being distinguished from the other second rods in that a first end thereof is separately slidable along the first rod from a position in which the selected second rod is substantially unloaded by normal forces, to a tensioned position which is located nearer but not beyond the dead centre or the collapse or pass-through position, which is, for instance, determined by a plane through the second ends of three of the second rods, in which tensioned position the radial distance between both ends of the selected second rod is increased, in which moreover means are present for fixing the first end of the selected second rod with regard to the first rod in the tensioned position.

When erecting the canopy structure of the invention one can first of all bring the other second rods in their end position, in the course of which they can to a certain degree tension the circumferential belt, which can be in the shape of a line or can also be integrated in the cloth, or at least bring it to its ultimate location, after which tensioning the circumferential belt can easily take place by sliding the end, which is located there, of the selected second rod which is substantially radially extending from the first rod, along the first rod, which end is finally fixed in the tension position. The final tensioning thus takes place by increasing the circumference of the circumferential belt, by sliding up the first end of the selected second rod in a direction perpendicular to the plane in which the circumferential belt is located. The circumferential belt may be almost free of stretch. The movement of the first end of the selected second rod along the first rod when transferring it from the unloaded to the tension position is - with a view to attaining a certain tension in the circumferential belt - (a number of times) larger than the movement which the second rods would have to undergo if they were all jointly brought into the tension position. The distribution of the second rods in groups makes

for a lighter ultimate tensioning action.

Preferably the selected second rod is arranged for rotation in a plane which encompasses the first rod, during the movement of the first end of the selected second rod to the tensioned position.

In a first development of the canopy structure according to the invention the latter has the appearance of an umbrella or parasol. In that case the first end of the selected second rod is hingedly connected to the central hinge means.

Preferably cords extend between a first end of the first rod and the outer ends of the second rods. These cords are flexible and preferably made of almost stretch-free material. The cords serve to transmit pulling forces and are preferably formed by separate threads, but can, if so desired, alternatively be formed by seams in the cloth, if the latter is connected to the first end of the first rod. The selected second rod, the cord connected thereto and a portion of the first rod thus form a tension triangle, an vertex (the first end of the selected second rod) of which is moved to enlarge the side determined by the first rod, but at the same time another vertex (the second end of the said second rod) of which is moved outwards so as to tension the circumferential belt or to pull it taut.

In addition, it is advantageous if the selected second rod on the one hand and the other second rods on the other hand are connected to one or more separate central hinge means, respectively, which are hub-shaped, for instance, and are independently slidable along the first rod and can be fixed thereto. The user can easily engage the first hub or first hubs so as to thereby bring the other second rods into their end position, and then engage the selected second hub to bring this into the tensioned position. It is possible to fix the selected second hub indirectly onto the first rod, that is via the first hub. Alternatively, the first and the second hub can be fixed with regard to each other by means of a tensioning cord or by means of suitable snap connections.

The second hub can be provided with several selected second rods, so that two or three second rods will be brought into the tensioned position after the other second rods have been brought into the tensioned position, for instance.

Just as with a parasol the first rod can be provided at one end, the lower end, with means for support on a base or for connection to a fixed support. However, alternatively, it is also possible to have one of the remaining second rods, which is made extra rigid for that purpose, take over the support function. Then the first rod can be kept short. In that case that one second rod can then extend to outside the cloth for attachment to a support, so that an awning-like structure is, for instance, formed.

Preferably the central hinge means are located between the end of the first rod that supports the cords and the perpendicular projection of the second end of the

selected second rod on the first rod.

According to a second, further development of the canopy structure according to the invention the latter has the shape of a tent, in which the second end of the selected second rod is hingedly connected to the central hinge means.

In that case the second rods are preferably connected with their other end to poles, to which the first rod belongs. In this canopy structure sliding up the first end of the selected second rod along the first rod takes places on the outer side of the canopy structure.

In this canopy structure the second rods can form two groups which are connected with a same central hinge means, in which the second rods of the first group extend therefrom in a radially upwardly inclined manner to the poles and the second rods of the second group thereof extending therefrom in a radially downwardly inclined manner to the poles. In this case the said tension triangle is formed by a second rod of the first group, a second rod of the second group (in which one of both rods is the said second rod) and the first rod. From the point of view of ease of operation it is moreover preferable that the said second rod belongs to the second group.

The invention will now be elucidated on the basis of a number of illustrative embodiments shown in the accompanying drawings.

Fig. 1 shows a first embodiment of the canopy structure according to the invention, in the form of a parasol, in a collapsed state;

Fig. 2 shows the parasol of fig. 1 during unfolding and tensioning;

Fig. 3 shows the parasol of fig. 1 in a tensioned position;

Fig. 4 shows an alternative embodiment of a canopy structure according to the invention made as a parasol:

Fig. 5. shows another illustrative embodiment of the canopy structure according to the invention, in the shape of a tent, in a collapsed state;

Fig. 5A shows the construction of the central hinge of the tent of fig. 5;

Fig. 6 shows the tent of fig. 5 during folding out and tensioning thereof;

Fig. 7 shows the tent of fig. 5 in a tensioned position; and

Figs. 8A-8D show some applications of alternative embodiments of the canopy according to the invention.

In figure 1 the parasol 1 is shown, comprising a cloth 100, and a frame 101. The frame 101 comprises a central rigid tube 2, which can be placed in a conventional parasol holder. At the upper end the tube 2 is provided with a top hood 7 to which cords 6 are attached. The frame 101 further comprises a series of buckle-resistant rods 3 and a series of buckle-resistant rods 4. At their inner, first end the rods 4 are connected by means of conventional hinges 12 to hinge member 11, which are formed as a whole with hub 13. At their second end, their outer end, the rods 4 are attached to a flexible, barely stretchable circumferential thread 5 and to respective cords 6. By means of conventional hinge connections 9 the rods 3 are connected at their inner one end to hinge member 8, which is formed as a whole with hub 10, which is provided with a handgrip 19, and are attached at their other, outer end to the said circumferential thread 5. The hubs 10 and 13 are slidable over the tube 2. The buckle-resistant rods 3 and 4, which are preferably made of fibre glass, are secured against rotation in tangential direction in their hinge connections with the respective hubs.

The cloth 100 is attached in the middle to the top hood 7 and at the circumferential side to the flexible circumferential thread 5, and thus to the outer ends of the rods 3, 4.

The hub 10 is provided with a handgrip 20 (see figure 2) with which hub 10 can be pulled downwards, along the tube 2. The hub 10 is further provided with a clamping screw 18, the function of which is explained below.

When erecting the parasol the tube 2 will first of all have to be placed in a suitable holder. At the lower end the tube 2 can also be provided with a sharp point, so that the latter can be secured in a stable manner in a ground suited for it. Then the user engages the handgrip 19 in order to pull the hub 10 downwards, at most to the dead centre for the rods 3 extending to either side. There is a stopping edge 17 on the tube 2 to prevent the hub 10 being slid too far down, through the dead centre. With the help of the clamping screw 16 the hub 10 is fixed in position on the tube 2. The described action can be carried out effortlessly by the user, because the circumferential thread 5 will not be or will hardly be tensioned as the rods 4 will still be in the starting position. However, the rods 3 are already positioned in their end position.

Subsequently the tension cord 14 is engaged by the user, which tension cord is attached with one end to the hub 10 and passes upwards towards the hub 13 where it is turned about pulley guide 18 and then passes downward to a position where the tension cord 14 can be reached by the user. By pulling the tension cord 14 the hub 13 will move downwards in the direction A, until the hub 13 reaches the hub 10. Then there can be a snap connection between both hubs 10 and 13, but a cord clamp 15 can also be utilized to fix the tension cord in a tensioned position. The user can pull down the hub 13 without much difficulty and in a controlled manner. When

the hub 13 arrives at the hub 10 and is secured, the circumferential thread 5 will be tensioned. In doing this, the triangles 0 (see figure 3), each formed by a support thread 6, a rod 4 and an upper portion of the tube 2, are enlarged by moving the outer vertex, whilst rotating one side (the rods 4) and enlarging a side (the upper portion of the tube 2). On account of the division of the hub and thus bringing the hubs successively into a tensioned position, erecting the parasol is easier than if there were only one hub. Bringing the first hub 10 into a tensioned position will require scarcely any force. The second hub 13 will build up tension over a relatively large length - the stroke is longer in other words - whereby the force to be exerted for that purpose can remain relatively low, even approximately half the force which would be necessary if the hubs 10 and 13 were to be formed as a whole. The hub 13 can also be divided, in which case first the one rod 4 and then after that the other rod 4 is brought into the tensioned position. In that case the tensile force does not have to be generated until the latter rod 4 is operated.

It is noted that the rods of every pair 3, 3 and 4, 4 do not have to lie exactly in one plane with the axis of the rod 2. It is possible that the engaging points of two rods are located on both sides of the rod 2 on a same side of that rod, for instance in one tangential plane of the rod 2. Nor is necessary for the vertices of the canopy to lie in one plane: the lengths of the rods 4 can be different, for instance. Furthermore, both the hinge points of a hub can be spaced to some degree, as seen in the direction of the rod 2, in which case the rod has to take up a bending moment.

In the parasol 1 of the figures 1-3 use is made of a simple construction, which can be lightweight, simply erected and which can be brought to a high tension using relatively little force, in which large spans, for example 10 metres, are possible.

The rod 2 can be made shorter, even so short that the lower end comes to rest at a (slightly) higher position than the circumferential thread 5. A canopy is then obtained which can be placed on a base with the ends of two rods 3 and 4, for instance. With a number of suchlike canopies coupled to one another, a stable canopy wall can be speedily erected, which can be used in the case of road accidents, for example (figure 8A). In addition, suchlike canopies can be coupled to form a tent, with a canopy as upper panel and for instance two canopies as side panels (figure 8B). For greater stability the canopies, which are hingedly connected to one another at the location of their corners, are also connected to one another by means of connecting rods 45 which are hingedly attached with their ends to the central rods 2 of the canopies at the location of hinges 46. The structure can therefore hardly deform.

For coupling two canopies one or more of the rods 3 and 4 can be provided at their outer end with a coupling member, which can be coupled to a complementary coupling member on a rod of an adjacent canopy. The

coupling is preferably detachable. The coupling is in addition preferably formed as a hinge connection.

In particular with that sort of canopy it is advantageous if it can be collapsed into a position in which the rods are outside and the cloth is inside. This implies that when moving from the collapsed to the erected position and the tensioned position, the rods have to be tilted through the dead centre. For this purpose the hub (for example 13) to be tensioned later will have to be pushed sufficiently far from the other hub. For handling ease the first hub can then be fixed to the central rod 2. If it is desirable that the canopy is made more flat, by ensuring a relative small distance between the apex of the canopy and the plane through the vertices in a tensioned position, then passing or collapsing through is made possible in that at least one of the hinges 12 enables a rotation of the rod 4 through an angle much greater than 90° , for example around 180° . The rod 2 can then be tilted into a position shown in figure 8C. Hence the mutual distance between the ends of both rods 4 located at the rod 2 is reduced by S (the mutual distance between the hinge 12), whereby collapsing through is facilitated.

It is noted that with a sufficiently short rod 2 the cloth can be tensioned at the side of the hubs facing away from the top. The cloth can then coincide with the plane through the vertices of the canopy and be completely flat, so as to be used as projection screen, for example (Figure 8D).

In figure 4 an alternative embodiment of a parasol according to the invention is shown. The parasol 21, of which only the frame member is shown, does indeed comprise a central tube 22, but the latter is of a length limited to that which is needed for tensioning the parasol. Here too there are two hubs, indicated by numbers 70 and 73. Two rods 63a are hingedly connected to the hub 70 and three rods 64 are hingedly connected to the hub 73. The rods 63a, 63b and 64 are each connected to a circumferential thread 65, and each connected by means of support threads 66 to the top hood 67. The hub 70 is furthermore rigidly connected to an outer end of rigid bar 63b, which is inserted with its other end into a holder 60 attached to a wall 80.

When erecting the parasol 31 the handgrip 79 is pushed upward, as a result of which the tube 62 slides up in the hub 70 until a predetermined position has been reached, which can, for example, be fixed by means of a snap connection (not shown). Subsequently in the same way in which it is done with the parasol in figures 1-3, the hub 73 can be pulled downward in the direction of A until it arrives against the hub 70, after which the relative position of the hub 73 with regard to the tube 62 can be fixed using suitable means. In that case, too, the circumferential thread 65 will be tensioned, and the cloth, which is here also attached to the top hood 67 and to the circumferential thread 65, will be very taut.

In figure 5 the frame 31 for a tent structure is shown. The frame 31 is constructed of a central hinge 41 (see in particular figure 5A), which is in fact built up of two

plates forming a whole. At the location of the hinges 43a four rods 33a are hingedly attached to the upper plate and at the location of the hinges 43b four rods 33b and 34 are hingedly attached to the lower plate. The hinge plate 41 is further provided with a central bore 42, into which possibly a central rod can be inserted to lift up the centre of the tent cloth into an apex. The rods 33a are each provided at their outer end with hinge connection 36, for connecting to poles 32, 32a. A first circumferential thread 35a runs through the hinge connections 36, and connects all hinge connections 36 with one another. Approximately halfway along the poles 32, 32a the latter are connected with a second circumferential thread 35b.

The rods 33b, 34 are provided at their outer ends with connecting means 37a, 37b, which can cooperate with suitable connecting means on the poles 32, 32a at the location of the attachment thereon of the circumferential thread 35b.

When erecting the frame 31 the rods 33a are tilted outward in the directions B (see figure 5), in the course of which the poles 32, 32a will move in the direction C. A spider-shaped structure is the result. Subsequently the rods 33b are swayed outward in the direction D and are brought with their attaching outer end 37a into connection with the attaching members 37c on the poles 32 cooperating therewith. In that state the circumferential threads 35a and 35b will be straight to some degree, but still be completely tensioned. This tensioning takes place by the by swaying the fourth rod 34 attached to the lower plate member of hinge plate 41 upward in the direction D and placing the hollow attaching outer end 37b on the lower portion of the pole 32a. The attaching outer end 37b is at the same time, by means of a tension cord 38, which is turned over a pulley 40 at the location of the upper end of the pole 32a and runs downward to a position at which the user can engage the tension cord 38. The user then tightens the cord 38, downwards, as a result of which the attaching end 37b will slide upward along the pole 32, until it reaches close to the connection of the circumferential thread 35b to the pole 32a. This position is then secured by fixing the tension cord 38 in cord clamp 39 which is attached to the pole 32a. In that situation the frame 31 with the circumferential threads 35a and 35b is completely tensioned and forms a stable support for a tent cloth. The tent cloth can be loose, in which case it can then be placed over the frame 31, or already be attached to at least the circumferential thread 35a. It is possible to insert a ridge rod in the hole 42 in the hinge 41, to keep the centre of the cloth up high with a view to drainage.

In the tent structure of the figures 5-7 a tension triangle O is thus again formed, by a rod 33a, the rod 34 and the upper portion of the pole 32a.

Claims

1. A canopy structure comprising a cloth and a frame

supporting the cloth, which frame comprises a first rod as well as a number of second rods, which are at least almost all hingedly connected at their one end to central hinge means and which extend from the central hinge means in various substantially radial directions and are directed substantially transversely to the first rod and are connected at their other end by means of a circumferential belt to each other, at least one selected second rod being distinguished from the other second rods in that a first end thereof is separately slideable along the first rod from a position in which the selected second rod is substantially unloaded by normal forces, to a tensioned position which is located nearer but not beyond the dead centre, the collapse or pass-through position, which is, for instance, determined by a plane through the second ends of three of the second rods, in which tensioned position the radial distance between both ends of the selected second rod is enlarged, in which moreover means are present for fixing the first end of the selected second rod with regard to the first rod in the tensioned position.

2. Canopy structure according to claim 1, in which the selected second rod is arranged for rotation in a plane which encompasses the first rod, during the movement of the first end of the said second rod to the tensioned position.

3. Canopy structure according to claim 1 or 2, in which the first end of the selected second rod is hingedly connected to the central hinge means, in which preferably the selected second rod on the one hand and the other central hub-shaped hinge means respectively which are independently slideable along the first rod and can be fixed thereto.

4. Canopy structure according to claim 3, in which the first rod is provided at one end with means for support on a base or for connection to a fixed support.

5. Canopy structure according to claim 3, in which one of the second rods is replaced by an extra stiff rod which is provided at the said other end with means for support on on a base or for connection to a fixed support, and is preferably connected to the central hinge means.

6. Canopy structure according to any one of the claims 3-5, in which the cloth is connected to the said other ends of the second rods and rests on one end of the said rod, further preferably comprising cords, which are arranged between the said other ends of the second rods and the end of the first rod from which the first end of the selected second rod is moved away when being moved to the tensioned position.

7. Canopy structure according to claim 6, in which the central hinge means are permanently located between the said end of the first rod and the perpendicular projection of the second end of the said second rod on the first rod. 5
8. Canopy structure according to claim 6, in which in a collapsed position of the canopy the central hinge means are located at a distance from the said end of the first rod of the canopy, and in the collapsed position the second rods are directed with their radial outer ends towards the said end of the first rod, and the other ends of the second rods are fixedly and hingedly connected to the first rod and the central hinge means are slideable along the first rod to a position in which the outer ends of the second rods are facing away from the said end of the first rod. 10 15
9. Canopy structure according to any one of the claims 4-8, in which several second rods are connected to the hub to which said second rod is connected. 20
10. Canopy structure according to claim 1 or 2, in which the second end of the said second rod is hingedly connected to the central hinge means, in which preferably the second rods with their other ends are connected to poles, to which the first rod belongs, in which further the poles are preferably arranged in a manner substantially parallel to one another. 25 30
11. Canopy structure according to claim 10, in which the second rods form two groups, which are connected to the same central hinge means, in which the second rods of the first group extend therefrom in a radially upwardly inclined manner to the poles and the second rods of the second group thereof extending therefrom in a radially downwardly inclined manner to the poles, in which preferably the said second rod belongs to the second group, in which furthermore the second rods of the first group are hingedly connected to the poles, preferably with the upper end thereof. 35 40
12. Canopy structure comprising a cloth and a tension frame therefor, in which the tension frame is made up of a number of rods and cords, which determine a number of tension triangles extending with regard to one another in different radial directions from a central point, which triangles are located in planes at least almost crossing each other in a line extending the central point, in which at least one of the tension triangles can be brought from a unloaded position to a tensioned position and held therein after the other tension triangles have been brought into the end position. 45 50 55
13. Canopy structure according to claim 12, in which bringing the at least one tension triangle into the tension position takes place by tilting a radially extending rod of that triangle in the plane of the tension triangle, the angle in this triangle between the said line and the rod concerned being reduced, in which the rods are preferably resistant to buckling and comprise a central, first rod which at least almost coincides with the said line, as well as a number of radial second rods, which are hingedly connected to the first rod by means of two or more separate connecting means, and preferably at least one connecting member being slideable along the first rod and the cords being centrally connected to the first rod, are flexible and each determines a tension triangle with a second rod and the first rod.
14. Canopy structure according to claim 13, in which at least one of the other connecting means is fixed to the first rod and in which the slideable connecting member can be brought to a position at such a large distance from the fixed connecting part, that the second rods in the non-tensioned position can be tilted through their dead centre so as to come to rest in a collapsed position outside the cloth.
15. Canopy structure according to claim 13, in which the connecting member to be tensioned last is provided on both sides of the first rod with a hinge connection for two second rods, in which the hinge axes are located on both sides of the first rod at a certain distance from each other, and in which the second rods are oppositely tiltable so as to extend in opposite directions at least almost parallel to the first rod, whereby the mutual distance between the ends of the second rods is reduced with said certain distance, so that in the non-tensioned with said certain distance, so that in the non-tensioned position the second rods can be canted through their dead point or collapse or pass-through position in order to come to rest in a collapsed position outside the cloth, in which preferably the hinge of at least one of the two second rods allows a rotation at an angle in excess of 120°, preferably near 180°.

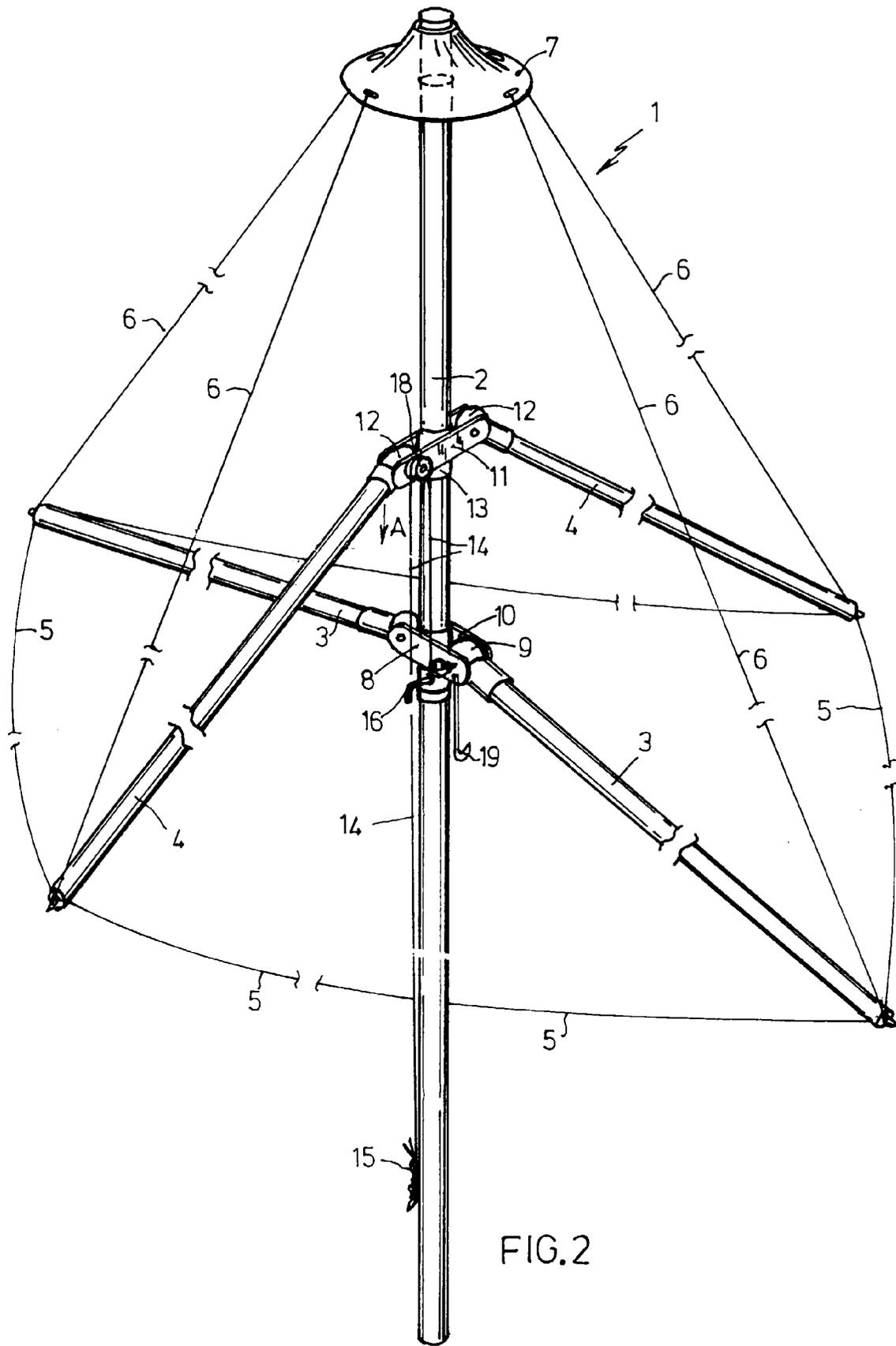


FIG.2

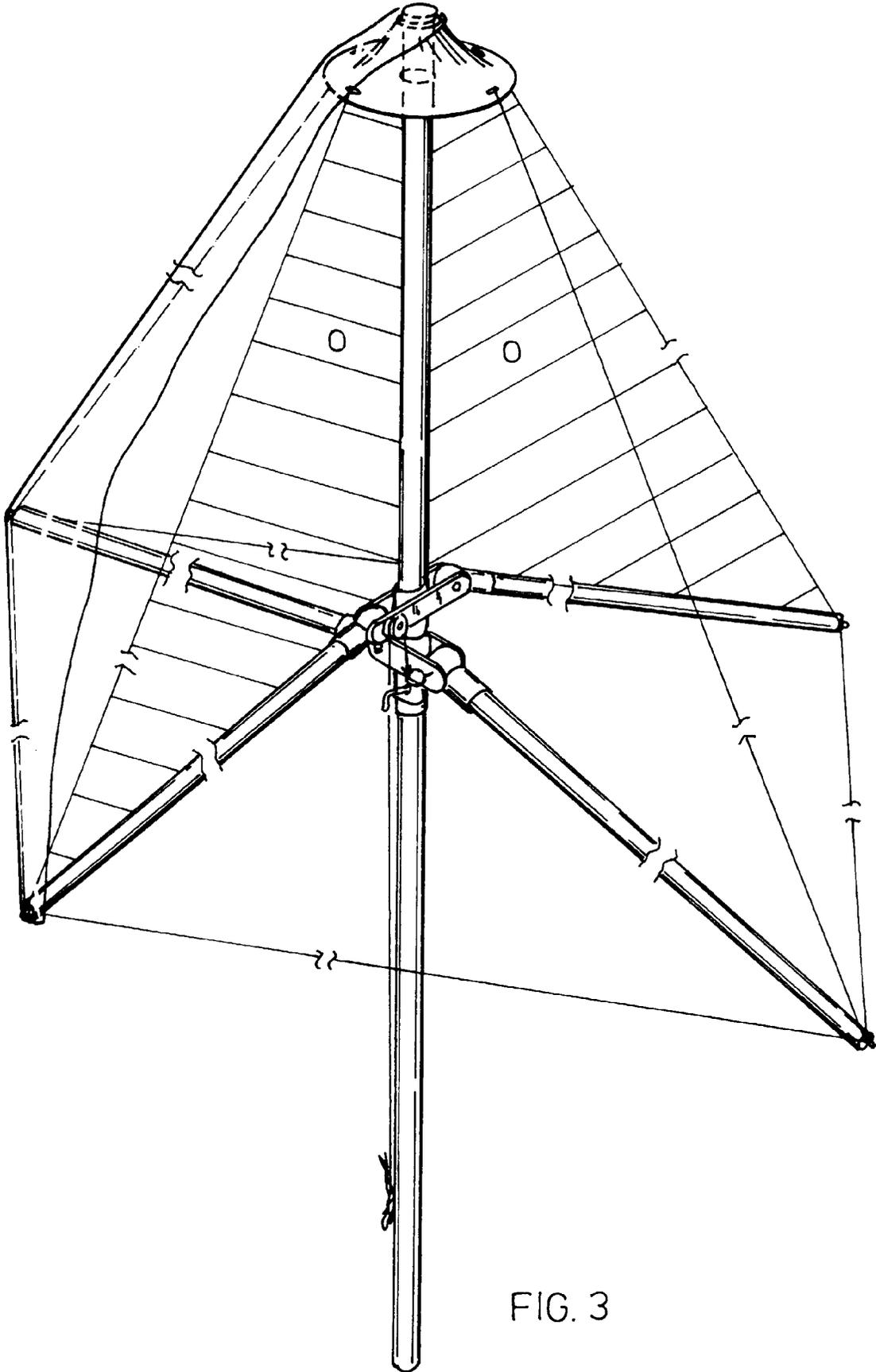


FIG. 3

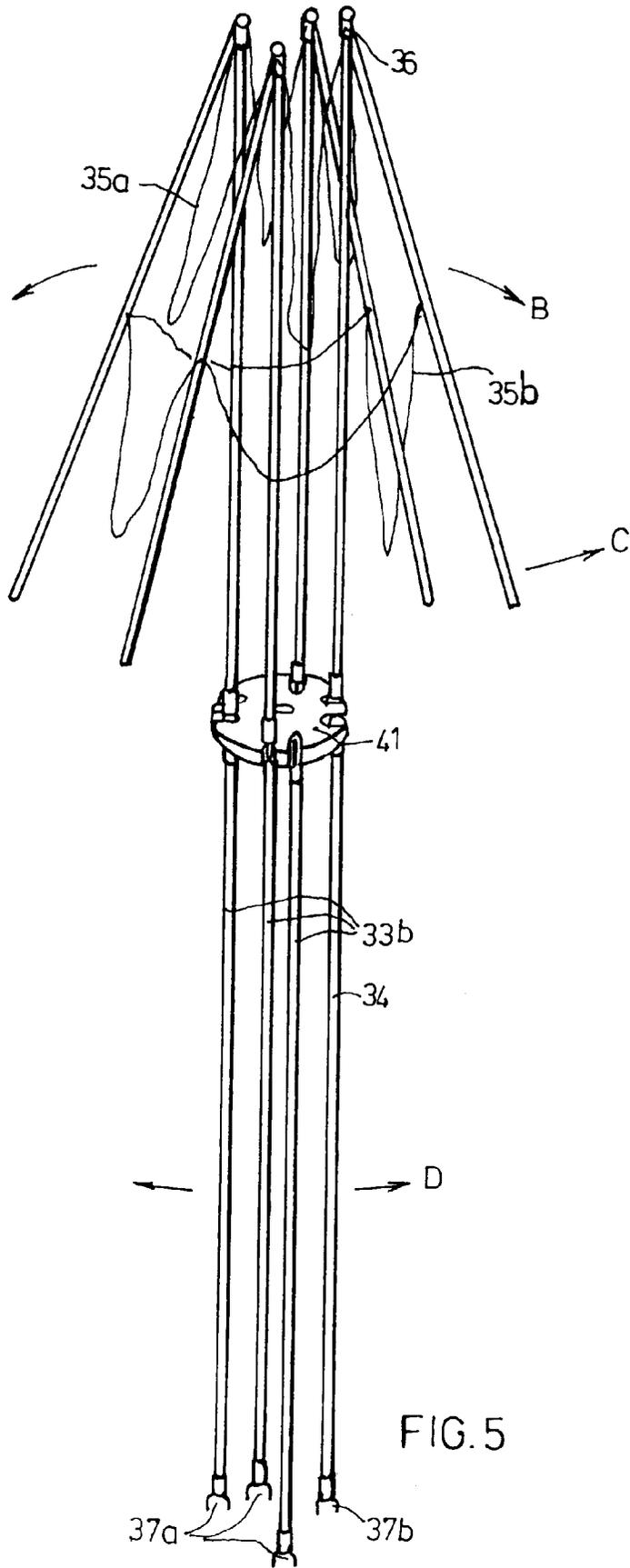


FIG. 5

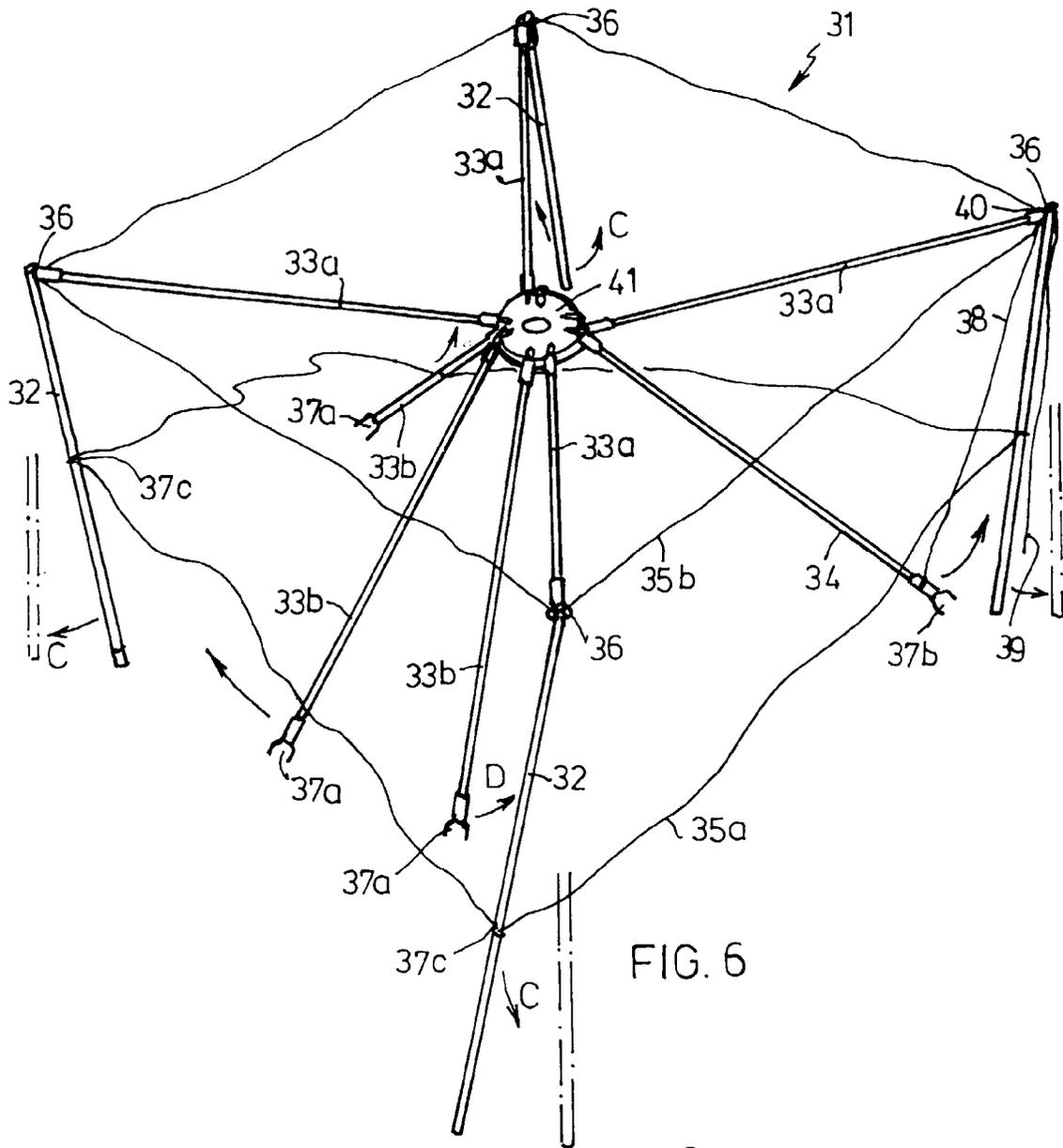


FIG. 6

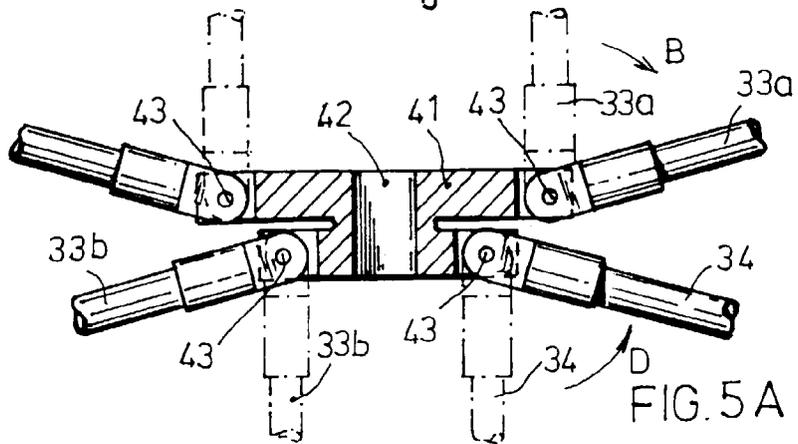


FIG. 5A

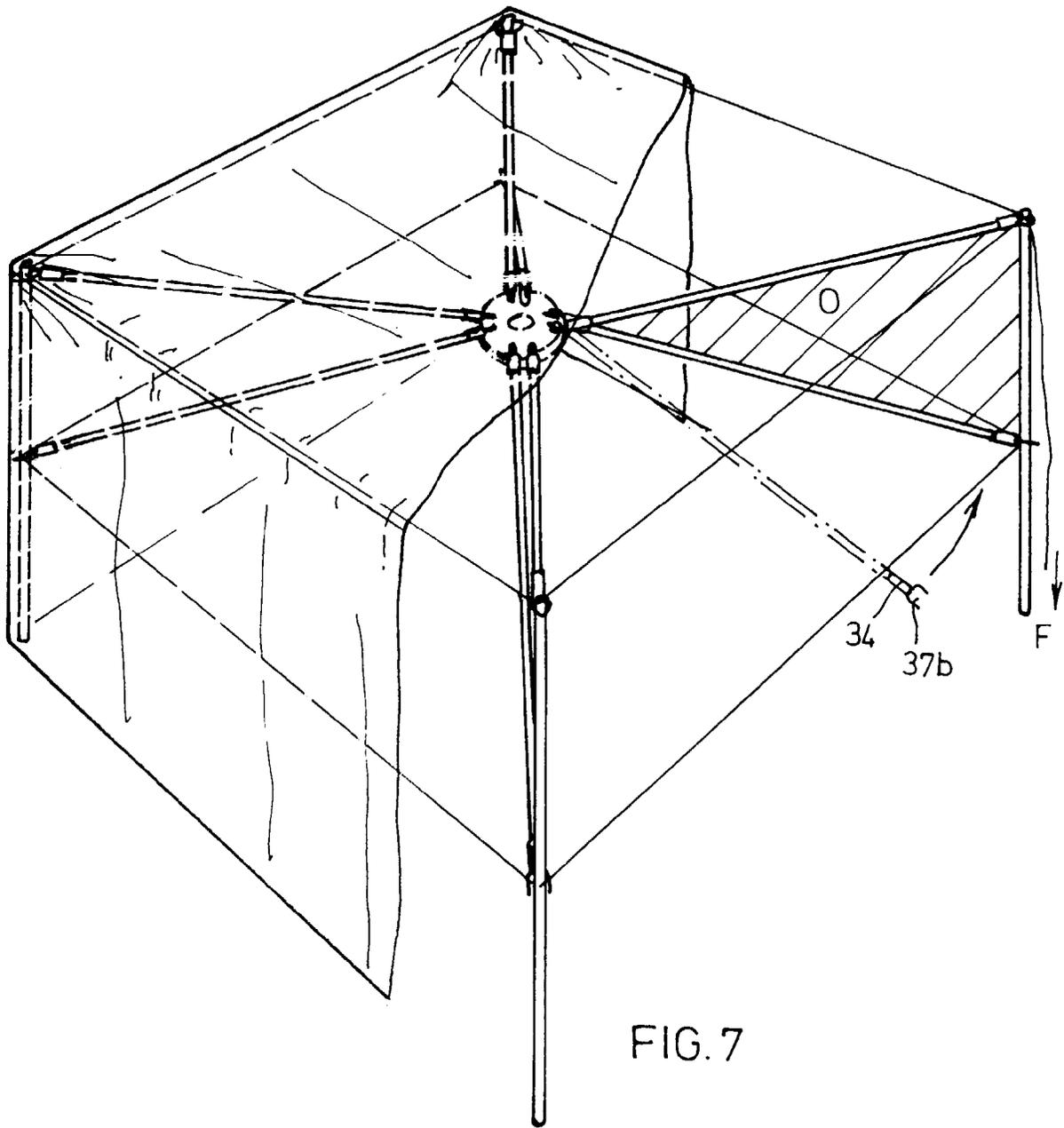


FIG. 7



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EUROPEAN SEARCH REPORT

Application Number
EP 97 20 2803

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	DE 87 04 106 U (LENNARZ) 30 April 1987 * page 8, line 1 - page 9, line 7 * * page 11, line 6 - line 14; figures 1-5 * ---	1-3,6,7, 10,12,13	E04H15/28 E04H15/58 A45B23/00
A	GB 2 265 165 A (SHELDON) 22 September 1993 * page 7, paragraph 1; figure 6 * ---	1,10	
A	GB 2 297 099 A (PURSSORD) 24 July 1996 ---		
A	EP 0 409 639 A (FOX DESIGN INTERNATIONAL LIMITED) 23 January 1991 -----		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			E04H A45B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		3 December 1997	Clasing, M
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