

12

EUROPEAN PATENT APPLICATION

21 Application number: **88830170.2**

51 Int. Cl.⁴: **E 04 B 1/343**
E 04 H 3/16, E 04 H 15/50

22 Date of filing: **22.04.88**

30 Priority: **24.04.87 IT 2025787**

43 Date of publication of application:
26.10.88 Bulletin 88/43

84 Designated Contracting States:
CH DE ES FR GB LI

71 Applicant: **Dona', Severino**
Via L. Galvani, 2
Caleppio di Settala (Milano) (IT)

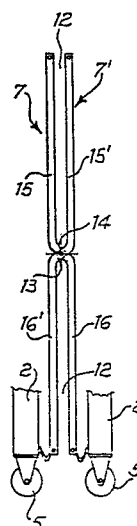
72 Inventor: **Dona', Severino**
Via L. Galvani, 2
Caleppio di Settala (Milano) (IT)

74 Representative: **Caregaro, Silvio et al**
c/o Società Italiana Brevetti S.p.A. Via Carducci 8
I-20123 Milano (IT)

54 **Improved pantograph linkage for collapsible bellows-like canvas coverings.**

57 In collapsible canvas coverings (1) substantially comprising a canvas (1) supported by a plurality of arches (2) mutually connected by pantograph linkages and therefore capable of being mutually brought closer or moved apart in order to uncover or to cover the sheltered area, the pantograph linkages have been improved in order to avoid tearings of the canvas and/or injuries. Each unit of the pantograph linkage comprises, in a way known per se, two rods (7, 7') mutually pivoted in a St. Andrews' cross fashion, in the middle area thereof, wherein said rods have been bent in such a way that each arm (15, 15'), upstream from said middle area is offset both relative to the other arm and relative to the pivot pin (8) connecting both rods together.

Fig. 3



Description

IMPROVED PANTOGRAPH LINKAGE FOR COLLAPSIBLE BELLOWS-LIKE CANVAS COVERINGS.

This invention relates to bellows-like collapsible canvas coverings which are widely used to keep selectively sheltered or uncovered certain areas, like for instance tennis courts, commercial storage areas and so on, depending upon the variations of the weather conditions. Said collapsible canvas coverings substantially comprise a waterproof canvas supported by a plurality of mutually parallel arches connected to each other by means of pantograph linkages and capable of being brought closer or apart, being driven by a preferably electric motor. When the arches are moved apart from each other they drag the canvas therewith, whereby said canvas is extended to cover the sheltered area; to uncover the same area, it is just enough to take the arches back closer to each other, and the canvas folds in a bellows-like fashion. The pantograph linkages presently used to connect the arches to each other comprise, in the simplest embodiment thereof, two rods centrally pivoted to each other like a St. Andrews' cross, each rod having the lower end thereof pivotally connected to the base of an arch, and the upper end thereof terminating with a sleeve which is slidably mounted on a vertical rod fastened at both ends thereof to the adjacent arch. When two adjacent arches are moved closer the pantograph linkage rods close up as a scissor, and the upper ends thereof slide upwards along said vertical rod. When the arches are moved apart, the pantograph linkage rods open in a scissor-like fashion and the ends thereof slide downwards along the vertical rods, while the lower ends move apart from the arches they are pivoted to, causing the hinges to open up.

As it is known, when the arches are moved closer and the canvas gets folded in a bellows-like fashion, the bellows folds end up being caught between the rods of each pantograph linkage and said rods, while closing in a scissor-like fashion, may damage or in the worst case tear the canvas. In order to avoid said drawback, it is necessary to provide, close to the pantograph linkage, suitable protection means, like for instance horizontal rods, in order to keep the bellows folds from being caught between the pantograph linkage rods. Another serious drawback of the known pantograph linkages is the injuries they can originate. In fact, if an operator leaves absent-mindedly his hand lying on a pantograph linkage, during uncovering of the sheltered area, he is subjected to the risk of having his hand cut off by the pantograph linkage components while they are closing in a scissor-like fashion and they are mutually approaching up to a point wherein they are actually contacting each other.

It has now been devised, and it is the object of this invention, a new collapsible canvas covering wherein the arches are connected to pantograph linkages which, upon closing, leave between each element and the adjacent one, enough room to receive the fold of the bellows-like folding canvas. In the simplest embodiment thereof, said pantograph link-

age comprises two mutually pivoted rods, the pivot being at the mid-point of the rods, in a known St. Andrews' cross fashion, said rod being bent at the pivoting area, whereby the arm, upstream from said bend lies in a position offset relative to the other arm and relative to the pivot pin. Due to that offset arrangement, when the pantograph linkage is closed, the arms of each pantograph linkage member will be located apart from each other and the room available will be able to receive the canvas fold without any damage to the latter. The amount of offset should be determined as a function of the room needed to receive the canvas fold.

With the pantograph linkage according to this invention, the canvas is never damaged, and the room available between the linkage members allows the folded canvas to find enough room when normally pushed between said members either by gravity or by the wind. Said room is also sufficient in order to avoid injuring or cutting the operator fingers, if he had inadvertently laid his hand between the pantograph linkage members when the arches are brought together.

Further features and advantages of the pantograph linkage according to this invention will become apparent to those skilled in the art from the following detailed description of an embodiment thereof, referring to the attached drawings, wherein:

Figure 1 is a perspective view of a collapsible canvas covering according to this invention, arranged above a tennis court, and shown in an open position;

Figure 2 shows an enlarged detail view, taken from the inside, of the area of the canvas covering included within the hatched rectangle A of Figure 1;

Figure 3 shows a member of the pantograph linkage of the canvas covering according to this invention, in a collapsed position, and in front view;

Figure 4 shows a front view of a different embodiment of a pantograph linkage element of the canvas covering of this invention, and

Figure 5 shows an elevational side view of the pantograph linkage unit of Figure 4.

Referring now to Figure 1, there is shown a canvas covering according to this invention mounted above a tennis court and kept in an open position. Said canvas covering comprises substantially a canvas 1 of waterproof material, supported by a plurality of metal arches 2 whose bases are mounted on wheels which are able to roll on guides 3 lying on the ground. A door 4 is provided for entrance underneath the canvas covering when it is in a closed position. A motor drives arches 2 to move closer or apart from each other, with a corresponding partial or total collapsing or closure of the collapsible canvas covering. In the position shown in the Figure, arches 2 have been brought together, in two groups, each group corresponding to a half of the canvas covering, whereby the collapsible covering is in a

collapsed position. Only the first arch 2 of each half canvas covering is not close to the others, in that it is directly connected to the motor and has a guiding and dragging function for all the other arches connected thereto. The connection between arches is provided in a known way, by means of a pantograph linkage comprising two rods pivoted to each other in a St. Andrews' cross fashion, which have been improved according to this invention, as it will be described in detail referring to the following Figures.

In Figure 2 which shows, in an enlarged view, taken from inside the court, the part of collapsible canvas covering included in the rectangle shown in hatched line in Figure 1, as it is shown, every arch 2 is provided at the lower end thereof with a wheel 5 and, at a certain height above the ground, also with a vertical bar 6 carrying a sleeve mounted thereon and able to slide on said rod. Each arch 2 is connected to the adjacent one by means of a pantograph linkage unit comprising rods 7, 7' centrally and rotatably pivoted to each other, at pivot pin 8. Rod 7 has the lower end thereof pivoted to an arch 2 at a hinge 10, while the opposite end thereof is fastened to sleeve 18 slidably mounted within vertical bar 6 associated with adjacent arch 2'. Rod 7' in turn has the lower end thereof pivoted to said adjacent arch at pivot point 9, while the upper end thereof is fastened to sleeve 17 slidably mounted on vertical bar 6 of arch 2 where to rod 7 is pivoted at point 10. Between pairs of arches where is shown folds 11 of canvas 1, folded in a bellows-like fashion.

As it is shown in Figure 2, between each pantograph linkage member according to this invention there is provided enough room to receive each canvas fold 11, whereby the canvas cannot get damaged when the collapsible canvas covering is in a collapsed position, as it would have been instead the case if the collapsible canvas covering had been provided with a pantograph linkage according to the previous art. Referring now to Figure 3, there is shown how rods 7, 7' according to this invention have been modified compared to the state of the art, in order to obtain the improved pantograph linkage according to this invention. Rod 7, whose cross section can be square, rectangular or round, is bent in the middle part thereof, wherein it has an opening 14 adapted to receive a pivot pin 8 by means of which rod 7 is pivotally connected to rod 7'. Due to said bent configuration, rod 7 is divided into two sections: an arm 15 located above or upstream said central area 13, and arm 16 located below or downstream from said central region 13. Similarly, rod 7' as well is divided into two sections: an arm 15' located above central area 13' and an arm 16' located below said central area. Arms 15 and 16 of rod 7 are both mutually offset and offset relative to opening 14, as well as arms 15' and 16' which are both mutually offset and off set relative to opening 14. This is the essential feature of this invention, in that it is just because of said feature that, when the collapsible canvas covering is collapsed, between rods 7, 7' there is provided the available room 12 whose important function has already been described above.

Lower arm 16 of rod 7 is connected at the lower end thereof, to arch 2 by means of hinge 10. Upper arm 15 of the same rod 7 is fastened at the upper end thereof to sleeve 18 which is slidably mounted on vertical bar 6 fastened to arch 2', the latter arch being immediately adjacent to the arch on which the lower end of said bar is fastened. Lower arm 16' of rod 7' is pivoted to arch 2' at 9, and upper arm 15' of said rod 7' is fastened to sleeve 17 which is slidably mounted within bar 6 fastened on upper part of arch 2 immediately close to arch 2' whereupon there is pivoted, at 9, the lower arm 16' of said rod.

In Figure 4 there is shown another embodiment of the pantograph linkage element according to this invention. According to the latter embodiment, rods 7 and 7' are not bent at their central area 13, but they are actually interrupted at said area. This embodiment was obtained using a rectangular cross section metal rod whose two equal length segments 15 and 16 are welded, respectively at the lower end and at the upper end thereof, on the side of a segment 13, substantially shorter than the first two, but of the same material. Rod 7' has been constructed in the same way, and both the short central segments 13 and 13' are provided with an opening 14 adapted to receive pivot pin 8. In this embodiment as well there is present the basic feature of this invention, i.e. the fact that the two arms of each rod are offset both mutually and relative to opening 14.

In Figure 5, which shows a side elevational view of the lower part of an arch 2, there is shown that arms 15, 16 and 15', 16' of the rods (which are partially broken away for simplicity and clarity) are not straight, but are rather slightly curved, in order to follow the curvature of arch 2. This feature is particularly useful in that it enables the members of the pantograph linkage to be kept very close to the arches, whereby room is gained underneath the collapsible canvas covering, and in addition the whole structure acquires a better appearance. The room gained is particularly important in those cases when the pantograph linkage members reach a height from 4 to 5 meters, and that is true in those cases where the dimensions of the collapsible canvas covering are such as to allow a pitch higher than 3 meters to be used between adjacent arches.

The embodiments described and shown herein have been reported only as exemplary cases of this invention, and in no way they should be interpreted in a limiting sense. Further modifications and/or additions can be made to them by those skilled in the art, without exceeding the scope of the invention.

Claims

1. Collapsible canvas coverings for sports grounds and the like, comprising a waterproof canvas supported by a plurality of arches capable of being taken mutually closer or moved apart by means of connecting pantograph linkages comprising two rods centrally

pivoted to each other in a St.Andrews' cross fashion, and having the ends thereof connected to said arches in a known fashion, characterized in that the two rods (7, 7') forming each pantograph linkage are each comprised of two arms (15, 16 and 15', 16') symmetrically offset to each other relative to opening (14) for the pivot pin connecting said rods.

5

2. The canvas coverings of Claim 1, characterized in that the offset between arms (15, 16 and 15', 16') of the two rods (7, 7') of each pantograph linkage is obtained by bending each rod in the central area thereof.

10

3. The canvas coverings of Claim 1, characterized in that the offset of arms (15, 16 and 15', 16') of each rod (7, 7') of the pantograph linkage is obtained by forming each rod by means of two segments of metal sections having the same length of the arms (15, 16 and 15', 16') of each rod, which have an end welded alongside a shorter segment (13) of the same metal section.

15

20

4. The collapsible coverings of Claim 2 and 3, characterized in that rods (7, 7') of each pantograph linkage are made of a tubular metal section of a rectangular cross section.

25

5. The collapsible canvas coverings according to one or more of the preceding Claims, characterized in that rods (7, 7') constituting each pantograph linkage are curved according to an arc with a shape parallel to the span of the covering arches to which they are fastened.

30

35

40

45

50

55

60

65

4

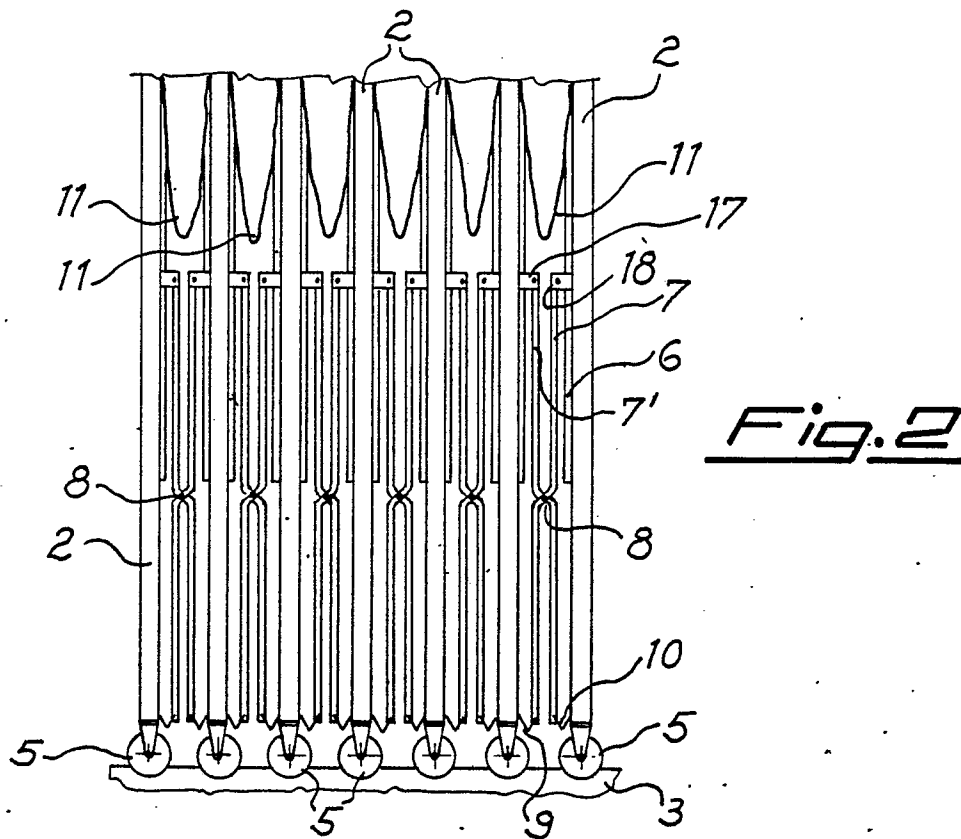
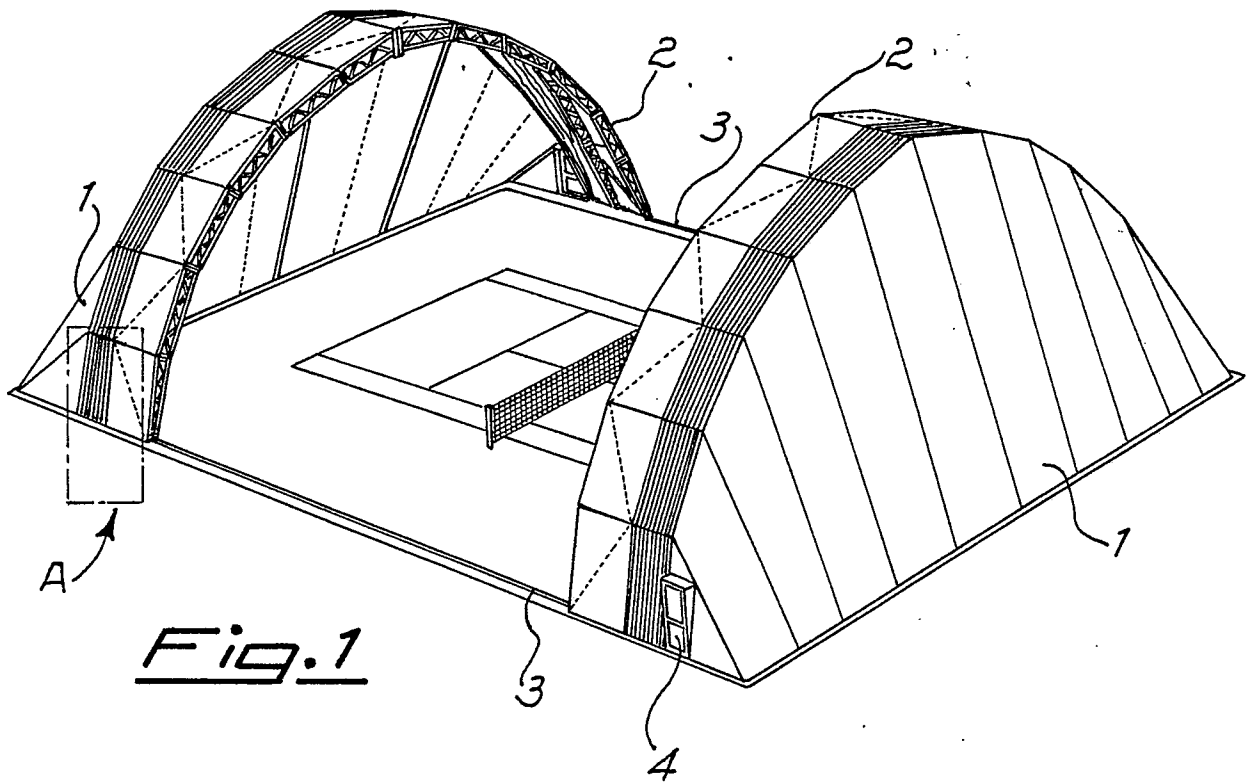
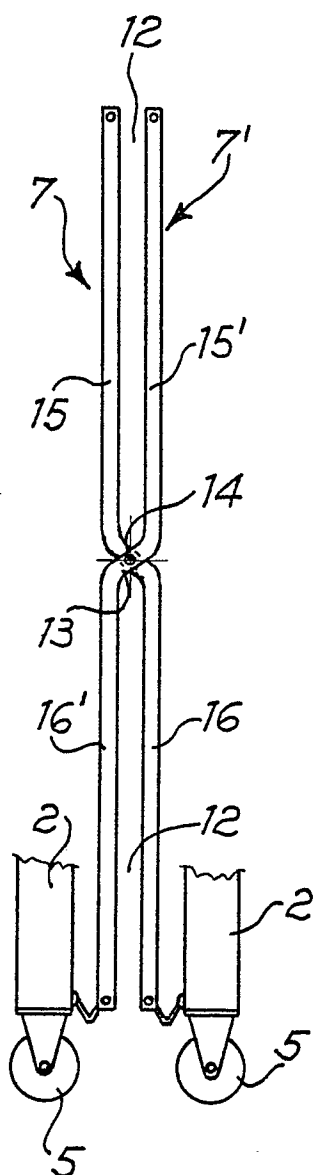
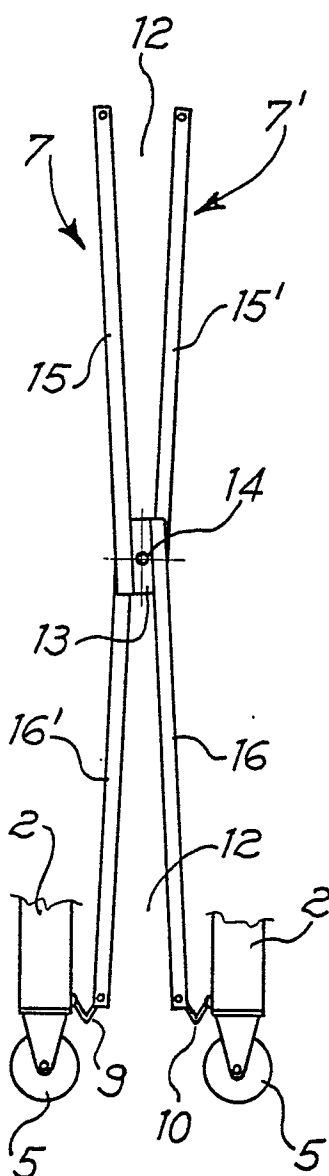
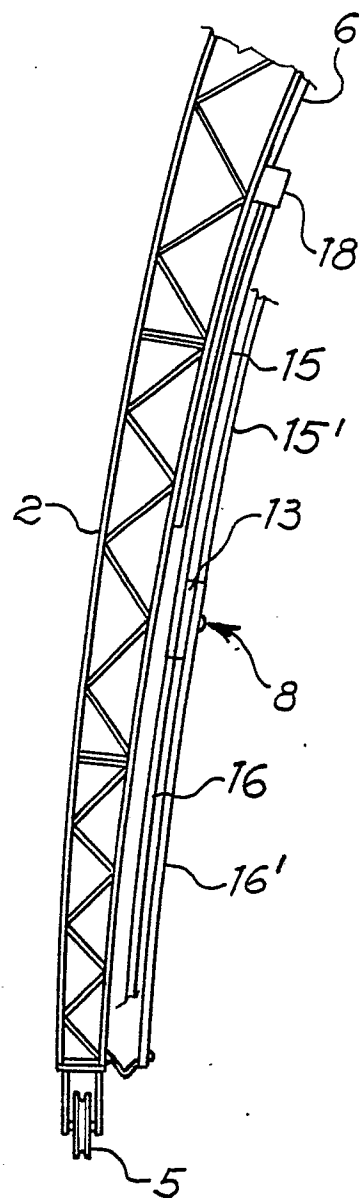


Fig. 3Fig. 4Fig. 5



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 83 0170

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. 4)
Y	EP-A-0 081 706 (EUGEN & KLAUS LANG GmbH) * Page 7, line 15 - page 8, line 13; figures 1,2 * ---	1	E 04 B 1/343 E 04 H 3/16 E 04 H 15/50
Y	GB-A- 983 720 (MARINO) * Page 1, line 70 - page 2, line 22; figures 1-4 *	1	
A	---	4	
A	FR-A-2 277 204 (MINKA-TREPPEN GmbH) * Figure 1 * -----	2	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			E 04 B E 04 H F 16 H E 06 C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 26-07-1988	Examiner CLASING M.F.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	