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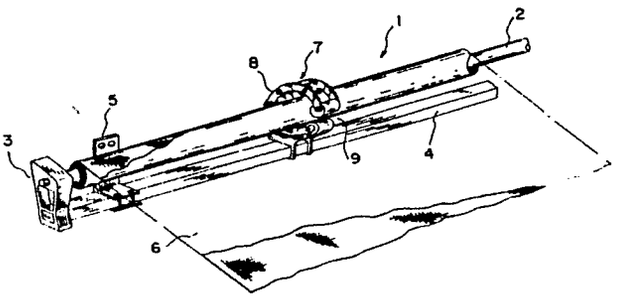
(54) Apparatus for supporting intermediate portion of awning sheet winding shaft.

(57) An apparatus for supporting an intermediate portion of an awning sheet winding shaft (2), comprising: i) a housing (8) having an awning sheet entrance/exit opening portion (9) and the remaining portion with which at least a half of an outer peripheral surface of the winding shaft (2) is surrounded; ii) rollers (10) rotatably mounted in the housing (8) so as to be spaced apart from each other in a circumferential direction of the housing; iii) an endless belt (12) running round at least two of the rollers (10), an outer surface of the belt (12) being brought into contact with at least a lower surface of the awning sheet (6) wound on the winding shaft (2); and iv) an annular groove (14) provided in one of an outer peripheral surface of each of the rollers (10) and an inner peripheral surface of the belt (12), the other one of the outer peripheral surface of each of the rollers (10) and the inner peripheral surface of the belt being provided with an annular ridge (15) engaging with the annular groove (14).

FIG.1



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APPARATUS FOR SUPPORTING INTERMEDIATE PORTION OF AWNING SHEET WINDING SHAFT

The present invention relates to an apparatus for supporting an intermediate portion of an awning sheet winding shaft, and more particularly to one in which the awning sheet winding shaft is so supported as to minimize deflection produced under the influence of the weight of the awning sheet wound thereon thereby permitting the awning sheet to be smoothly extended and retracted over an extended period of time in use.

In general, in a place such as entrances, windows and terraces of a building such as shops and houses, there is provided a windable awning sheet assembly so as to extend its awning sheet outward from a wall of the building. In such awning sheet assembly, a windable awning sheet has its one end secured to a winding shaft opposite ends of which are rotatably supported and rotated manually or electrically to extend and retract the awning sheet wound thereon. On the other hand, the other end of the windable awning sheet is secured to a rod-like or pipe-like front beam opposite ends of which are supported by a pair of supporting arms or a plurality of folding arms. Each of such folding arms is provided with a folding section in its intermediate portion while normally biased at an extended position by means of a spring.

As described above, in general, since the winding shaft on which the awning sheet is wound has its opposite ends rotatably mounted on brackets through bearings, the winding shaft is deflected downward by gravity or under the influence of the weight of the awning sheet wound on the winding shaft when the awning sheet is wound on the winding shaft. As the awning sheet increases in width, such downward deflection of the winding shaft increases. The downward deflection of the winding shaft prevents the awing sheet from being smoothly extended and retracted, and increases stresses in the bearings of the winding shaft to shorten their service lives.

Hitherto, in order to prevent the winding shaft from being deflected downward by gravity, the winding shaft is provided with at least one apparatus for supporting an intermediate portion of the winding shaft. Such conventional apparatus is constructed of: a housing provided with an awning sheet entrance/exit opening portion and the remaining portion with which the winding shaft is surrounded; a plurality of rollers rotatably mounted in the housing; and an endless belt running round the rollers for supporting the awning sheet having being wound on the winding shaft on an outer surface of the belt which is driven by the awning sheet through frictional contact therewith. In the above conventional apparatus, the awning sheet is extended and retracted through the entrance/exit opening portion of the housing of the apparatus and drives the endless belt through the frictional contact therewith, the endless belt supporting the awning sheet.

However, the conventional apparatus for supporting the intermediate portion of the winding shaft is disadvantageous in that: the belt is driven by the awning sheet through the frictional contact therewith to have a ten dency to cause misalignment in the width direction of the awning sheet. When such misalignment of the belt is produced in the width direction of the awning sheet, the belt is brought into contact with the housing of the apparatus to shorten its service life and to prevent the winding shaft from being smoothly rotated.

Embodiments of the present invention may achieve one or more of the following objects:

to provide an apparatus for supporting an intermediate portion of an awning sheet winding shaft through an endless belt which is driven by an awning sheet wound on the winding shaft and is free from misalignment in the width direction of the awning sheet, to make it possible to smoothly extend and retract the awning sheet over an extended period of time in use;

to provide an apparatus for supporting an intermediate portion of an awning sheet winding shaft through an endless belt, in which an opening angle of an awning sheet entrance/exit opening portion of the housing of the apparatus is adjusted according to an awning sheet extending/retracting direction of the winding shaft;

to provide an apparatus for supporting an intermediate portion of an awning sheet winding shaft through an endless belt, in which the winding shaft is detachably mounted in the housing of the apparatus in an easy manner.

The present invention provides an apparatus for supporting at least a lower surface of an intermediate portion of an awning sheet winding shaft on which a windable awning sheet is wound, comprising:

i) a housing provided with an awning sheet entrance/exit opening portion and the remaining portion with which at least a half of an outer peripheral surface of said awning sheet winding shaft is surrounded;

ii) a plurality of rollers rotatably mounted in said housing so as to be spaced apart from each other in a circumferential direction of said housing;

iii) an endless belt running round at least two of said rollers, an outer surface of said endless belt being brought into contact with at least a lower surface of said awning sheet wound on said winding shaft; and

iV) an annular groove portion provided in one of an outer peripheral surface of each of said rollers and an inner peripheral surface of said endless belt, the other one of said outer peripheral surface of each of said rollers and said inner peripheral surface of said endless belt being provided with an annular ridge portion engaging with said annular groove portion.

The above objects, other objects, features and advantages of the present invention will be described hereinbelow in detail with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic perspective view of the awning sheet assembly provided with the awning sheet winding shaft the intermediate portion of which is supported by the apparatus of the present invention for supporting the intermediate portion of the winding shaft;

Fig. 2 is a side view of the apparatus of the present invention for supporting the intermediate portion of the winding shaft of the awning sheet assembly shown in Fig. 1;

Fig. 3 is a partially enlarged sectional view of the apparatus of the present invention for supporting the intermediate portion of the winding shaft, taken along the line 111-111 of Fig. 2;

Fig. 4 is a partial side/sectional view of modified embodiments of the roller and the endless belt of the apparatus of the present invention for supporting the intermediate portion of the winding shaft, shown in Fig. 3;

Fig. 5 is an exploded perspective view of the apparatus of the present invention for supporting the intermediate portion of the winding shaft of the awning sheet assembly shown in Fig. 2; and

Fig. 6 is a exploded perspective view of a modified embodiment of the apparatus of the present invention for supporting the intermediate portion of the winding shaft of the awning sheet assembly shown in Fig. 2.

Embodiments of the invention will now be described by way of example only and with reference to the drawings.

As shown in Fig. 1, an awning sheet assembly 1 is provided with an awning sheet winding shaft 2 opposite ends of which are rotatably mounted on a pair of main brackets 3 one of which is not shown in Fig. 1. Each of the brackets 3 is fixedly mounted on a base pipe 4 which is made of metal and has a square shape in cross section. The base pipe 4 is in turn fixedly mounted on a plurality of supporting brackets 5 which are suitably spaced apart from each other and fixed to a wall and the like serving as a primary supporting means for supporting the awning sheet assembly.

An awning sheet 6 of the awning sheet assembly 1 is made of fabrics coated or laminated with synthetic resins, and has its one end secured to the winding shaft 2 so as to be wound thereon. The other end or free end of the awning sheet 6 is fixed to a front beam (not shown). In securing the one end of the awning sheet 6 to the winding shaft 2, for example, the one end of the awning sheet 6 is first received into a longitudinal groove of the winding shaft 2, the groove being provided in an outer peripheral portion of the winding shaft 2 so as to extend along a longitudinal axis of the winding shaft 2, and thereafter a rod-like stopper is press-fitted into the groove through the one end of the awning sheet 6 so that the one end of the awning sheet 6 is sandwiched between the winding shaft 2 and the stopper in the groove so as to be secured to the winding shaft 2. In securing the other end of the awning sheet 6 to the front beam, the same method as that employed in the above in securing the one end of the awning sheet 6 to the winding shaft 2 is employed.

In the awning sheet assembly shown in Fig. 1, in order to support an intermediate portion of the winding shaft 2, there is provided at least one apparatus 7 of the present invention for supporting the intermediate portion of the winding shaft 6, the apparatus 7 being hereinafter referred to as the "intermediate supporting apparatus 7". The intermediate supporting apparatus 7 is detachably mounted on a base pipe 4. However, it is also possible to directly mount the intermediate supporting apparatus 7 on a wall and the like serving as a primary supporting means for supporting the awning sheet assembly.

The intermediate supporting apparatus 7 is provided with a housing 8 surrounding an outer periphery of the winding shaft 2. The housing 8 is made of a rigid material such as metal and the like, and has a C-shaped substantially annular form provided with an inner diameter larger than an outer diameter of the awning sheet 6 having been completely wound on the winding shaft 2. An opening portion of the C-shaped substantially annular form of the housing 8 constitutes an awning sheet entrance/exit opening portion 9 of the intermediate supporting apparatus 7, through which opening portion 9 the awning sheet 6 is extended and retracted. At least a half of the outer periphery of

the winding shaft 2 including its lower peripheral side is surrounded with the housing 8.

As shown in Fig. 2, a plurality of rollers 10 are rotatably mounted on the housing 8 through a plurality of bolts 11 while spaced apart from each other in a cir cumferential direction of the housing 8. Each of the rollers 10 is made of a rigid and wear-resistant material such as metal and plastic.

An endless belt 12 runs round the rollers 10 as shown in Fig. 2. An outer peripheral surface of the endless belt 12 is brought into contact with at least a lower side of the awning sheet 6 wound on the winding shaft 2. In order to ensure such contact, it is necessary that the endless belt 12 runs round at least two rollers 10 disposed in a level lower than that of a central axis of the winding shaft 2. Incidentally, as the awning sheet 6 is wound on or unwound from around the winding shaft 2, an outer diameter of the awning sheet 6 having being wound on the winding shaft 2 increases or decreases. At this time, the intermediate portion of the winding shaft 2 is resiliently moved upward or downward to make it possible that a lower side of the awning sheet 6 is always brought into contact with the endless belt 12.

In an embodiment of the intermediate supporting apparatus 7 of the present invention shown in Fig. 2, the endless belt 12 runs round lower three rollers 10 among six rollers 10 mounted on the C-shaped housing 8, the lower three rollers 10 being disposed under the winding shaft 2. If necessary, it is also possible to increase the number of the rollers 10 round which the endless belt 12 runs, the number of the rollers 10 being two in minimum. Further, it is also possible to provide a plurality of endless belts 12 running round the rollers 10, the endless belts 12 being disposed in parallel so as to be brought into contact with each other or to be spaced apart from each other in the width directions of the rollers 10. The endless belt 12 may be a conventional type belt reinforced with tire cords and the like.

In Fig. 3, the details of the rollers 10 mounted on the housing 8 and the endless belt 12 running round the rollers 10 in construction are shown. As is clear from Fig. 3, the housing 8 is constructed of a pair of plates 8a, 8b disposed in parallel to each other. Each of the plates 8a, 8b is provided with a plurality of through-holes for receiving a plurality of bolts 11. Each of the rollers 10 is provided with an axial central through-hole in which a bearing means 13 is mounted. The bearing means 13 may be a conventional type bearing means containing a ball bearing, and, therefore the details thereof in construction is not shown in the drawings. Each of the rollers 10 is rotatably mounted on the housing 8. Namely, in assembling of the housing 8, each of the rollers 10 is inserted between the plates 8a, 8b, and then bolts 11 are inserted into the through-holes of the plates 8a, 8b to threadably engage with threaded holes of opposite ends of the bearing means 13, so that each of the rollers 10 is rotatably mounted on the housing 8.

As is clear from Fig. 3, each of the rollers 10 is provided with an annular groove portion 14 in an axially central portion of its outer peripheral surface. On the other hand, the endless belt 12 running round the rollers 10 is provided with an annular ridge portion 15 in its inner peripheral surface, the annular ridge portion 15 of the endless belt 12 being engaged with the annular groove portions 14 of the rollers 10 in an insertion manner to prevent the endless belt 12 from causing misalignment with the rollers 10 in the width directions of the rollers 10. It is also possible to provide the groove portion 14 in an edge portion of each of the rollers 10. In this case, the ridge portion 15 of the endless belt 12 is also provided in the edge portion of the endless belt 12 corresponding to the edge portion of each of the rollers 10. In addition, as shown in Fig. 4, the number of the groove portion 14 and the number of the ridge portion 15 may be two or more than two.

In the embodiment of the present invention shown in Figs. 3 and 4, the annular groove portion 14 is provided in each of the rollers 10, while the annular ridge portion 15 is provided in the endless belt 12. However, it is also possible to provide the annular groove portion 14 in the endless belt 12, and the annular ridge portion 15 is provided in each of the rollers 10.

It is preferable that the annular ridge portion 15 is slightly smaller in size than the annular groove portion 14 so as to prevent the ridge portion 15 from being clamped in the groove portion 14, to ensure a smooth movement of the endless belt 12 without causing an excessive frictional resistance between the awning sheet 6 and the endless belt 12. As a result, the awning sheet 6 is prevented from being damaged, while the winding shaft 2 is driven with the lowest possible consumption of power. In cross section, the groove portion 14 is larger in width than the ridge portion 15 by an amount of from 0.5 to 4 mm, preferably from 1.5 to 2.5 mm. On the other hand, in cross section, the groove portion 14 is larger in depth or height than the ridge portion 15 by an amount of from 0.5 to 2 mm, preferably from 0.7 to 1.5 mm.

As shown in Figs. 2 and 5, the housing 8 is fixed to a bracket 17 through a fastener assembly 16 which is constructed of: a plurality of fastener segments 18 provided in a lower side of an outer peripheral portion of each of the plates 8a, 8b of the housing 8, each of the segments 18 being provided with a through-hole for receiving a bolt 19; a plurality of the bolts 19 each of which is inserted

into the through-hole of each of the fastener segments 18; and a plurality of nuts 20 each of which is threadably engaged with each of the bolts 19. On the other hand, the bracket 17 is provided with a pair of arc-shaped arms 21 in its upper portion. Each of the arc-shaped arms 21 is provided with an arc- shaped slit 22. In assembling, the through-holes of the fastener segments 18 are aligned with such arc-shaped slits 22 of the bracket 17, and then the bolts 19 is passed through these through-holes and the arc-shaped slits 22. After that, the bolts 19 is threadably engaged with the nuts 20 so that the housing 8 is fixedly mounted on the bracket 17. At this time, before fastening the bolts 19 and nuts 20, the mounting position of the housing 8 on the bracket 17 is suitably adjusted by moving the fastener segments 18 to a desired mounting position along the arc-shaped slits 22 of the bracket 17.

On the other hand, the bracket 17 is further provided with a C-shaped mounting member 23 in its lower portion. In assembling, as shown in Fig. 1, the C-shaped mounting member 23 of the bracket 17 is fixedly mounted on the base pipe 4 by fastening a set bolt 24.

As described above, since the mounting position of the housing 8 on the bracket 17 is adjustable, it is possible to fixedly mount the housing 8 at any desired position around the winding shaft 2.

Consequently, it is possible to precisely position the awning sheet entrance/exit opening portion 9 of the housing 8 so as to be aligned with the awning sheet extending/retracting direction of the winding shaft 2.

Fig. 5 is an exploded perspective view of the apparatus of the present invention for supporting the intermediate portion of the winding shaft 2 of the awning sheet assembly shown in Fig. 2, in which the housing 8 is separated from the bracket 17. As is clear from Fig. 5, the housing 8 is constructed of an upper member 25 and a lower member 26. The upper member 25 of the housing 8 is constructed of: a pair of plates 8c, 8d arranged in parallel to each other; and a pair of rollers 10 rotatably mounted between the plates 8c, 8d. On the other hand, the lower member 26 of the housing 8 is constructed of: a pair of plate 8a, 8b arranged in parallel to each other; four rollers 10 rotatably mounted between the plates 8a, 8b; and an endless belt 12 running round three of these four rollers 10.

The lower member 26 of the housing 8 is fixedly mounted on the bracket 17 through the fastener segments 18, bolts 19 and the nuts 20. At this time, each of the bolts 19 is inserted into a pipe-like spacer 30 which is disposed between the pair of the plate 8a, 8b so that the plates 8a, 8b are spaced apart from each other to mount the rollers 10 therebetween. The upper member 25 of the housing 8 is connected with the lower member 26 of the same 8 by means of a pair of bolts 27 and a pair of nuts 28 corresponding to the bolts 27 to form the C-shaped housing 8.

As shown in Fig. 5, since the housing is constructed of two halves members, i.e., the upper member 25 and the lower member 26, it is possible for the housing 8 to assume the C-shaped form defining the awning sheet entrance/exit opening portion 9. Consequently, in case that an opening gap of the awning sheet entrance/exit opening portion 9 is smaller than the outer diameter of the winding shaft 2, it is possible to insert/withdraw the winding shaft 2 into/from the housing 8. Namely, before inserting/withdrawing the winding shaft 2 into/from the housing 8, the housing 8 is divided into the upper member 25 and the lower member 26 to enlarge the opening gap of the awning sheet entrance/exit opening portion 9 so as to make it possible to pass the winding shaft 2 through such enlarged opening gap of the awning sheet entrance/exit opening portion 9 of the housing 8. As is clear from the above, since the winding shaft 2 is easily mounted in the housing 8 of the intermediate supporting apparatus 7 of the present invention, it is possible to realize easy installation and maintenance of the awning sheet assembly provided with the intermediate supporting apparatus 7 of the present invention.

Fig. 6 is a exploded perspective view of a modified embodiment of the intermediate supporting apparatus 7 of the present invention for supporting the intermediate portion of the winding shaft 2 of the awning sheet assembly shown in Fig. 2. The modified embodiment of the intermediate supporting apparatus 7 of the present invention shown in Fig. 6 is different from the embodiment of the present invention shown in Fig. 5 in that an upper member 25a of the housing 8 is connected with a lower member 26a of the same 8 in a manner different from that employed in the embodiment shown in Fig. 5. The remaining construction of the modified embodiment shown in Fig. 6 is the same as that of the embodiment shown in Fig. 5, and, therefore only the construction of the modified embodiment shown in Fig. 6 different from the construction of the embodiment shown in Fig. 5 will be described hereinbelow in detail with reference to the drawings so as to avoid redundancy in description.

The upper member 25a of the housing 8 is connected with the lower member 26a of the same 8 through a pair of short pins 29 so as to be swingable relative to the lower member 26a. When the winding shaft 2 is mounted in the housing 8, the upper member 25a is swung upward on the pins 29 as shown in phantom lines in Fig. 6 so as

to enlarge the opening gap of the awning sheet entrance/exit opening portion 9a of the housing 8. After the winding shaft 2 is mounted in the housing 8, the upper member 25a of the housing 8 is swung downward on the pins 29 so as to return its initial position shown in solid lines in Fig. 6, and is then fixed to the lower member 26a of the housing 8 by means of a bolt 27 and a nut (not shown) corresponding to the bolt 27.

Claims

1. An apparatus for supporting at least a lower surface of an intermediate portion of an awning sheet winding shaft (2) on which a windable awning sheet (6) is wound, comprising:

i) a housing (8) provided with an awning sheet entrance/exit opening portion (9) and the remaining portion with which at least a half of an outer peripheral surface of said awning sheet winding shaft (2) is surrounded;

ii) a plurality of rollers (10) rotatably mounted in said housing (8) so as to be spaced apart from each other in a circumferential direction of said housing;

iii) an endless belt (12) running round at least two of said rollers (10), an outer surface of said endless belt (12) being brought into contact with at least a lower surface of said awning sheet (6) wound on said winding shaft (2); and

iv) an annular groove portion (14) provided in one of an outer peripheral surface of each of said rollers (10) and an inner peripheral surface of said endless belt (12), the other one of said outer peripheral surface of each of said rollers (10) and said inner peripheral surface of said endless belt being provided with an annular ridge portion (15) engaging with said annular groove portion (14).

2. The apparatus as set forth in claim 1, wherein:
in cross-section, said ridge portion (15) is smaller in width and height than said groove portion (14).

3. The apparatus as set forth in claim 1 or 2, wherein:
said housing (8) is so mounted on a bracket (17) as to be moved around said awning sheet winding shaft (2) to a desired mounting position at which said housing (8) is fixed to said bracket (17) through fastener means (16).

4. The apparatus as set forth in claim 1, wherein:
said housing (8) is constructed of an upper member (25) and a lower member (26) to assume a C-shaped form in its side view so as to define an awning sheet entrance/exit opening portion (9) so that an opening gap of said awning sheet entrance/exit opening portion can be enlarged.

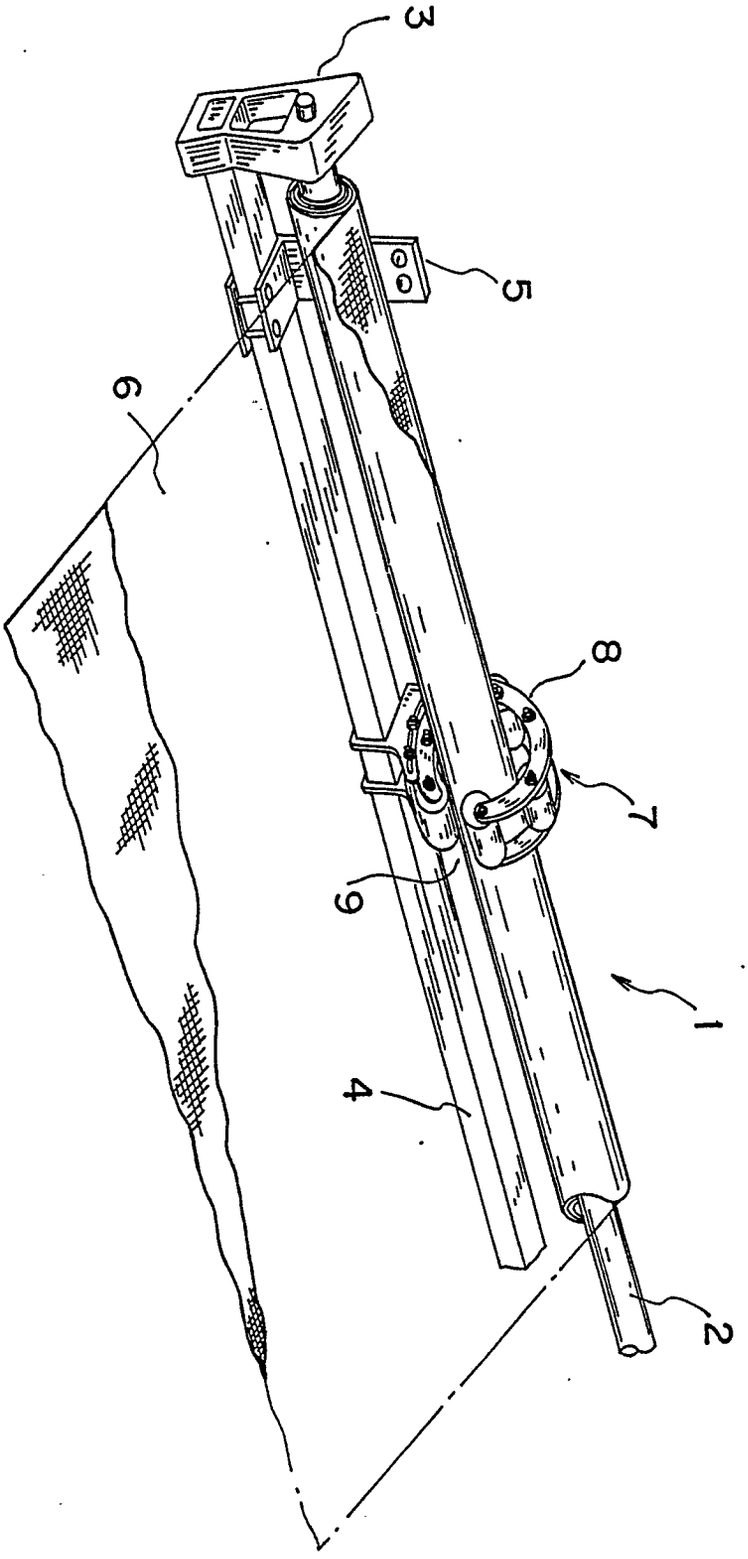


FIG. 1

FIG.2

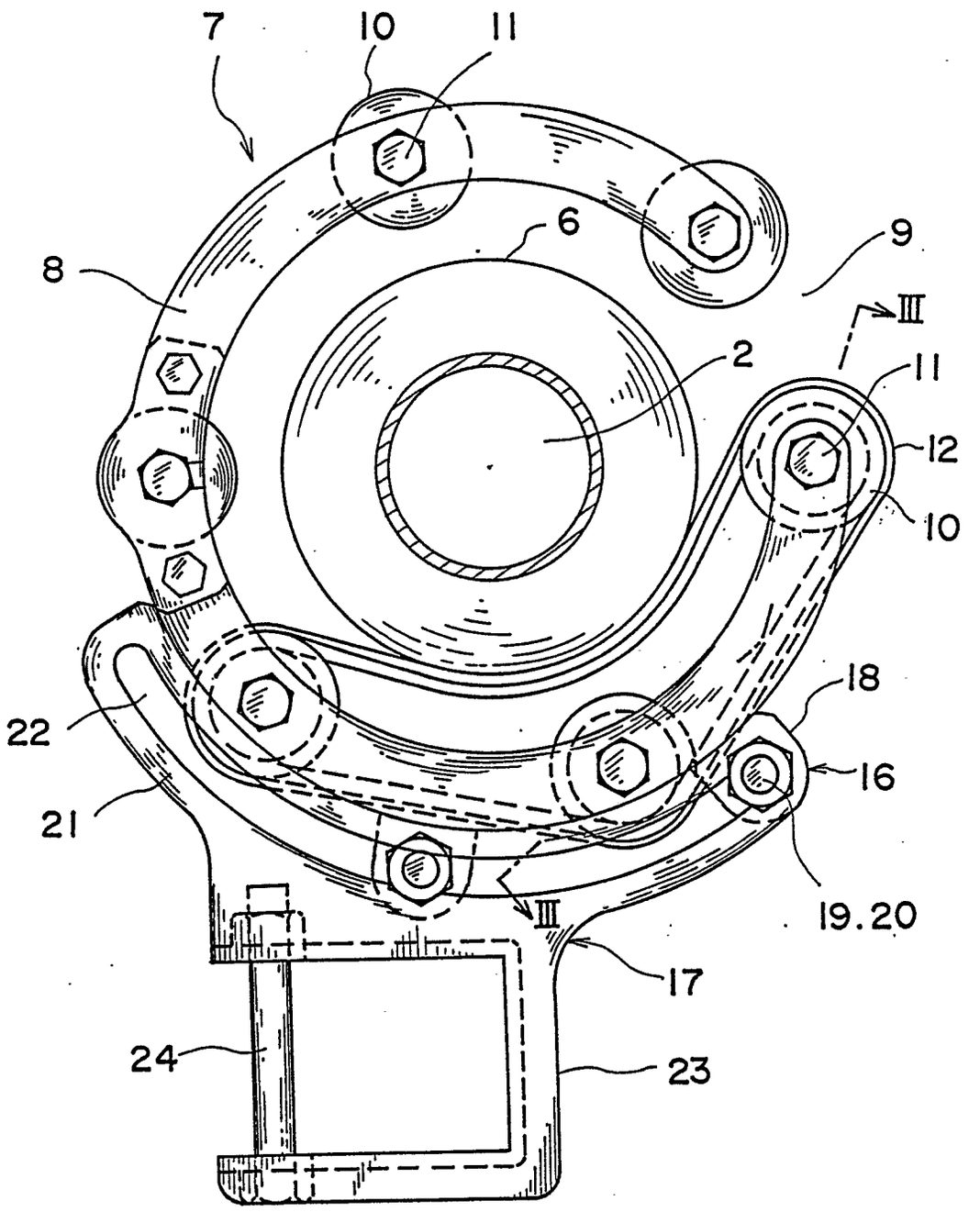


FIG.3

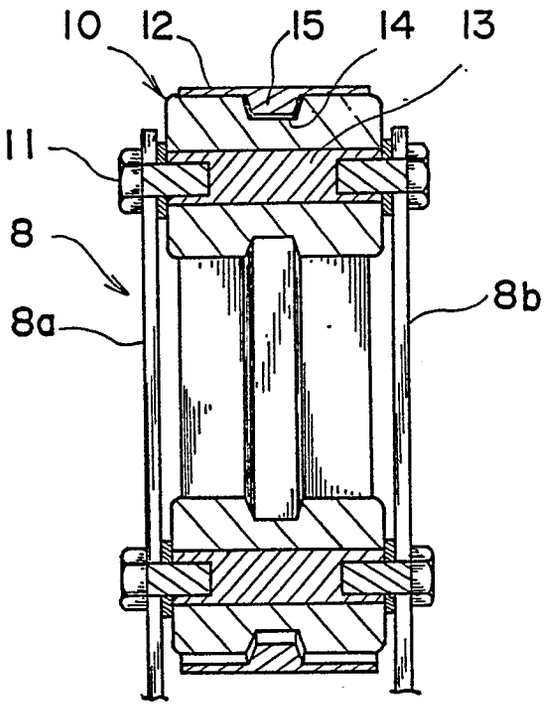


FIG.4

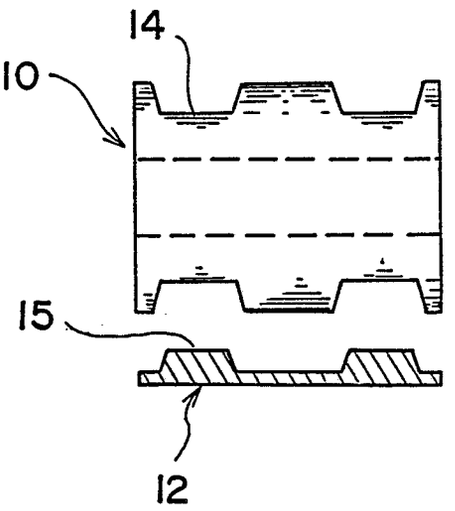


FIG. 5

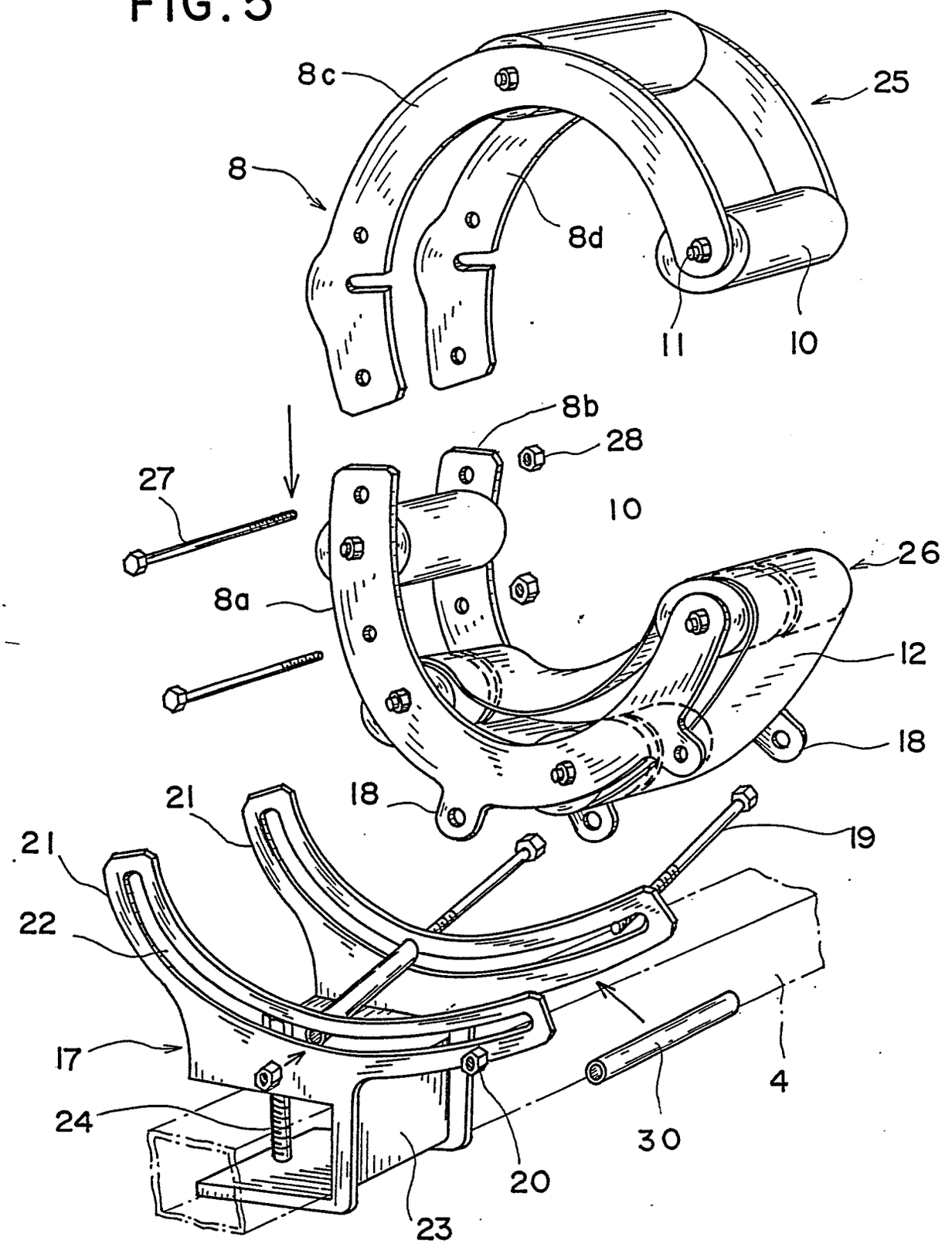
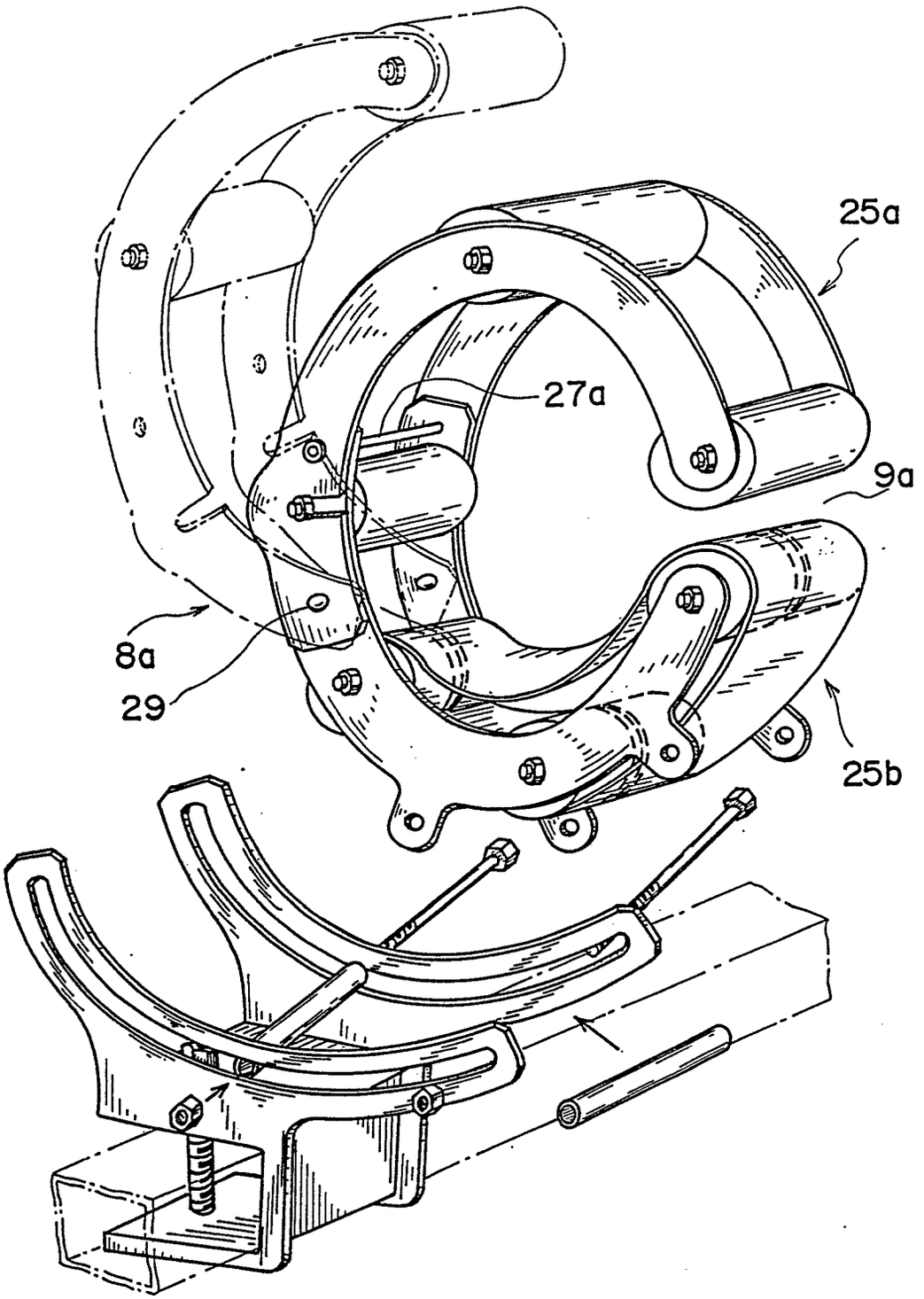


FIG.6



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EUROPEAN SEARCH REPORT

Application Number

EP 88 31 0290

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	GB-A- 492 012 (ANTON) * Page 1, line 87 - page 2, line 123; figures 1-7 *	1,2,4	E 04 F 10/06
Y	US-A-2 472 513 (BERGQUIST) * Column 2, line 5 - column 3, line 19; figures 1-4 *	1,2,4	
A	US-A-2 326 642 (HEISER) * Page 1, right-hand column, line 16 - page 2, right-hand column, line 73; figures 1-5 *	1,3,4	
A	US-A-1 765 451 (SCHANE) * Page 1, line 33 - page 2, line 77; figures 1-4 *	1,3,4	
A	FR-A-2 562 145 (FRANCIAFLEX) * Page 3, line 7 - page 5, line 21; figures 1,2 *	1,3,4	
A	US-A-2 220 311 (ANTON)		TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	US-A-1 615 830 (DERUS)		E 04 F F 16 G
A	FR-A-2 411 954 (AMORETTI)		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12-07-1989	AYITER J.

CATEGORY OF CITED DOCUMENTS

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