

A CABLE GUIDE ROLLER ARRANGEMENT

The present invention relates to a cable guide roller arrangement which finds use in the installation of electric cables.

Background Art

It is known to provide such roller arrangements in which solid aluminium rollers, having integrally formed stub axles at each end, are rotatably mounted in journals positioned in the corners of a rectangular frame. This arrangement suffers from a number of disadvantages. Firstly, the aluminium rollers are liable to become scuffed or suffer damage in use. This gives rise to sharp edged protrusions on the rollers which can damage the outer electrical insulation of the cable as it passes over the roller. As a consequence, the cable insulation can be damaged or degraded during the installation procedure.

Secondly, there is appreciable friction between the roller and the journals mounting the roller during the installation of long cables of appreciable diameter (for example with continuous cable lengths in excess of 2 km and cable diameters of the order of 150 mm the frictional load of such rollers presents a substantial mechanical load during the cable installing procedure).

It is the object of the present invention to try to lessen the frictional load and thus ease the cable installation.

Summary of the Invention

According to the present invention there is disclosed a cable guide roller arrangement comprising a frame having a plurality of rollers therein, each roller being mounted for rotation relative to said frame and said rollers being positioned along a path which encompasses the cable in use, wherein each said roller has a central passageway through which a fixed shaft passes with at least a working clearance, said shaft being non-rotatably mounted at each end in a support connected to said frame, and a bearing being positioned at each end of each roller to permit each said roller to rotate about the corresponding shaft.

Brief Description of the Drawings:

A preferred embodiment of the present invention will now be described with reference to the drawings in which:

Fig. 1 is a perspective view of a prior art cable guide roller;

Fig. 2 is an exploded perspective view of one roller and a corner journal arrangement;

Fig. 3 is a schematic perspective view of a modified journal showing a ball bearing in phantom;

Fig. 4 is a view similar to Fig. 2 but of the preferred embodiment of the present invention;

Fig. 5 is a longitudinal cross-sectional view through two adjacent rollers each of the embodiment of Fig. 4; and

Fig. 6 is a view similar to that of Fig. 1 but of the preferred embodiment of Figs. 4 and 5.

Detailed Description

As seen in Fig. 1, a prior art cable guide roller 1 has a square frame 2 and four aluminium rollers 3. Each of the rollers 3 has a stub axle 4 at each end as seen in Fig. 2 with the stub axles 4 and roller 3 being integrally formed by turning from a solid rod of aluminium. Each of the stub axles 4 is rotatably mounted in a blind hole 5 located in a journal mounting block 6.

Since there are four rollers 3, there are eight stub axles and eight blocks 6. As seen in Figs. 1 and 2, each pair of blocks 6 is mounted in a corresponding corner of the frame 2 with the bevelled edges 7 abutting.

One side 9 of the frame 2 is pivoted at 10 so as to be movable into an open position as indicated by broken lines in Fig. 1. A latch 11 retains the pivoted side 9 in the closed position.

In use the cable to be laid (not illustrated) is passed through the opening defined by the four rollers 3 and pulled along its intended route. Since this route will, in general, not be a straight line, the cable will move over one of the rollers 3 causing

it to rotate as the cable is pulled into its final position. Since the cable can weight in the vicinity of 40 kg/meter and be a kilometer or more in length, substantial mechanical loads are created. Thus, one of the cable guide rollers is required every 1-2 meters along the cable route.

After the cable has been pulled into its final position, the side 9 of each frame 2 is unlatched, thereby permitting the frames 2 to be removed. Because of the journal mounting of the rollers 3, there is an appreciable total rolling friction created by the rotation of the large numbers of rollers 3. If this rolling friction could be reduced, the task of installation of the cable could be substantially lessened.

As indicated in Fig. 3, the rolling friction of the rollers 3 could be reduced by the use of a ball bearing 14 as illustrated in phantom in Fig. 3. However, it is not possible to enlarge the blind hole 5 to have a diameter sufficient to accommodate the outer race 15 of the ball bearing 14 without exceeding the present dimensions of the block 6. Under this proposal the sub axle 4 would be received in the inner race 16 of the ball bearing 14.

Thus, the proposal of Fig. 3 is unworkable unless the dimensions of the block 6 were to be substantially increased. This would increase the overall size of the frame 2 which is undesirable, especially in cramped spaces in which cables are laid and where space is at a premium.

As seen in Figs. 4 and 5, the preferred embodiment of the present invention overcomes the above mentioned difficulties by fixing a long shaft 24 between the mounting blocks 6 which are as before save that there is a tight frictional fit between the ends of the shaft 24 and the blind holes 5.

In order to enable the rollers 23 of the preferred embodiment to rotate, each roller 23 is provided with a central cavity 25 and a ball bearing 30 at each end. There is a working clearance 28 between the central cavity 25 and the fixed shaft 24. The inner race 31 of the bearing 30 is a frictional fit on the shaft 24 whilst the outer race 32 of the bearing 30 rotates with the roller 23.

In this way the geometry of the rollers 23 is altered to accommodate the desired ball bearings 30 but the overall size of the frame 22 (Fig. 5) in which the rollers 23 are mounted can be retained essentially as before.

As indicated in Fig. 6, one side 29 of the frame 22 is releasable from the remaining U-shaped portion of the frame 22 by means of two latch pins 20. As a consequence, the frame 22 can be easily removed from the cable (not illustrated) after installation without the need for the same space as is required for the side 9 to pivot away from the frame 2. In the cramped tunnels in which such cables are laid, this represents a worthwhile advantage.

A further advantage is achieved by fabricating the rollers 23 from hard natural rubber. As a result, any wear or scuffing of the rollers 23 does not produce an insulation damaging sharp protrusion. As a consequence, the likelihood of any insulation damage being caused to the cable during installation is substantially lessened.

Industrial Applicability

The preferred embodiment of the present invention finds particular application in the proposed laying of AC power cables by Singapore Power. Rather than lay expensive submarine cables under a portion of Singapore harbour, it is proposed to build a small waterproof tunnel under the harbour through which the cables are to be laid. The total continuous length of cable is approximately 2.2 km, the cable weight is approximately 40 kg/meter, the cable diameter is approximately 150 mm, and the frames 22 are intended to be positioned every 2 meters. The cables will be 66 KV, 230 KV and 400 KV and are to be megger tested to 20 KV DC after installation.

The foregoing describes only one embodiment of the present invention and modifications, obvious to those skilled in the cable laying arts, can be made thereto without departing from the scope of the present invention. For example, the bearings 30 can be roller bearings.



CLAIMS:

1. A cable guide roller arrangement comprising a frame having a plurality of rollers therein, each roller being mounted for rotation relative to said frame and said rollers being positioned along a path which encompasses the cable in use, wherein each said roller has a central passageway through which a fixed shaft passes with at least a working clearance, said shaft being non-rotatably mounted at each end in a support connected to said frame, and a bearing being positioned at each end of each roller to permit each said roller to rotate about the corresponding shaft.
2. A cable guide roller arrangement as claimed in claim 1, wherein said frame is substantially rectangular having four sides, and one of said rollers extends along each of said sides.
3. A cable guide roller arrangement as claimed in claim 2, wherein three of said sides are connected together into a substantially U-shaped sub-frame which is closed by said fourth side.
4. A cable guide roller arrangement as claimed in claim 3, wherein each end of said fourth side is releasably detachable from said U-shaped sub-frame.
5. A cable guide roller arrangement as claimed in any one of claims 1 to 4, wherein said bearing is a ball bearing.
6. A cable guide roller arrangement as claimed in any one of claims 1 to 5, wherein each said roller is fabricated from hard elastomeric material.
7. A cable guide roller arrangement as claimed in claim 6, wherein said elastomeric material comprises natural rubber.

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ABSTRACT

The present invention discloses a cable guide roller arrangement (22) for use in the installation of electric cables. Four rollers (23) are mounted in a square frame (22) one side (29) of which is releasably detachable from the frame (22). Each roller (23) is fabricated from hard natural rubber and is rotatably mounted about a fixed shaft (24) which passes through the centre of the roller (23). The shaft (24) extends between a pair of supports (6). The arrangement provides reduced frictional losses together with a compact structure.

Fig. 5

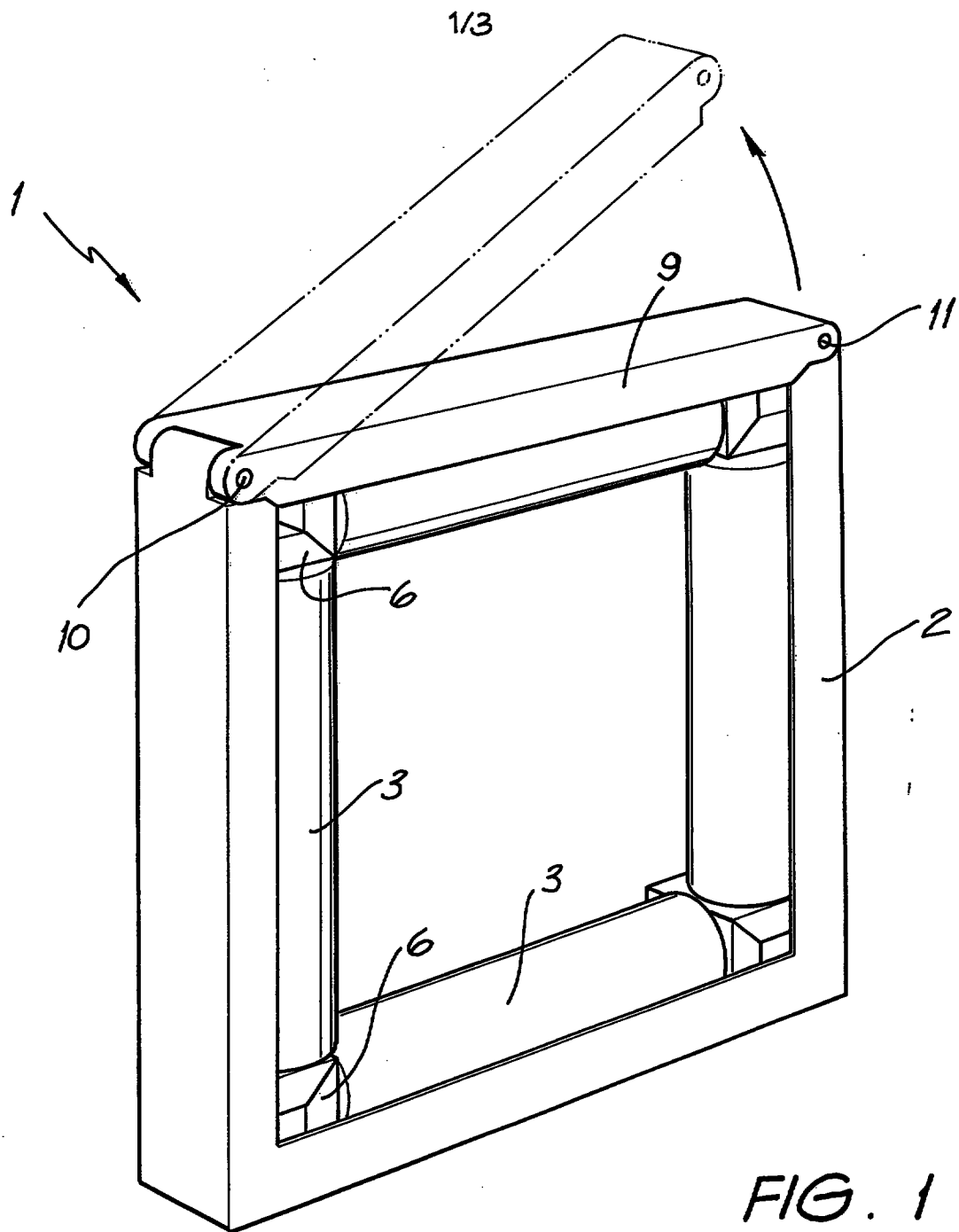


FIG. 1
PRIOR ART

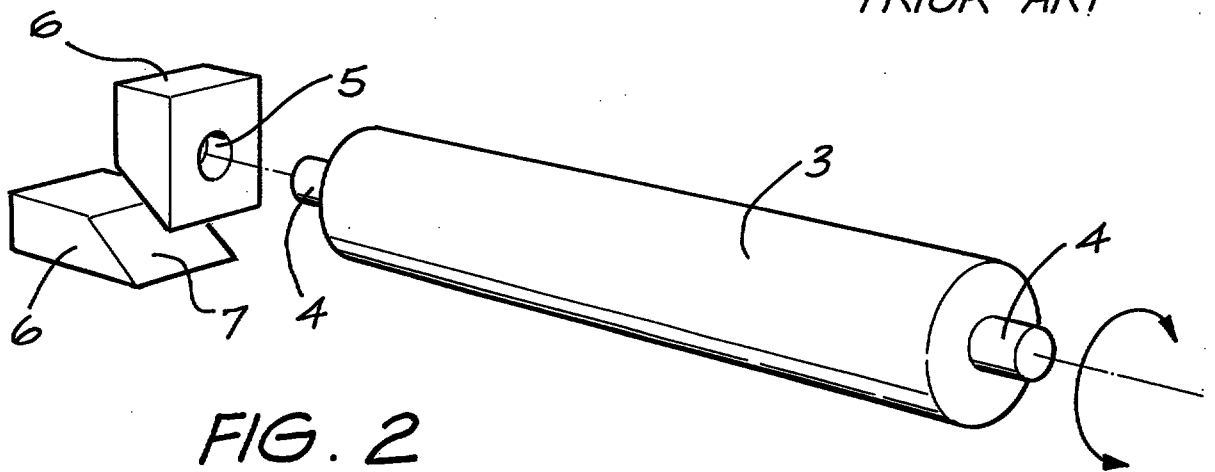
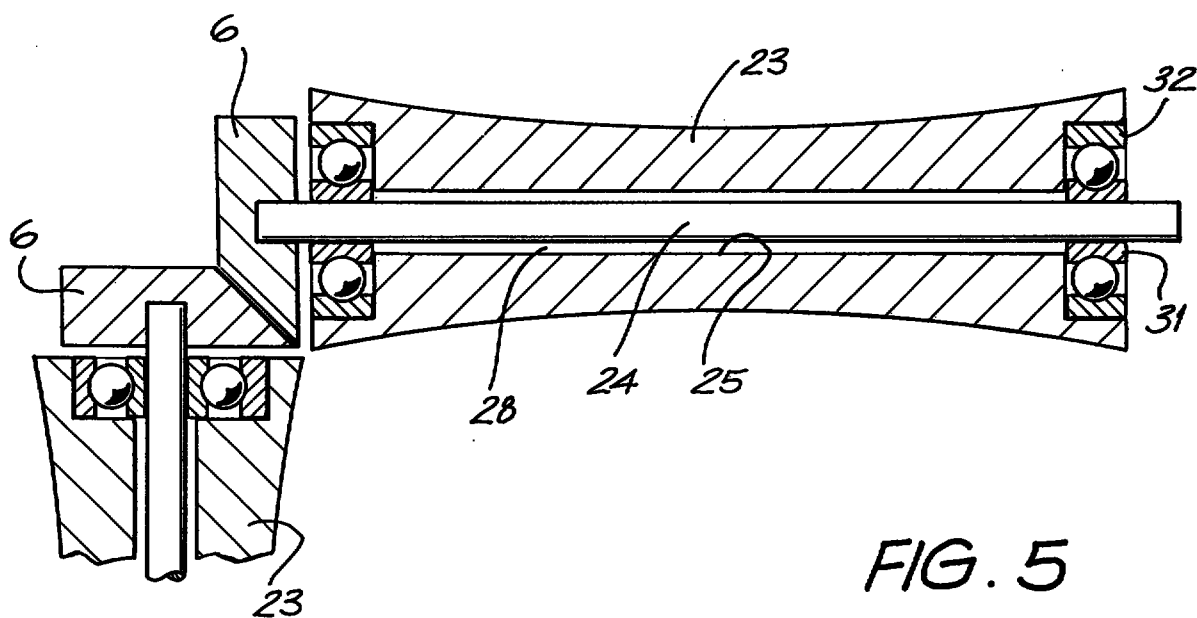
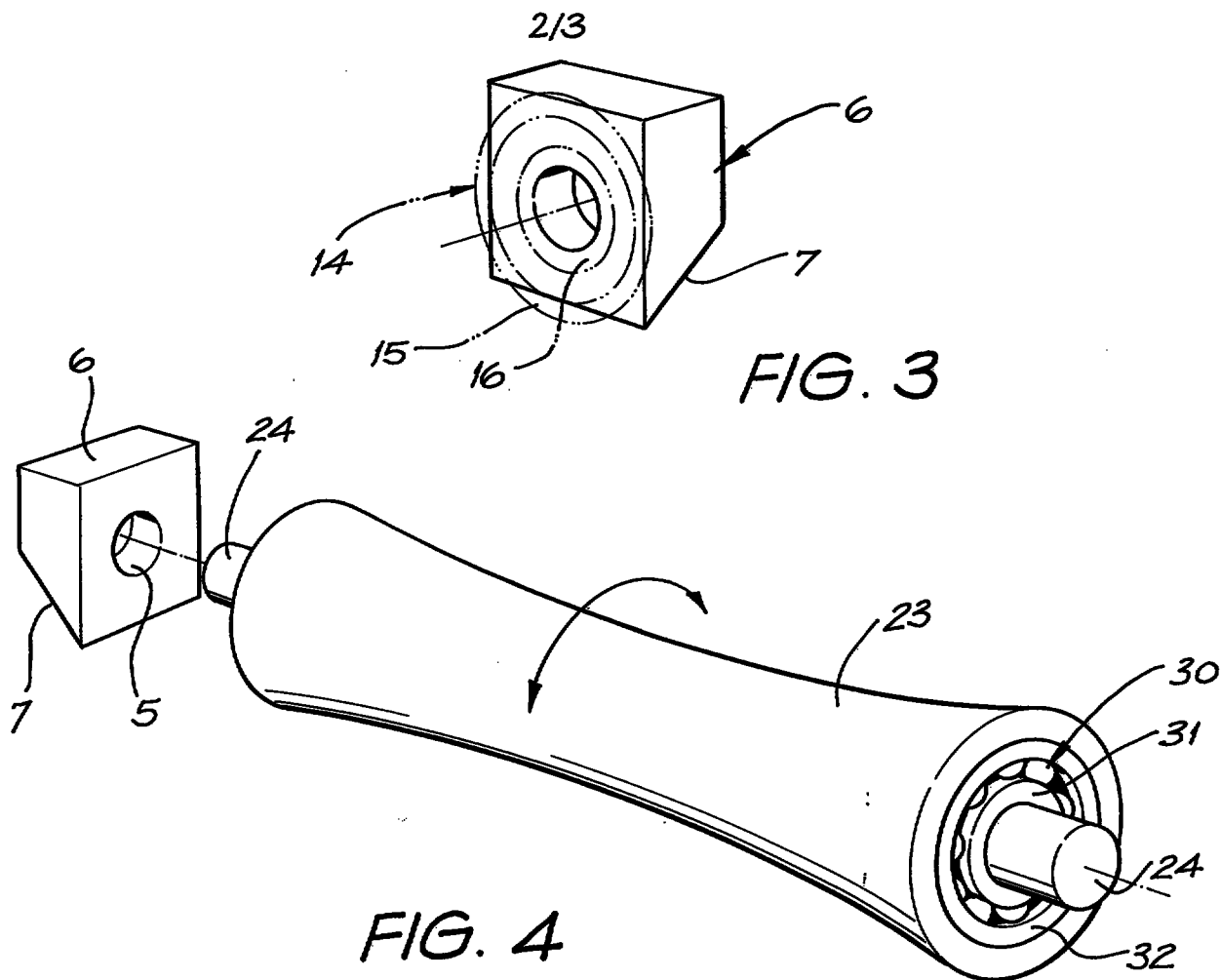


FIG. 2
PRIOR ART



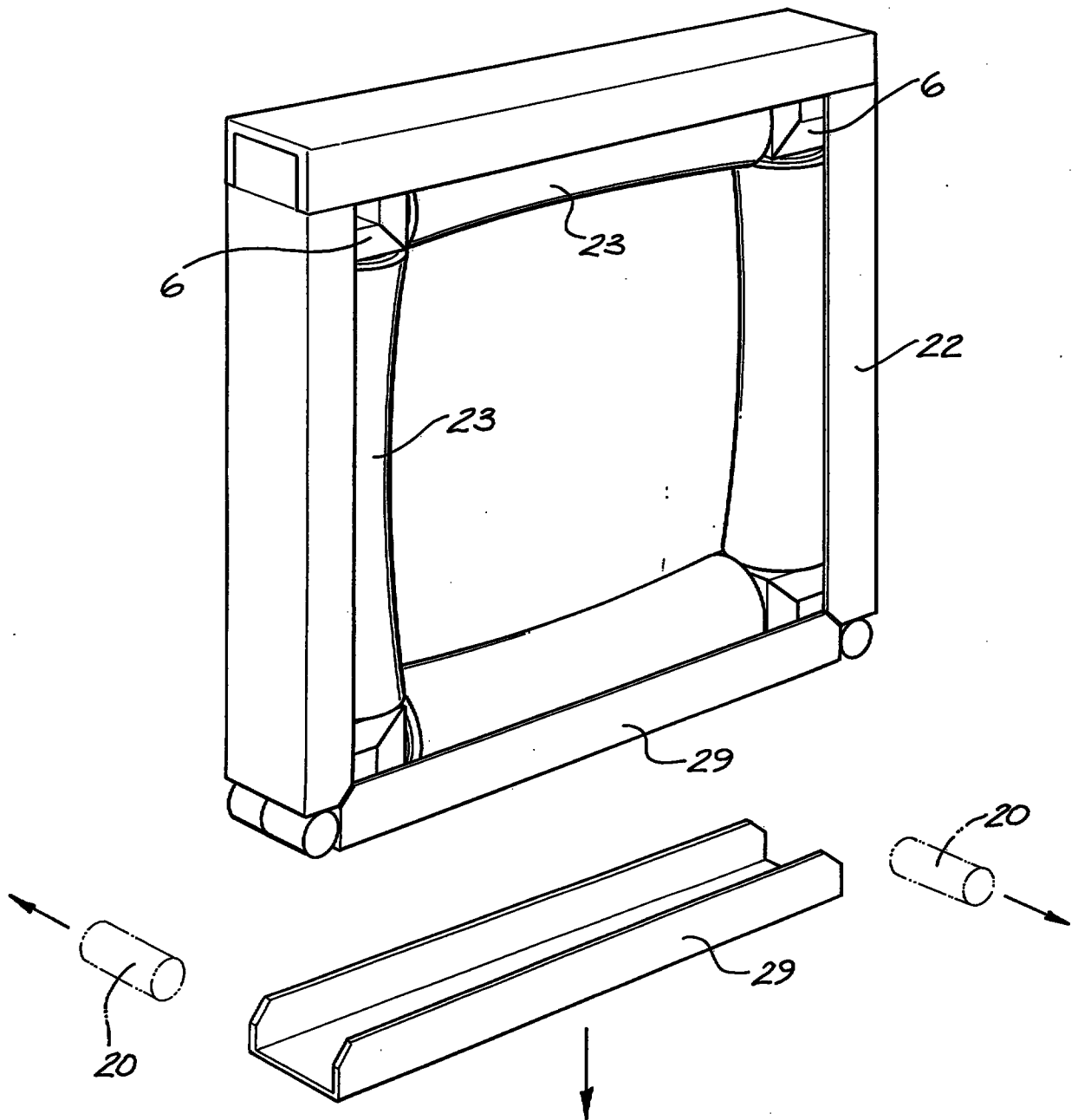


FIG. 6