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Dauernheim et al.

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[54] **APPARATUS FOR CONNECTING THE GUIDE TUBE OF A CABLE WINDOW WINDER TO A CENTRAL GUIDE RAIL**

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[51] **Int. Cl.** **F05f 11/40,** B27b 9/02

[58] **Field of Search** 49/352, 227, 360, 349; 74/89.15, 89.2

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[57] **ABSTRACT**

In a slidable window of the type used in automobiles, the window is guided in the open position partially by the window frame and partially by a guide rail located in the window shaft of the automobile door. A cable window winder opens and closes the window and has a guide tube portion arranged in parallel with the guide rail. One end of the guide tube portion is fixed to the guide rail and its other end is displaceably secured to the guide rail, preferably by a flexible thermoplastic member, so that errors in parallelism or deviations in curvature between the guide rail and the guide tube portion can be compensated.

10 Claims, 6 Drawing Figures

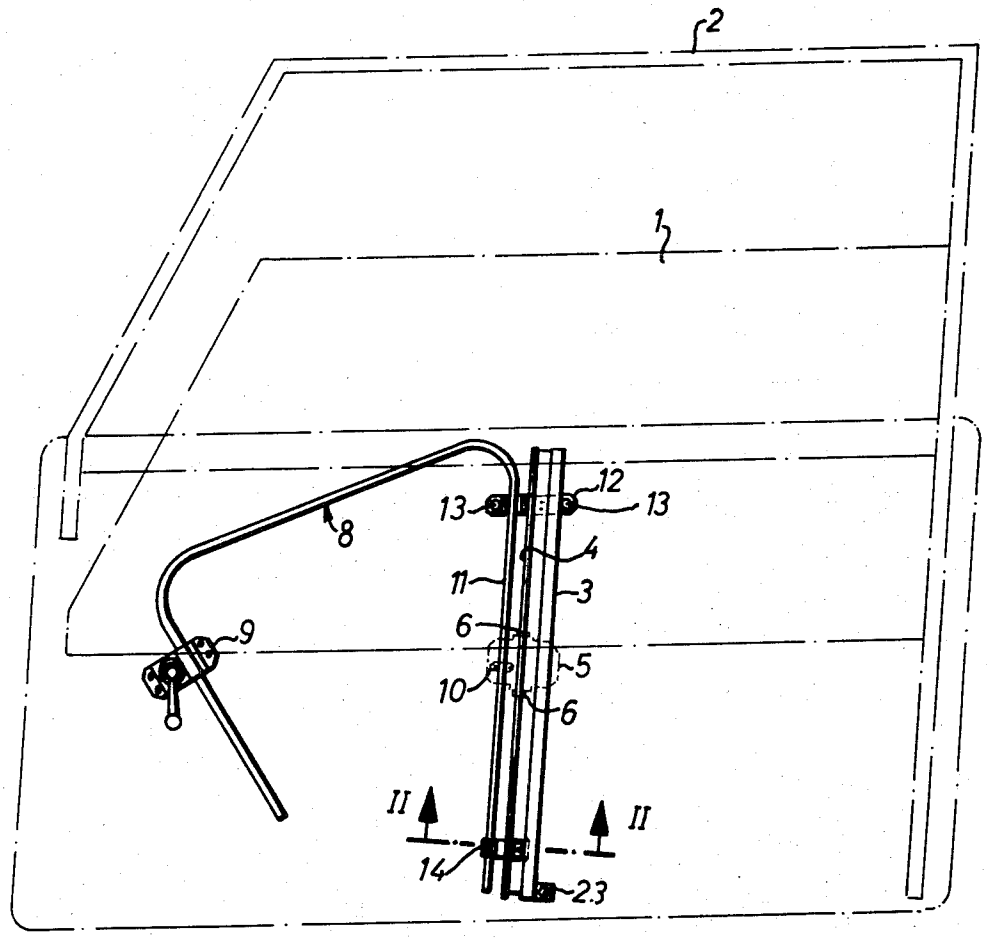


Fig. 1

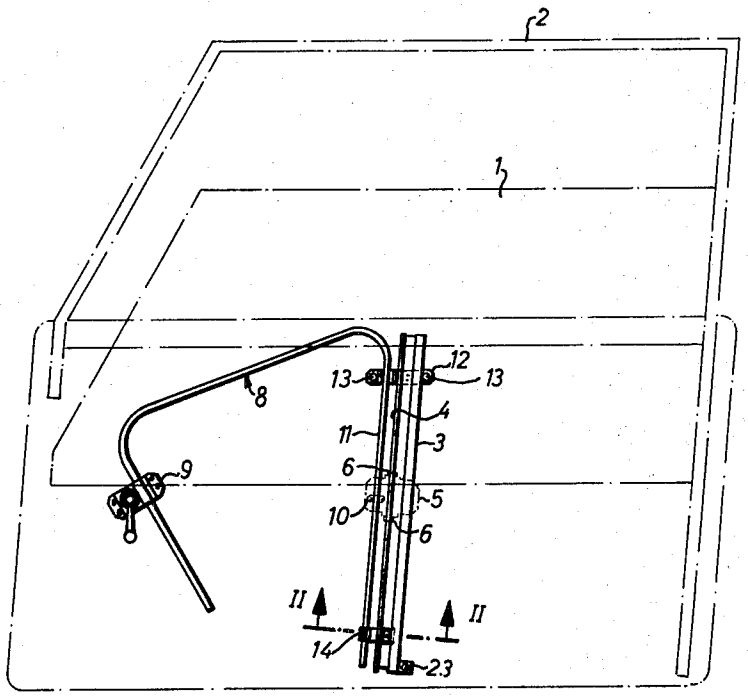
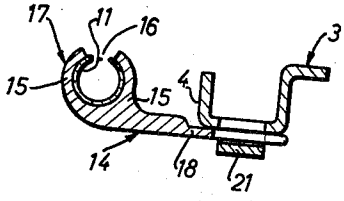


Fig. 2



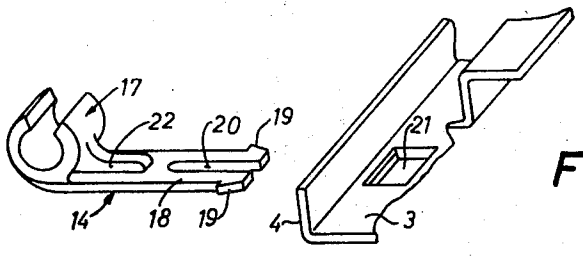
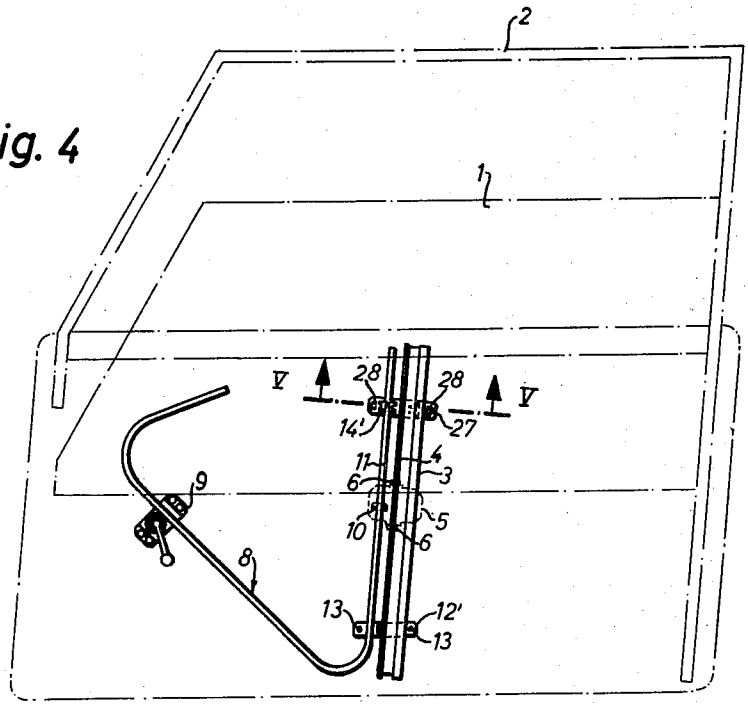


Fig. 3

Fig. 4



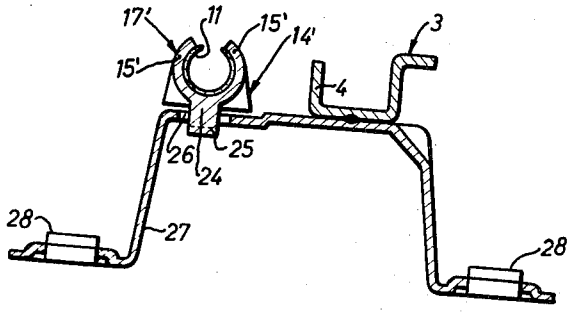


Fig. 5

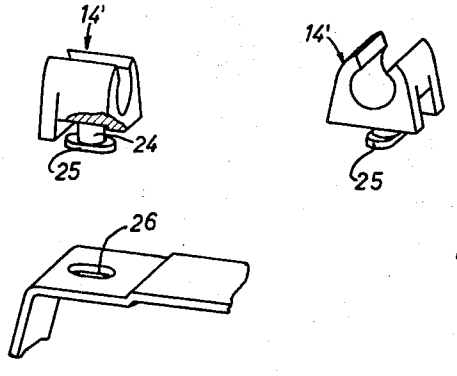


Fig. 6

APPARATUS FOR CONNECTING THE GUIDE TUBE OF A CABLE WINDOW WINDER TO A CENTRAL GUIDE RAIL

SUMMARY OF THE INVENTION

The present invention is directed to an apparatus for opening and closing a slidable window, such as used in automobiles, and, more particularly, it is directed to the connection between the guide tube of a cable window winder and a guide rail located within the window shaft in the door of an automobile.

In cable window winders, a flexible winding cable is provided in the guide tube, sliding therein to transmit tension and compression; this cable is engaged by the drive pinion of a toothed drive mounted in a housing and is connected directly or indirectly to the window by one or more dogs fitted to the winding cable and extending through a longitudinal slot in the guide tube.

The guide tube, constructed in this widely-used type of window winder, has, at least in the region of the dog path, a slotted metal tube, and is mounted in the window shaft so that its portion extending along the dog path is aligned to the direction of sliding and possibly also to the curvature of the window.

The central guide rail provided within the window shaft of the automobile door and affording the sole or an additional guide, must follow a corresponding exact alignment, if difficulties in functioning such as heavy running are to be avoided. Since the dog or dogs engage the slide, a trolley or the like, which is guided in sliding or rolling manner without play on the guide rail, is fixed to the window, and it is important to assure very exact parallel alignment of the guide tube slot and the guiding path of the guide rail. The guide tube and guide rail, which principally to simplify assembly are usually joined together to form one unit by having the guide tube fixed directly (e.g., DT-PS 1,931,472, DT-OS 1,555,632) or indirectly by webs (e.g., DT-PS 1,805,566) to the guide rail, for example by spot welding, must for this purpose have an exact parallel alignment relative to each other.

It has been found in practice that this parallel alignment, so necessary for functioning, can be achieved only with considerable difficulty and appreciable trouble in series or mass production. Often it is necessary to align the guide tube and guide rail after assembly.

It is an object of the invention to overcome this deficiency and to provide a connection between guide tube and guide rail which enables installation to be made with little concern for the parallel alignment of guide tube and guide rail.

Therefore, in accordance with the present invention, the guide tube, in the vicinity of one end of the guide rail, is fixed to the guide rail either directly or indirectly in a known manner, whereas in the vicinity of the other end of the guide rail, a slidable and/or flexible connecting piece is provided between this rail and the guide tube and permits limited relative movements between the two. In this simple manner, it is possible to ensure in a reliable manner that departures from the exact parallel setting between guide tube and guide rail can be compensated automatically when adjusting the lifting setting of the window, principally by the guide tube adjusting itself flexibly to the guide rail.

The arrangement may with advantages be such that the connecting piece on the one hand grips the guide tube with two spring arms, leaving the slot free, and on the other hand fits slidably into a recess mounted directly or indirectly on the guide rail. This arrangement makes possible the attachment of the connecting piece without the assistance of tools.

In a preferred form of embodiment of the invention, the connecting piece has an elongated projection which is elastically bendable transversely to its direction of sliding. The connecting piece constructed in this way is capable not only of taking up by means of sliding movements errors in the parallelism between the guide tube and the guide rail, but it also compensates, by suitable elastic bending deformation, deviations in curvature between guide tube and guide rail during the lifting adjustment of the window, where the guide rail and guide tube have been given a curvature to match a predetermined curvature of the window pane.

In one alternative embodiment of the invention, the connecting piece is provided, on the side opposite the slot formed by the adjacent ends of the spring arms, with a projection oriented at right angles to the axis of the guide tube, this projection engages in the recess so as to slide both transversely and longitudinally. Accordingly, the connecting piece, by suitable sliding movements, can be used during the lifting setting of the window to compensate both for errors in parallelism and also for deviations in curvature between the guide tube and guide rail.

In the preferred embodiment, the connecting piece consists, in pursuance of the concept of the invention, of a slotted cylindrical sleeve of a size to fit the outer diameter of the guide tube, and of an elongated extension or projection extending from the sleeve on the side opposite the slot and disposed tangentially to the cylindrical sleeve, this extension is provided at its outer end spaced from the sleeve with at least one flexibly resilient arrestor nose which cooperates with the recess on the guide rail to provide an outer limitation of the sliding movement. After the elongated extension has been fitted into the recess, the arrestor nose engages behind an edge of the recess which cooperates with it, so that not only is the sliding movement in one direction limited thereby, but also any unintentional loosening of the connecting piece from the guide rail is prevented.

The recess may favorably be a flat lug pressed directly from the guide rail or from a part connected to it. The lug is dimensioned so that it guides the elongated extension of the connecting piece.

In the alternative embodiment of the invention, the connecting piece advantageously consists of a slotted cylindrical tube fitting the external diameter of the guide tube, and of a substantially cylindrically shaped projection, which carries at its end spaced from the sleeve an elongated hammer head whose maximum or elongated dimension extends parallel to the axis of the guide tube. With this arrangement, the associated recess is formed by an elongated hole having its elongated dimension extending in the direction of sliding in the guide rail or in a part connected thereto; this hole permits the hammer head to pass through it. After the hammer head has been introduced through the elongated hole, the connecting piece, in this form of embodiment, is rotated through 90°, so that the hammer head locks the projection to the guide rail. The length of the projection, that is the effective length of the projection between the hammer head and the cylindrical

sleeve, determines the extent of take-up of a possible curvature deviation between the guide tube and guide rail.

The connecting piece can be made especially simply and to accurate dimensions, if it is injection molded in one piece from a thermoplastic material, such as polyamide 6. Since the guide rail and recess usually consist of a metal material, the construction of the connecting piece from plastics results in a pairing of materials well suited to easy sliding, and one which also eliminates noise at the connecting point.

The fact that in both embodiments the connecting piece with its slotted cylindrical sleeve is placed as a spring fitting over the guide tube so that spot welding passing through the guide tube at this connecting position is no longer required, eliminates another previously existing source of trouble. In the forms of construction previously known, welding residue in the pipe could lead to a rattling noise from the dogs, when the winding cable was moved in the pipe.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there are illustrated and described preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is a diagrammatic view of the interior of a vehicle door with an installed cable window winder and a central guide rail, with the guide tube and guide rail connected together according to the invention;

FIG. 2 is an enlarged view of the section taken along the line II—II in FIG. 1;

FIG. 3 is a perspective view of the connecting components permitting relative movement between the guide rail and guide tube;

FIG. 4 is a view similar to FIG. 1, but illustrating a modified form of the cable window winder and the connecting components according to the invention;

FIG. 5 is an enlarged view of the section taken along the line V—V in FIG. 4; and

FIG. 6 is a perspective view of the elements of the alternative embodiment of the connecting piece.

DETAILED DESCRIPTION OF THE INVENTION

In the form of window shown in FIGS. 1 and 4, only the rear edge of the window 1 is guided during the entire window lifting stroke, that is, in the rear frame bar of the window frame 2, while the front edge of the window, as soon as it is moved slightly downwardly from its closed position, comes out of the associated frame bar of the window frame 2. For this reason, a guide rail 3, constructed in known manner from a profiled plate, is also secured in the window shaft to the inner plate (not shown) of the door. On a flange 4, extending perpendicularly to the window 1, of the guide rail 3 a slide 5 is slidably guided by means of slide pieces 6 fixed to it. The slide 5, of a known constructional form, is also fixed in a known manner, not illustrated, to the bottom edge of the window 1.

In FIGS. 1 and 4, the only parts shown of the known cable window winder, which requires no further explanation at this point, are the guide tube 8, the drive housing 9 and the dog 10. A guide tube portion 11 of the guide tube 8 runs parallel to the flange 4 of the guide rail 3. In the window winder illustrated in FIG. 1, the winder is of a so-called pulling type, because the cable (not shown) pulls upwards during the closure stroke of the window 1. By contrast, the window winder illustrated in FIG. 4 is described as a pushing window winder, because the cable pushes the window 1 upwards during the closure stroke. For the window winder illustrated in FIG. 1, the fixed connection between the guide tube portion 11 and the guide rail 3 may favorably be provided at the top by a connecting strap 12, whereas in the window winder illustrated in FIG. 4, the connecting strap 12' between the guide tube portion 11 and guide rail 3 is mounted at the bottom. The guide rail and guide tube are rigidly connected to the connecting strap 12, 12', respectively, for example by spot welding. The connecting straps 12 and 12' are provided with holes or nuts 13 for attaching the unit constituted by the window winder and guide rail to the inner plate of the door. Instead of the indirect connection of the guide tube to the guide rail by means of the connection strap 12 or 12', respectively, as shown in FIGS. 1 and 4, a direct connection can also be formed in known manner, by securing the guide tube directly to the guide rail, for example by spot welding.

Since the dog 10 illustrated in FIGS. 1 and 4, fixed to the winding cable, is immovably fixed to the guiding slide 5, it can be seen that when errors in parallelism occur between the guide tube portion 11 and the guide rail 3, and also when deviations in curvature occur between these two components, compensation cannot be effected, if the ends of the guide tube and of the guide rail opposite to the fixing straps 12, 12' are also rigidly connected together.

To explain the preferred embodiment of a connection piece 14 which permits such a compensation, reference is made to FIGS. 2 and 3. The connection piece 14, injection molded in one piece from polyamide 6, surrounds the guide tube 11 with its spring arms 15, the adjacent free ends of the arms 15 are spaced apart and terminate before the guide slot 16 in the guide tube so that the dog 10 (FIG. 1) can pass outwardly unobstructedly through the slot 16. The spring arms 15 are components of a cylindrical housing or sleeve 17, from which an elongated extension 18 extends tangentially of the sleeve. The extension 18 is provided at its free end with two arrestor noses 19, which can yield in the manner of a spring due to a slot-shaped recess 20 formed in the free end of the extension 18. In the embodiment shown, the recess for the extension 18 consists of a flat lug 21 pressed out from the guide rail 3 and with the guide rail, forming an opening through which the extension is fitted. The lug 21 guides the extension 18, and its arrestor noses 19 engage behind this lug outwardly from the sleeve, after the extension has been positioned through the lug. The arrestor noses 19 thus limit the sliding movement in one direction and the opposite limit is provided by a stiffening web 22 extending from the cylindrical housing 17 along the extension 18. As illustrated especially in FIG. 3, the elongated extension 18 is flexible on account of its cross section, so that it can take up not only deviations in parallelism, but also errors in alignment perpendicular

to the plane of the drawing, by suitable elastic bending.

In addition to the attachment of the connecting strap **12** by means of the holes **13**, the window winder and guide rail unit, illustrated in FIG. **1**, are secured to the door by means of the drive housing **9** and the end member **23**, respectively.

In an alternative embodiment shown in FIGS. **4** to **6**, the connecting piece **14'** is also a molding formed in one piece of polyamide **6**. In this case also, a slotted cylindrical housing or sleeve **17'** is provided, having spring arms **15'** which grip the guide tube **11**. A cylindrical projection **24** extends from the opposite side of the cylindrical sleeve **17'** from its slot and has a hammer head **25** which fits through a suitably shaped elongated hole **26** and is locked by a 90° rotation, before the guide tube **11** is fixed into the connecting piece **14'**. The cylindrical sleeve **17'** is then ready to receive the guide tube **11**. The elongated hole **26** is mounted in a fixing bridge **27**, to which the guide rail **3** is rigidly secured. The fixing bridge **27** is secured to the inner plate of the door by means of nuts **28**. In this embodiment, it would clearly be possible for the guide tube **11** to be fixed directly to the guide rail **3**, in which case the elongated hole **26** would be provided in the guide rail itself.

The elongated hole **26** makes possible limited relative movements between the guide tube **11** and the guide rail **3**, and therefore, in combination with the projection **24**, is adapted for compensating for errors in parallelism between guide tube **11** and the guide rail **3**. As can be seen especially from FIG. **5**, it is also possible for errors in alignment perpendicular to the plane of the drawing between guide tube **11** and guide rail **3** to be absorbed by means of the connecting piece **14'**, by having the projection **24** constructed to a suitable effective length. In this connection, errors in alignment are understood to mean principally deviations in curvature between the guide tube portion **11** and the guide rail **3**.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. In an apparatus for opening and closing a slidable window, such as a window which can be opened by lowering into the window shaft in a door of an automobile vehicle, comprising a guide rail, a window winder, said window winder including a guide tube having a guide tube portion disposed in parallel relation with said guide rail and fixed at one end to said guide rail, wherein the improvement comprises means for flexibly and displaceably connecting the opposite end of said guide tube portion from its end fixed to said guide rail to said guide rail for permitting limited relative movement between said guide rail and said guide tube portion.

2. In an apparatus, as set forth in claim **1**, wherein said means comprises a flexible connecting piece including two spring arms which grip said guide tube with the adjacent ends of said spring arms disposed in spaced relationship forming a slot, and a projection extending from said spring arms and arranged to be slidably engageable relative to said guide rail.

3. In an apparatus, as set forth in claim **2**, wherein said projection is an elongated member extending from said arms transversely of the axial direction of said guide tube portion, and said elongated member is elastically bendable in the direction transverse to the axial direction of said guide tube portion.

4. In an apparatus, as set forth in claim **2**, wherein said projection extends outwardly from said spring arms perpendicularly to the axis of said guide tube portion and the extension of said projection intersects the axis of said guide tube portion, and said projection being displaceable transversely and longitudinally of said guide tube axis.

5. In an apparatus, as set forth in claim **1**, wherein said means comprises a slotted cylindrically shaped sleeve in resilient engagement with the exterior diameter of said guide tube portion, and an elongated extension secured to and extending tangentially from the opposite side of said sleeve from the slot therein, said projection extending transversely of the axis of said guide tube portion, said projection having at least one elastically resilient arrestor nose therein spaced from the connection of said projection to said sleeve and said arrestor nose arranged to limit the sliding movement of said means at its maximum dimension from the axis of said guide tube.

6. In an apparatus, as set forth in claim **5**, wherein said guide rail has a flat lug pressed from its surface with said lug combining with said guide rail for forming an opening in which said projection on said sleeve is slidably displaceable and said arrestor nose being engageable with said lug for limiting in one direction the limit sliding movement of said means.

7. In an apparatus, as set forth in claim **1**, wherein said means comprises a slotted cylindrically shaped sleeve in resilient engagement with the exterior diameter of said guide tube portion, and a cylindrically shaped projection secured to and extending outwardly from said sleeve on the opposite side thereof from the slot therein and disposes at right angles to the axis of said sleeve, a head secured to the end of said projection spaced outwardly from said sleeve, and said head being elongated in the axial direction of said sleeve.

8. In an apparatus, as set forth in claim **7**, wherein said guide rail includes a section having an elongated hole therein with the elongated dimension of said hole extending transversely of the axial direction of said sleeve, the elongated dimension of said hole being sufficient to pass the elongated dimension of said head and the dimension of said hole normal to its elongated dimension being less than the elongated dimension of said head and at least sufficient to receive the transverse dimension of said projection so that said head and projection can be positioned through the elongated hole and turned 90° for slidably securing said sleeve to said section of said guide rail whereby said projection can slide in the elongated direction of said hole.

9. In an apparatus, as set forth in claim **2**, wherein said connecting piece and projection are formed as a single piece from a thermoplastic material.

10. In an apparatus, as set forth in claim **9**, wherein said connecting piece and projection is injection molded from polyamide **6**.

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