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(54) Strut of a folding vehicle roof cover

(57) A strut 8 connected at its ends to the remainder of the folding frame (Fig. 1) supporting a fabric roof skin 3 is elastically deformed during the final stage of roof erection from a convexly curved shape to a more trapezoidal shape so that it exerts tensioning forces on the skin. The cross-sectional profile, e.g. tubular or flat, may vary along its length to achieve the desired skin tensioning when deformed.

Fig. 2

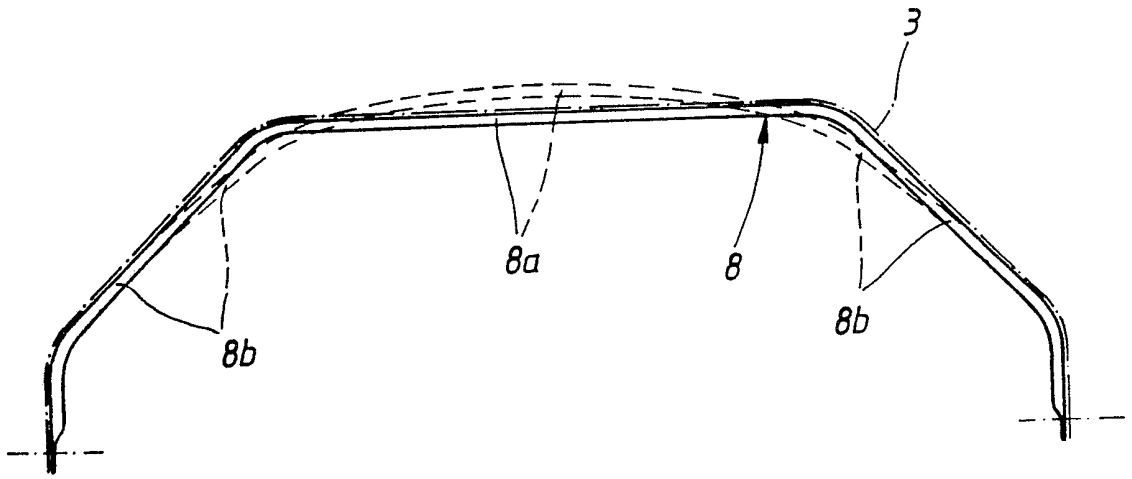

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Fig. 1

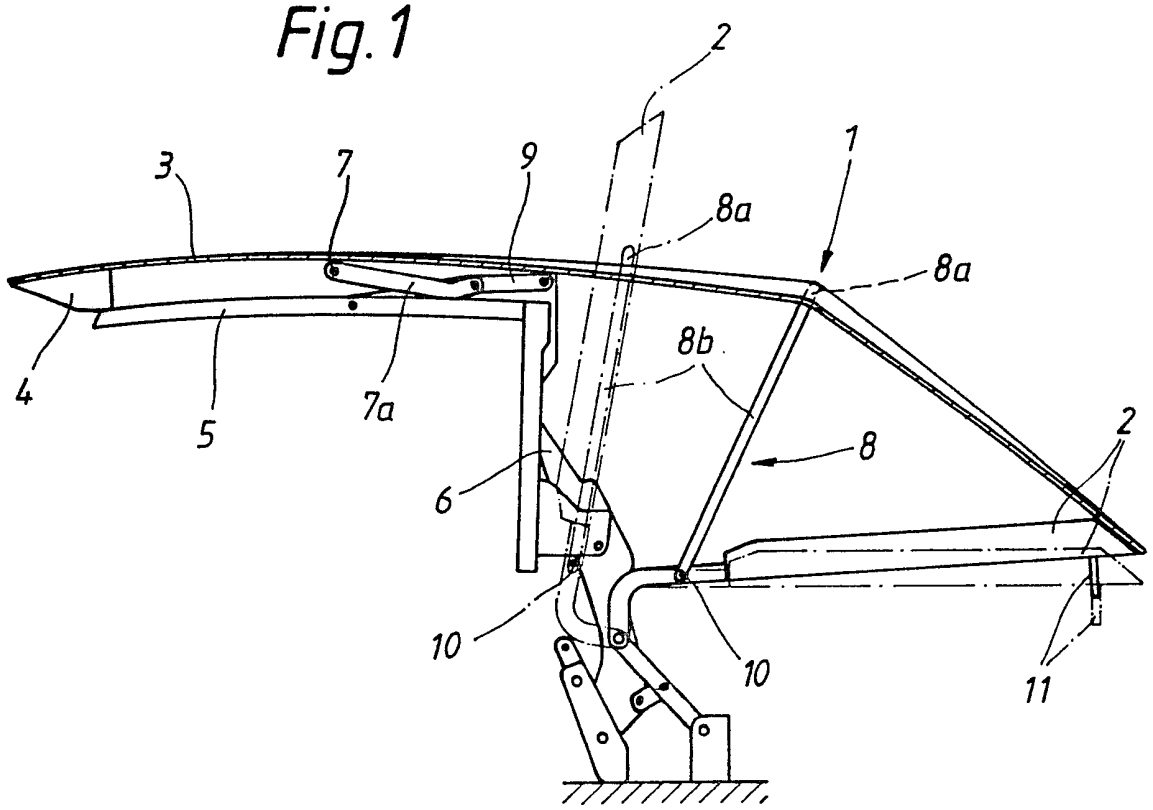
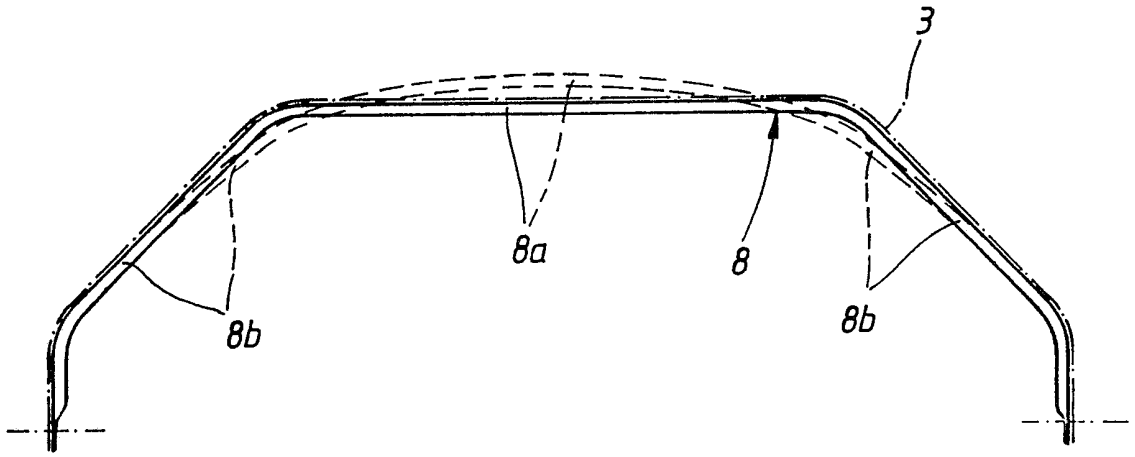


Fig. 2



Strut for a folding vehicle cover

The invention relates to a strut for a folding vehicle cover, in particular a strut for a folding vehicle cover, having a frame and a roof skin, the strut bridging the roof width by being braced axially on load-bearing connecting components on both sides of the vehicle by angled strut flanks, whilst a strut section between the strut flanks is raisable in the strut plane relative to the braced ends of the strut flanks into a tensioned position in which position the roof skin of the folding cover is resiliently stressed by means of the strut section, and whilst the strut section is locked upon reaching a vertical limit position located above the tensioned position,

A strut of this type may be seen to be already known from British Patent Specification No. 836,677. This is a tubular corner strut having strut flanks angled downwards in mutual mirror image symmetry, which can be plugged into housing bushes fixed to the vehicle wall in order to attach the strut to the vehicle. The lower ends of the strut flanks are thereby firmly braced circumferentially and counter to the plug-in direction after the strut is fitted.

In order to achieve a vertical mobility of an upper strut section, the strut flanks are divided into a plurality of tubular sections which are nested telescopically and which therefore permit variations in the length of the strut flanks by mutual longitudinal sliding of the mutually associated tubular sections.

Since the corner strut is required to tension the roof skin of an associated folding cover, a compression spring arrangement is provided which stresses the yoke-shaped upper strut section with a vertical feed and presses it against the roof skin with a substantially constant spring force.

The total possible vertical feed of the strut section is limited here by slot stops of the telescopic guides, each of which is formed by a clamp screw.

By means of the clamp screws the strut section can be fixed simultaneously in a lower limit position, whereby the

closing process of the folding cover remains possible without difficulty when the corner strut is applied.

When the folding cover is closed the clamp screws may be released, causing the strut section, driven by the compression springs, to fly up until no further vertical feed is possible after the roof skin is made taut.

The fitting of the known corner strut is thus necessary in addition to the closing process of the folding cover and is furthermore rendered difficult by complicated operation.

The present invention seeks to develop a generic strut of a folding vehicle cover further so that its manipulation is simplified as far as possible.

According to the present invention there is provided a strut for a folding vehicle cover, having a frame and a roof skin, the strut bridging the roof width by being braced axially on load-bearing connecting components on both sides of the vehicle by angled strut flanks, whilst a strut section between the strut flanks is raisable in the strut plane relative to the braced ends of the strut flanks into a tensioned position in which position the roof skin of the folding cover is resiliently stressed by means of the strut section, and whilst the strut section is locked upon reaching a vertical limit position located above the tensioned position, wherein the strut is integrated into the frame by the strut flanks being braced articulately against associated side wall frame parts of the frame, the strut section being retained in the locked position during erection of the folding cover until a taut roof skin is obtained, and in a final erection phase of the folding cover the strut section is lowerable out of said limit position counter to the spring loading, under the influence of longitudinal tensile forces in the roof skin, into the tensioned position.

The strut participates in the positive movement of the cover frame and is entrained by the cover fabric into its obliquely oriented limit position when the folding cover is closed. The transmission of the lowering feed to the strut section demands higher actuating forces in the final closing phase compared to customary folding covers, whereas the

manipulation of the folding cover remains entirely unmodified.

An operation of the strut independent of the operation of the folding cover is therefore superfluous.

Preferably the strut can be constructed particularly simply if it is constructed overall as a flexurally resilient shaped spring, whilst preferably the locked limit position and also the tensioned position of the strut section may be defined by different deformation positions.

This construction is characterised by a small material outlay, the possibility of inexpensive production, low fault-proneness and minimum requirements for installation space.

The invention will now be described by way of example with reference to the accompanying drawings, in which:

Fig. 1 shows a side view of a cover frame of a folding cover, and

Fig. 2 shows a diagrammatic rear view of a corner strut of the cover frame according to Fig. 1 in an overarched and a flattened position.

A folding cover 1 of a cabriolet, not shown in detail, is an embodiment which is completely lowerable into a U-shaped cover box enclosing the rear seat region of the vehicle. The folding cover 1 occupies an almost completely closed position in which a U-shaped roof skin retaining yoke or side wall frame part 2, which forms its lower extremity, has not yet assumed its position of rest on a cover box lid which closes the cover box towards the top.

A roof skin 3 which terminates the folding cover 1 outwards and consists of textile material is sectioned in the side wall plane so that the main parts of the cover frame, between which the roof skin 3 is tensioned, are visible.

These parts are a front roof frame 4, which maintains the roof skin 3 adjacently to a top frame of a windscreen, two lateral roof frames 5, to which the roof skin 3 is connected above the side windows of the cabriolet, the two uprights 6 of a main strut, on which the roof skin 3 is retained adjacently to the rear window edges of the side windows, and the roof skin retaining yoke 2 already

mentioned, by which the roof skin 3 is enclosed all round in the region of its rear extremity. An intermediate strut 7 and a corner strut or strut 8 are also provided for the intermediate bracing of the roof skin 3. The intermediate strut 7 abuts the interior surface of the roof skin 3 by a strut tube which bridges the roof width and is articulated pivotably to lateral roof frame guide rods 9 by flanks 7a directed backwards at right angles, which are constructed as leaf springs. A pivot stop, not shown, is arranged between each of the flanks 7a and the associated roof frame guide rod 9. These pivot stops ensure that the intermediate stop 7 cannot be pivoted closer to the roof side frames 5 than the position illustrated under the influence of tensile forces in the roof skin 3, but is blocked. The flanks 7a are of soft flexural construction only in the transverse direction of the vehicle and nevertheless brace the strut tube upwards with high flexural rigidity.

The corner strut 8 consists of a resilient tubular yoke which exhibits generally a somewhat trapezoidal extension. This results in a division of the corner strut 8 into a strut section 8a oriented approximately horizontally in the central region and into obliquely oriented strut flanks 8b, shaped onto the strut section 8a in mirror image relationship, by which the corner strut 8 is mounted pivotably at the ends on the associated lateral members of the roof skin retaining yoke 2. Since a lower longitudinal section of the strut flanks 8b is required to tension the roof skin 3 in the side wall plane, these longitudinal sections are bent out of their oblique directionary extension into the side wall plane of the folding cover 1. Due to this extension of the strut flanks 8b the geometrical axis of the pivot bearings 10 on the roof skin retaining yoke 2 can extend horizontally in the transverse direction of the vehicle, which is convenient for the folding process of the corner strut 8.

In order to make the strut section 8a flexible downwards by the influence of longitudinal tensile forces in the roof skin 3 in the course of the closing process, it exhibits a convexly curved shape when the roof skin 3 is tensioned only

in the transverse plane of the corner strut 8. To cause the strut section 8a to assume this overarched shape, the corner strut 8, which is generally constructed as a shaped spring, is pretensioned in the width direction of the folding cover 1, while the spring forces of the latter, which have a tendency to force apart the lower end regions of the strut flanks 8b in the sense of an increase in interval, are absorbed through the pivot bearings 10 by the roof skin retaining yoke 2, which is rigid in upward flexure. The overarching of the strut section 8a is then accompanied by a slight springing of the obliquely oriented longitudinal sections of the strut flanks 8b. It would also be conceivable, as an alternative, to make the corner strut 8 with an overarched strut section 8a, which would reduce the axial stressing of the pivot bearing 10. The tubular cross-section of the corner strut 8 could also be replaced by a leaf spring cross-section for example. Moreover, it would be conceivable to vary the profile cross-section of the corner strut 8 along its length so that the required deformation behaviour is again adjusted overall. The only limits to freedom of structural conformation are imposed here by the spring force to be exerted ultimately, which must be dimensioned to maintain the roof skin 3 taut reliably under all customary travelling conditions.

The tautening of the roof skin 3 during closing, i.e. erection into a closed position, of the folding cover 1 occurs in two consecutive stages by the backward folding movement of the roof skin retaining yoke 2. The tensioning process can occur after the front roof frame 4 is connected firmly by locks to the associated window frame of the vehicle body. This presupposes that the uprights 6 of the main strut occupy the erect position shown, and that the intermediate strut 7 is blocked pivotally by the roof frame guide rods 9. Thus all the frame parts arranged in front of the main strut are held stationary and can only be minimally resiliently deformed by tensile stresses in the roof skin 3.

The roof skin retaining yoke 2 still occupies its erect position indicated by broken lines, whilst the strut 8 is

likewise still located in its plane. The roof skin 3 therefore makes large folds in the region of the uprights 6. After the cover box lid is closed the roof skin retaining yoke 2 can be pivoted out of its erect position about a transverse vehicle axis oriented behind the cover uprights 6, whilst the roof skin 3 becomes increasingly taut. Just before the roof skin retaining yoke 2 reaches its rest position on the cover box lid, a fully taut roof skin 3 is already present, whereby the first tensioning stage is complete. The corner strut 8, which is entrained by the tautening roof skin 3, also occupies its obliquely oriented limit position folded out of the plane of the roof skin retaining yoke 2, in which it is locked against any further pivoting about the pivot bearings 10. This locking is achieved by a traction web being provided in a manner not shown between the strut tube of the main strut and the strut section 8a, and drawn taut.

Since the expansibility of the roof skin 3 is very limited due to the relatively heavy quality of cloth of the cover fabric which is necessary in order to achieve satisfactory robustness, when the strut section 8a occupies the overarched limit position it is impossible to press the roof skin retaining yoke 2 down into its position of rest indicated by broken lines. However, pressing the roof skin retaining yoke 2 down generates longitudinal tensile forces in the roof skin 3 which are transmitted to the strut section 8a and stress the latter in flexure. Since the longitudinal tensile forces occur primarily concentrated between the front roof frame 4 and the opposite width section of the roof skin retaining yoke 2, the stout section 8a can only react by a springing in the lowering direction. The spring stroke of the strut section 8a and the residual pivoting stroke of the roof skin retaining yoke 2 in the second tensioning stage are then matched mutually, so that in the rest position of the roof skin retaining yoke 2, the strut section 8a is bent into a flattened, virtually extended tensioned position. Due to this springing movement of the strut section 8a, the oblique sections of the strut flanks 8b simultaneously become bent

slightly apart, so that they are then inclined somewhat more steeply. During this change of shape of the corner strut 8 the circumferential length of the corner strut 8, which abuts the roof skin 3, is unchanged so that the tension of the roof skin 3 in the transverse plane of the strut is increased slightly but only indirectly, that is to say with the superimposition of the longitudinal tensile forces.

When the roof skin retaining yoke 2 has assumed its rest position it is retained in that position by two locking bolts 11 provided on the roof skin retaining yoke, which engage into associated locks. Due to the relatively high actuating forces which are required in the second tensioning stage of the roof skin 3, it is advantageous in order to facilitate the operation if the locking bolts 11 snap into a pre-engaged position of the locks before this closing phase is reached and can then be moved into their limit position by means of a servomotor.

The corner strut 8 according to the invention permits the exertion upon the roof skin 3 in a particularly simple manner of a constant spring force which leads to a highly constant roof skin tension under customary service conditions, and with which, assuming that the spring force is adequately dimensioned, flutter phenomena of the roof skin 3 can no longer occur even at high travelling speeds.

CLAIMS:

1. Strut for a folding vehicle cover, having a frame and a roof skin, the strut bridging the roof width by being braced axially on load-bearing connecting components on both sides of the vehicle by angled strut flanks, whilst a strut section between the strut flanks is raisable in the strut plane relative to the braced ends of the strut flanks into a tensioned position in which position the roof skin of the folding cover is resiliently stressed by means of the strut section, and the strut section being locked upon reaching a vertical limit position located above the tensioned position, wherein the strut is integrated into the frame by the strut flanks being braced articulately against associated side wall frame parts of the frame, the strut section being retained in the locked position during erection of the folding cover until a taut roof skin is obtained, and in a final erection phase of the folding cover the strut section is lowerable out of said limit position counter to the spring loading, under the influence of longitudinal tensile forces in the roof skin, into the tensioned position.

2. Strut according to claim 1, wherein the strut is constructed as a shaped spring.

3. Strut according to claim 2, wherein the strut section is a central region of the strut, which spans the roof width of the vehicle, and is vertically deformable.

4. Strut according to claim 3, wherein the strut section is overarched upwards in its locked limit position and resiliently flattened in its tensioned position.

5. Strut according to any one of the preceding claims, wherein a trapezoidally conformed corner strut is provided as the strut.

6. Strut substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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