COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

CONVENTION APPLICATION FOR A STANDARD PATENT

We, WEBASTO-WERK W.BAIER GMBH & CO of Stockdorf, Kraillinger Str.5, 8035 Gauting, Federal Republic of Germany hereby apply for the grant of a standard patent for an invention entitled:

"SLIDING AND LIFTING ROOF"

which is described in the accompanying complete specification.

DETAILS OF BASIC APPLICATION

Number of Basic Application: -
P 34 42 631.0

Name of Convention Country in which Basic Application was filed: -
Federal Republic of Germany

Date of Basic Application: -
22 November, 1984

Our address for service is: -

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DATED this SEVENTH day of NOVEMBER 1985

WEBASTO-WERK W.BAIER GMBH & CO

By: [Signature]


TO: THE COMMISSIONER OF PATENTS

AUSTRALIA
COMMONWEALTH OF AUSTRALIA
PATENTS ACT 1952
DECLARATION IN SUPPORT OF A
CONVENTION APPLICATION FOR A PATENT

In support of the Convention Application made for a patent for an
invention entitled:

"SLIDING AND LIFTING ROOF"

Wolfgang Vogel

1/We, ......................................................

of ......................................................

[full name of declarant(s)]

[full address of declarant(s) - not post office box]

Federal Republic of Germany

do solemnly and sincerely declare as follows:-

1. I am/we are authorised by WEBASTO-WERK W.BAIER GMBH & CO

the applicant for the patent to make this declaration on

its behalf.

2. The basic application as defined by Section 141 of the

Act was made in Federal Republic of Germany on 22

November, 1984 by WEBASTO-WERK W.BAIER GMBH & CO

3. WALTER SCHÄTZLER, BERNHARD SCHLEICHER, RICHARD IGEL and

HANS JARDIN; of Peter Dürflerstr.5, 8035 Stockdorf;

Prinzenstr.47, 8000 München 19; Luitpoldstr.12, 8034

Germering and Echerner Weg 1, 8084 Inning; all in the

Federal Republic of Germany [respectively], are the

actual inventors of the invention and the facts upon

which the applicant is entitled to make the application

is as follows:

WEBASTO-WERK W.BAIER GMBH & CO is entitled by Contract

of Employment between the inventors as employees and

WEBASTO-WERK W.BAIER GMBH & CO as employer, as a person

who would be entitled to have the patent assigned to it

if a patent were granted upon an application made by the

inventors.

4. The basic application referred to in paragraph 2 of this

Declaration was the first application made in a

Convention country in respect of the invention the

subject of the application.

DECLARED at Stockdorf this 13th day of January 1986

Signature of Declarant

Wolfgang Vogel

TO: THE COMMISSIONER OF PATENTS

AUSTRALIA

The invention relates to a sliding and lifting roof

for vehicles, with a rigid cover which in its closing position

closes a roof opening in a fixed roof surface and in sliding

is opened and closed through a system of cables. The

invention is particularly suitable for use, for example, in

camper vans and caravans.
Sliding and lifting roof for vehicles, with a rigid cover which in its closing position closes a roof orifice in a fixed roof surface and is guided on guide-rails extending parallel to the side edges of the roof orifice, and which is connected via a raising mechanism to at least one drive member adjustable in the cover shifting direction and, as a result of the displacement of the drive member, can either be raised when its rear edge is lifted above the fixed roof surface or shifted after its rear end has been lowered below the fixed roof surface, the raising mechanism having a sliding link adjustable together with the drive member, and a raising lever which in the region of one of its ends is mounted pivotally about an axle fixed to the cover, in the region of its other end is guided so as to be pivotable and longitudinally movable over a limited distance in the cover shifting direction in relation to the sliding link and is connected to the sliding link via an additional positive guide which incorporates a cam adjustable along a guide track, characterised in that the cam is connected to the raising lever at a distance from the pivot bearing located on the same side as the link, and a guide track is formed on the sliding link.
FORM 10

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PATENTS ACT 1952

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE:

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Complete Specification Lodge

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Address of Applicant: Stockdorf, Kraillinger Str.5, 8035 Gauting, Federal Republic of Germany

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Complete Specification for the invention entitled:

"SLIDING AND LIFTING ROOF"

The following statement is a full description of this invention, including the best method of performing it known to us
Abstract

Sliding and lifting roof for vehicles, with a cover which in its closing position closes a roof orifice in a roof surface and is guided on guide-rails parallel to the side edges of the roof orifice, and which is connected via a raising mechanism to a drive member adjustable in the cover-shifting direction and can be raised above the fixed roof surface as a result of the displacement of the drive member or can be shifted after being lowered below the fixed roof surface. The raising mechanism has a sliding link adjustable together with a drive member, and a raising lever which at one end is mounted pivotably about an axle fixed to the cover and at the other end is guided so as to be pivotable and longitudinally movable to a limited extent in the cover shift-direction in relation to the sliding link, and which is connected to the sliding link via an additional positive guide which incorporates a cam adjustable along a guide track. The cam is connected to the raising lever at a distance from the pivot bearing located on the same side as the link, and the guide track is formed on the sliding link (Figure 5).
The invention relates to a sliding and lifting roof for vehicles, with a rigid cover which in its closing position closes a roof orifice in a fixed roof surface and is guided on guide-rails extending parallel to the side edges of the roof orifice, and which is connected via a raising mechanism to at least one drive member adjustable in the cover shifting direction and as a result of the displacement of the drive member can either be raised when its rear edge is lifted above the fixed roof surface or shifted after its rear end has been lowered below the fixed roof surface, the raising mechanism having a sliding link adjustable together with the drive member, and a raising lever which in the region of one of its ends is mounted pivotably about an axle fixed to the cover, in the region of its other end is guided so as to be pivotable and longitudinally movable over limited distance in the cover shifting direction in relation to the sliding link and is connected to the sliding link via an additional positive guide which incorporates a cam adjustable along a guide track.

Such a sliding and lifting roof is known (German Offenlegungsschrift 3,238,454). The additional positive guide forces the raising lever, at least in the range of adjustment of the cover between the cover closing position and the lowered rear edge of the cover, to assume, for each position of the sliding link relative to the guide-rails, a predetermined pivoting position in relation to the sliding link. This guarantees particularly reliable and stable guidance of the cover. Rattling noises and noises due to vibration are reliably suppressed. In the known solution, the raising lever is provided with a guide slot, in which the cam attached to the sliding link is shifted when the rear edge of the cover is lowered out of the cover closing position. As a result of the relative longitudinal movement of the sliding link and of the raising-lever pivot bearing located on the same side as the link, this relative longitudinal movement being superimposed on the pivoting movement of the raising lever, the lever arm between this pivot bearing and the cam is shortened during the transition from the cover closing position into the lowered position of the cover. The torque.
transmitted by the cam to the raising lever decreases. The positive guide therefore has an effectiveness which is dependent on the particular position of the cover in this range of adjustment.

The object on which the invention indicated in claim 1 is based is to develop a sliding and lifting roof of the type mentioned in the introduction, in such a way that the torque exerted on the raising lever by the positive guide is substantially independent of the instantaneous cover position when the cover is shifted between the cover closing position and the lowered cover position.

According to the invention, this object is achieved in a surprisingly simple way when the cam is connected to the raising lever at a distance from the pivot bearing located on the link, and the guide track is formed on a sliding link.

In the sliding and lifting roof according to the invention, the lever arm between the raising-lever pivot bearing located on the link and the cover is virtually constant and, in particular, is unaffected by the longitudinal movement of the sliding link in relation to the raising-lever pivot bearing located on the link.

Preferably, the cam is at a greater distance from the pivot bearing located on the link than it is from the raising-lever pivot bearing located on the cover.

With regard to a sliding and lifting roof in which the additional positive guide also has a further cam provided in the region of one end of the raising lever and displaceable along a cam track of the sliding link, the guide track is advantageously formed at least partially by the inner face of a sliding-link part, the outer face of which forms the cam track for the further cam. This ensures that there is virtually constant leverage of the lever arms, by means of which the two cams act in opposite directions on the raising lever and endeavour to pivot the latter about the pivot bearing located on the link.

If a roller mounted rotatably on the raising lever is provided as a further cam, the raising-lever pivot bearing located on the cover can at the same time be designed as a
bearing for the roller.

The guide track can be designed as a guide slot over at least some of its longitudinal dimension, and the cam can advantageously be held engaged with the guide track over the entire pivoting range of the raising lever.

The invention is explained in more detail below by means of a preferred exemplary embodiment, with reference to the attached drawings in which:

Figure 1 shows a partial longitudinal section through a sliding and lifting roof according to the invention, with a cover in the closing position,

Figure 2 shows a longitudinal section corresponding to Figure 1, the rear edge of the cover being lowered,

Figure 3 shows a section corresponding to Figure 1, with the cover raised at its rear edge,

Figures 4 show the sliding link and the raising lever in to different operating positions,

Figures 9 show the sliding link and raising lever according to 13 to a modified embodiment in different operating positions, and

Figure 14 shows a perspective representation of the sliding link and raising lever according to the modified embodiment.

As emerges from Figures 1 to 3, there is in a fixed roof surface 10 a roof orifice 11 which can be closed or at least partially opened by means of a rigid cover 12. The roof orifice 11 is surrounded by a roof frame 13 which along the front edge 14 and on both sides of the roof orifice forms a drip moulding 15. Fastened to the roof frame 13 on each of two sides of the roof orifice 11 is a guide-rail 16 extending in the longitudinal direction of the vehicle. The guide rails, the cover and the functional parts of the sliding and lifting roof are essentially mirror-symmetrical relative to a longitudinal axis of symmetry. Consequently, only the design and functioning of the arrangement on one side are explained in detail below.

The cover 12 is guided in a known way (for example, German Offenlegungsschrift 3,238,454) in each of the guide-
rails 16 by means of a front guide member and is mounted so as to be pivotable about a pivot axis extending transversely to the cover shifting direction and formed, for example, by the front guide members. Sliding pieces 18, 19 running in the guide-rail 16 are attached to a carrier 20 which forms a drive member for a raising mechanism designated as a whole by 21. The carrier 20 and the mirror-symmetrical carrier (not shown) located on the other side of the roof are connected to one another by means of a transport bridge 22 extending in the transverse direction. The transport bridge 22 is adjustable in a way known per se in the cover shifting direction which is identical to the longitudinal direction of the vehicle. For example, there can be for this purpose a pressure-resistant threaded cable which engages essentially in the centre of the transport bridge (German Offenlegungsschrift 2,461,018) and which is connected in drive terms to a drive motor, preferably an electric motor, or to a crank handle.

The cover 12 is supported via a connecting piece 23 on a supporting arm 24. The supporting arm 24 is articulated at its rear end to one end of a raising lever 26 via a pivot bearing 25 formed, for example, by a hinge pin. The other end of the raising lever 26 is connected via a pivot bearing 27 to a sliding piece 28 which itself is guided so as to be longitudinally displaceable over a limited distance in a longitudinal slot 29 of a sliding link 30 fixed on the carrier 20 or connected fixedly to the latter. The sliding link 30 has on the outer face of a front sliding-link part 32 a cam track 33 which can interact with a cam in the form of a roller 34 made of elastic material. The pivot bearing 25 is at the same time designed as a bearing for the roller 34. The raising lever 26 carries, on the side facing the sliding link 30, a laterally projecting pin 35, on which a roller forming a cam 36 is mounted rotatably. The cam 36 interacts with a guide track 37 provided on the inner face of the sliding-link part 32.

The pivot 27, the sliding piece 28 and the longitudinal slot 29 of the sliding link 30 constitute a first positive guide for the raising lever 26, whilst an additional
positive guide is formed by the cam 36 interacting with the guide track 37 and by the roller 34 adjustable along the cam track 33. The two positive guides provide a three point engagement between the raising lever 26 and the sliding link 30. The dimensions of the arrangement are such that the components 26, 27, 28 and 30 are under a slight mutual prestress when the cover 12 is lowered (Figure 2), in a closing position of the cover (Figure 1) and at the start of the raising operation. As a result of this prestress, the relative movement between the raising lever 26 and the sliding link 30 takes place free of play in this range of adjustment. It is guaranteed that, within the said range of adjustment, the raising lever 26 is forced, for each position of the transport bridge 22 and consequently of the sliding link 30 relative to the guide rail 16, to assume a predetermined pivoting position in relation to the sliding link 30.

When the rear edge 40 of the cover in lowered (Figure 2), the raising lever 26 and the sliding link 30 assume the relative positions according to Figure 4. The sliding link 30 is positioned so that the front end of the longitudinal slot 29 comes up against the front end of the sliding piece 28. When the carrier 20 and the sliding link 30 are pulled backwards as a result of the adjustment of the transport bridge 22, the cover 12 is taken along with them. The cover 12 opens the roof orifice 11 at least partially.

In contrast to this, when the transport bridge 22 and, together with it, the sliding link 30, starting from the position according to Figures 2 and 4, are pushed forwards into the position illustrated in Figures 1 and 5, the longitudinal slot 29 is moved forwards in relation to the sliding piece 28. At the same time, the guide track 37 shifts relative to the cam 36, in such a way that the cam 36 runs up along a rearward-rising part 41 of the guide track 37. The roller 34 moves upwards on an obliquely upward-rising portion 42 of the cam track 33. As a result, the raising lever 26 is pivoted about the pivot bearing 27 in the clockwise direction (in Figures 1 and 5). Because of this pivoting movement, the rear edge
executes a pivoting movement in the anti-clockwise direction (in Figure 1). As soon as the sliding link 30 reaches the relative position in relation to the raising lever 26 according to Figure 5 and the roller 34 has run up onto a portion 43 of the cam track 33 adjoining the portion 42 and parallel to the guide rail 16, the cover 12 is in its closing position (Figure 1). The cover 12 lies essentially flush with the fixed roof surface 10.

The portion 43 of the cam track 33 and a part 44 of the guide track 37 likewise parallel to the guide rail 16 determine an idle travel. During this idle travel, the pivoting position of the raising lever 26 is kept constant regardless of the shifting movement of the sliding link 30. Because of the idle travel, when the sliding and lifting roof is actuated considerable tolerances can be allowed, without these becoming noticeable in a disturbing way. For example, when a drive motor serving for driving the sliding and lifting roof is switched off in the relative position according to Figure 5, it can run down harmlessly. The switch-off time can also be shifted within considerable tolerances, without having an adverse effect.

During a further movement of the sliding link 30 from the position according to Figure 5 into the position according to Figure 6, the roller 34 starts to run up along an inclined cam-track portion 45 adjoining the portion 43, whilst at the same time the cam 36 moves onto a rising part 46 of the guide track 37. The cover 12 begins to execute its raising movement.

Figure 7 shows the relative positions of the raising lever 26 and sliding link 30 after a very slight further forward movement of the carrier 20. The roller 34 has reached the top end of the cam-track portion 45. The cam 36 comes free of the guide track 37 and subsequently passes out of the sliding link through a slit 47 in the sliding link 30. The rear end of the longitudinal slot 29 comes up against the rear end of the sliding piece 28. During the movement of the sliding link 30 between the relative positions of Figures 4 to 7, the raising lever 26 has executed a pure rotary movement.

FIG. 4
about the axis of the pivot bearing 27. That is to say, the pivot bearing 27 has assumed a fixed relative position in relation to the guide rail 16. When, starting from the position according to Figure 7, the sliding link 30 is now pushed further forwards via the transport bridge 22, the lower end of the raising lever 26 is taken up by the sliding link 30 as a result of the engagement between the rear end of the longitudinal slot 29 and the sliding piece 28. The axis of the pivot bearing 27 travels further forwards in relation to the guide-rail 16. The end of the raising lever 26 articulated on the supporting arm 24 rises up (Figure 8). The cover 12 is raised according to Figure 3.

The raising lever 26 is provided, near the pivot bearing 27, with a stop surface 49 which, in the working position according to Figure 8, comes up against a stop surface 50 of the sliding link 30 and consequently limits the pivoting-out movement of the raising lever 26 relative to the sliding link 30. During the shift of the sliding link 30 from the position approximately corresponding to Figure 5 into a position just in front of the relative position according to Figure 7, the stop surface 49 is shifted with play relative to a surface 51 of the sliding link 30, this surface 51 extending parallel to the guide-rail 16. Consequently, if, for example during a break-in attempt, the cover 12 is lifted by force and the pin 35 is thereby torn off, the stop surface 49 comes up against the surface 51. These surfaces thus act as an additional safeguard against the undesirable pivoting out of the cover 12.

The distance between the axis of the roller 34 and of the pin 35 and the axis of the pivot bearing 27 remains constant in every position of the raising lever 26. This ensures a constant leverage for the positive guide formed by the roller 34 and the cam 36 in conjunction with the cam track 33 and guide track 37.

Figures 9 to 14 illustrate a modified embodiment which largely resembles the embodiment explained above. In Figures 9 to 14, corresponding parts bear reference symbols which differ from those used in
Figures 1 to 8 by a prefixed "1".

Whereas, in the design according to the first embodiment, the cam 36 disengages from the guide track 37 shortly after the raising lever 26, starting from the cover closing position, begins to raise the rear edge of the cover (Figure 7), in the second embodiment there is engagement between the cam 36 and guide track 137 over the entire pivoting range of the raising lever 126. At the same time, the part 146 of the guide track 137 rises less steeply than the corresponding part 46 of the first embodiment. The part 146 rising with a low inclination forms one limiting wall of a guide slit 53, the other limiting wall of which is determined by a further part 54 of the guide track 137.

Furthermore, in the second embodiment, the sliding link 130 is adjusted not via a transport bridge, but via a pressure-resistant drive cable 55 which engages directly on the sliding link 130 and which can be designed in a known way as a threaded cable. Figure 14 also shows sliding pieces 56 of which the sliding link 130 is guided so as to be longitudinally displaceable in guide-rails corresponding to the guide-rails 16.

Figure 9 shows the relative positions of the raising lever 126 and sliding link 130 when the rear edge of the cover is lowered below the fixed roof surface 10. The sliding piece 128 comes up against the front end of the longitudinal slot 129 which can be seen in Figure 14. When the sliding link 130 is pushed forwards by means of the drive cable 55, the cam 136 mounted rotatably on the pin 135 runs up along the rising part 141 of the guide track 137, whilst at the same time the roller 134 mounted on the pivot bearing 125 moves upwards along the rising portion 142 of the cam track 133 on the outer face of the front sliding-linked part 132. The raising lever 126 is pivoted in the clockwise direction (Figure 10) about the pivot bearing 127. The roller 134 runs up onto the portion 143 of the cam track 133, this portion 143 being parallel to the guide-rail 16. The cam 136 reaches the part 144 of the guide track 137 parallel to the portion 143. The cover is in
the closing position.

During a further forward movement of the sliding link 130 (Figure 11), the roller 134 runs up on the inclined portion 145 of the cam track 133. At the same time, the cam 136 reaches the rising part 146 of the guide track 137. The rear edge of the cover starts to move upwards above the fixed roof surface. At the end of the portion 145, the roller 134 lifts off from the cam track 133. The cam 136 runs into the guide slit 53, first being guided on one side by the rising part 146 and on the other side by the likewise rising part 54 (Figure 12). During the transition from the position according to Figure 12 into the relative position illustrated in Figure 13, the cam 136 leaves the slit 53. However, it is still supported on the part 54 of the guide track 137. The stop surface 149 of the raising lever 126 comes up against the stop surface 150 of the sliding link 130. The raising lever 126 has reached the end of its pivoting movement. The cover is fully raised.
The claims defining the invention are as follows:

1. Sliding and lifting roof for vehicles, with a rigid cover which in its closing position closes a roof orifice in a fixed roof surface is guided on guide-rails extending parallel to the side edges of the roof orifice, and which is connected via a raising mechanism to at least one drive member adjustable in the cover shifting direction and, as a result of the displacement of the drive member, can either be raised when its rear edge is lifted above the fixed roof surface or shifted after its rear end has been lowered below the fixed roof surface, the raising mechanism having a sliding link adjustable together with the drive member, and a raising lever which in the region of one of its ends is mounted pivotably about an axle fixed to the cover, in the region of its other end is guided so as to be pivotable and longitudinally movable over a limited distance in the cover shifting direction in relation to the sliding link and is connected to the sliding link via an additional positive guide which incorporates a cam adjustable along a guide track, characterised in that the cam is connected to the raising lever at a distance from the pivot bearing located on the same side as the link and a guide track is formed on the sliding link.

2. Sliding and lifting roof according to Claim 1, characterised in that the cam is at a greater distance from the pivot bearing located on the same side as the link than it is from the pivot bearing of the raising lever located on the same side as the cover.

3. Sliding and lifting roof according to Claim 1 or 2, in which the additional positive guide also has a further cam provided in the region of one end of the raising lever and displaceable along a cam track of the sliding link, characterised in that the guide track is formed at least partially by the inner face of a sliding-linked part, the outer face of which forms the cam track for the further cam (roller).

4. Sliding and lifting roof according to Claim 3, in which a roller mounted rotatably on the raising lever is provided as a further cam, characterised in that the pivot
bearing of the raising lever located on the same side as the
cover is at the same time designed as a bearing for the roller.
5. Sliding and lifting roof according to one of the pre-
ceding Claims, characterised in that the guide track is
designed as a guide slot over at least some of its longitudi-
nal dimension.
6. Sliding and lifting roof according to Claim 5,
characterised in that the cam is held engaged with the guide
track over the entire pivoting range of the raising lever.

DATED this SIXTH day of NOVEMBER, 1985

WEBASTO-WERK W. BAIER GMBH & CO

Patent Attorneys for the Applicant
SPRUSON & FERGUSON
The following statement is a full description of this invention, including the best method of performing it known to us.
is shortened during the transition from the cover closing position into the lowered position of the cover. The torque.