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Dorin et al.(10) **Pub. No.: US 2010/0244499 A1**(43) **Pub. Date: Sep. 30, 2010**(54) **SEGMENTED ROOF COMPRISING
DIFFERENTLY DIMENSIONED PINS**(75) Inventors: **Florian Dorin**, Koln (DE); **Stephan
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Leverkusen (DE)(21) Appl. No.: **12/738,748**(22) PCT Filed: **Oct. 7, 2008**(86) PCT No.: **PCT/EP2008/008456**§ 371 (c)(1),
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B60J 7/04 (2006.01)(52) **U.S. Cl.** **296/219**(57) **ABSTRACT**

The present invention relates to a segmented roof for a motor vehicle comprising a plurality of segments which are connected to one another in a cohesively bonded and/or interlocking manner, are guided laterally in guide rails by means of pins and are movable between a closed position, in which the segments are closely contiguous to one another, and an open position, in which the segments are pushed together and folded in a roof region, characterized in that, apart from the last segment [10], each segment [8] has two opposite sides A and two opposite sides B, and the segments are connected to one another along the sides B, and each side A has two pins [4], [5], one subset of the pins [4] being differently dimensioned from the other subset of the pins [5], two pins located on one side A being differently dimensioned, and two opposite pins on the opposite sides A of a segment each being identically dimensioned.

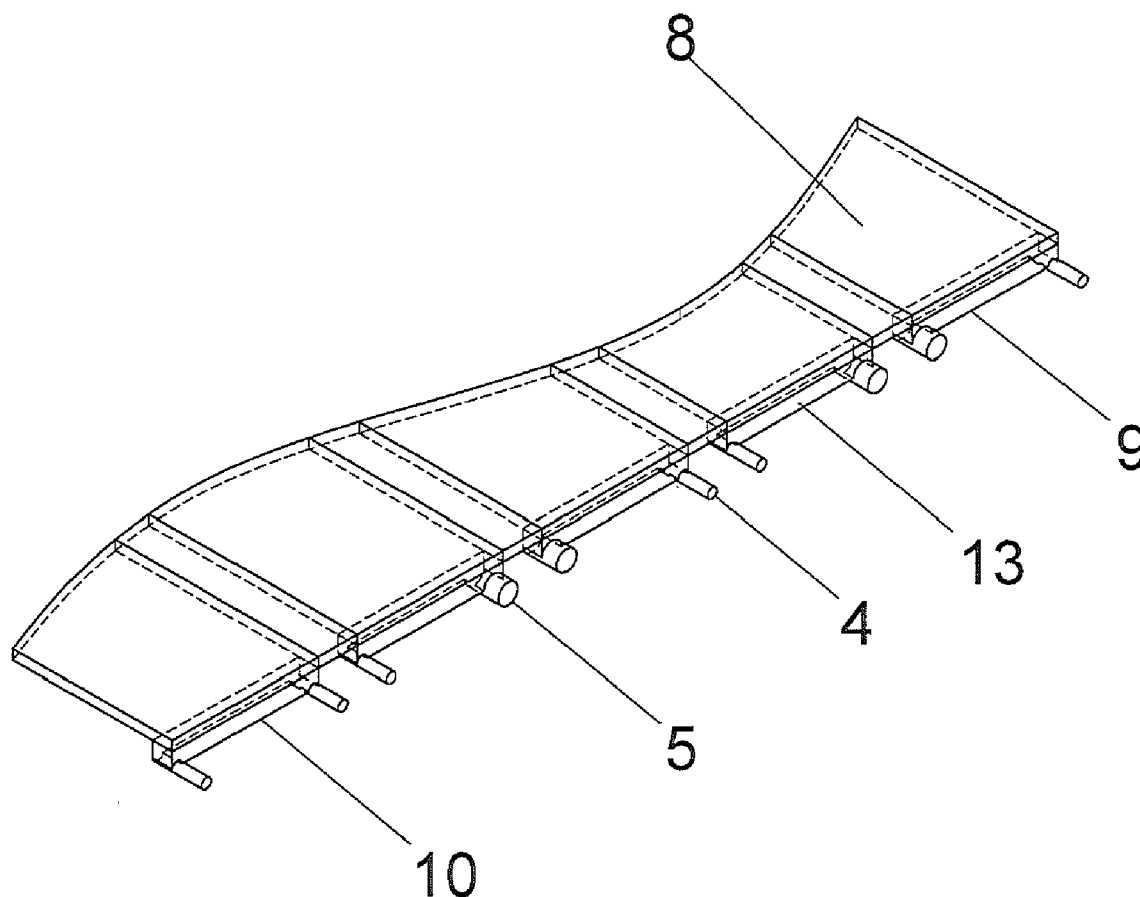


Fig. 03

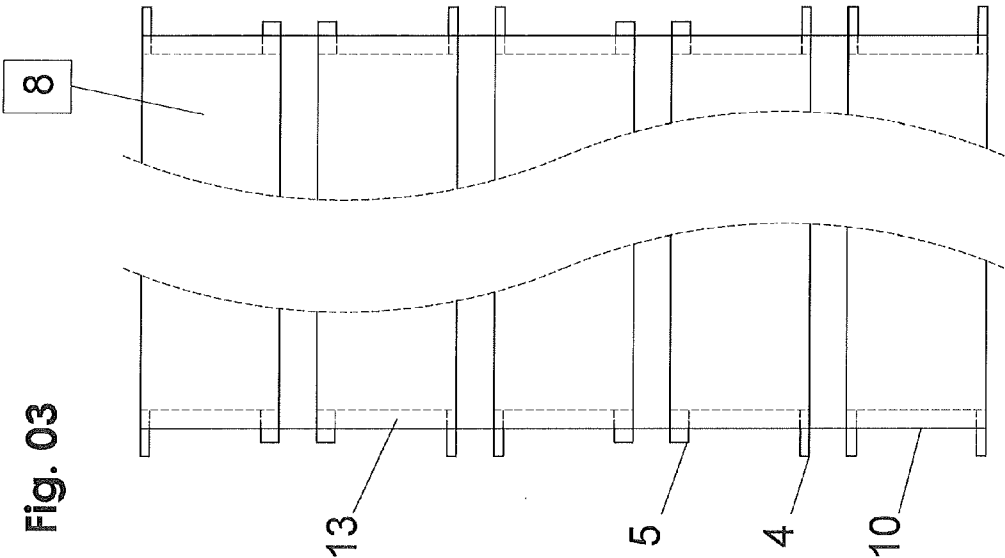


Fig. 02

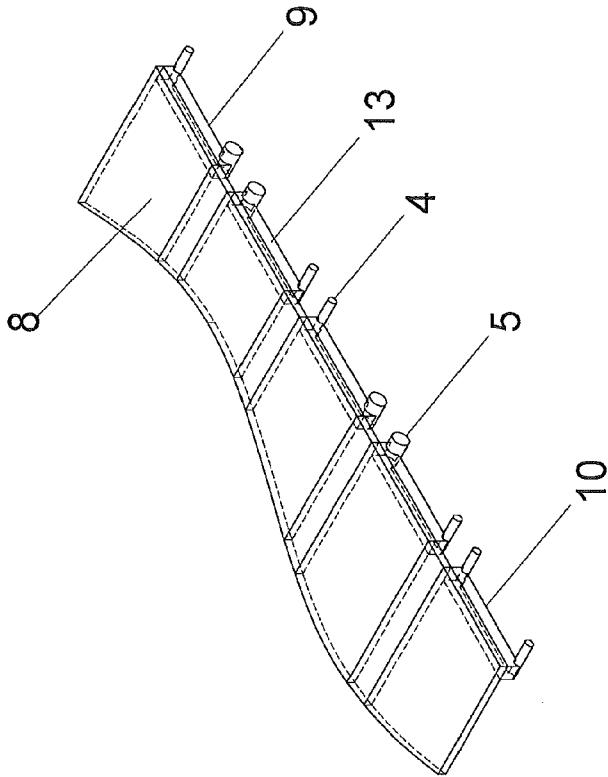


Fig. 04

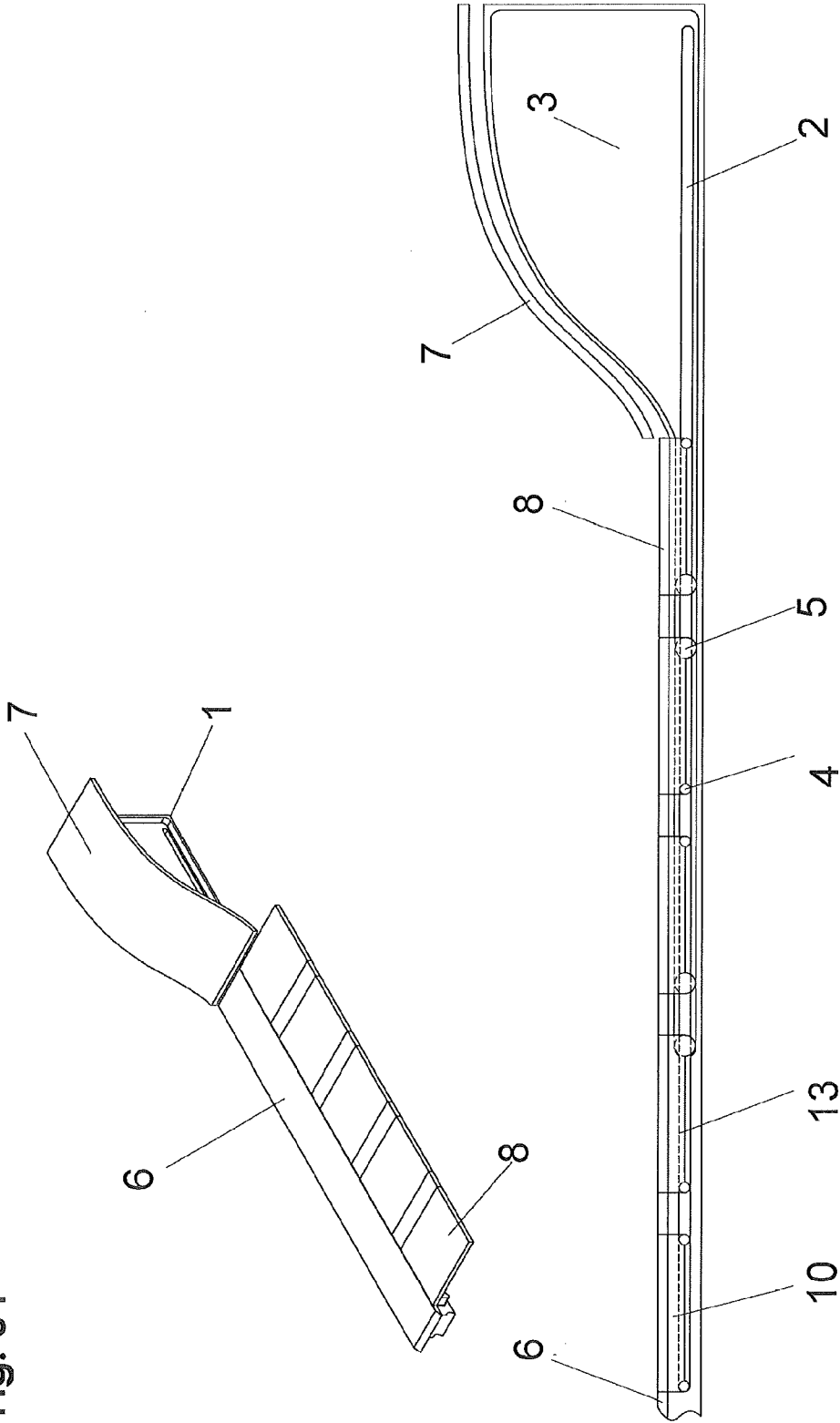


Fig. 05

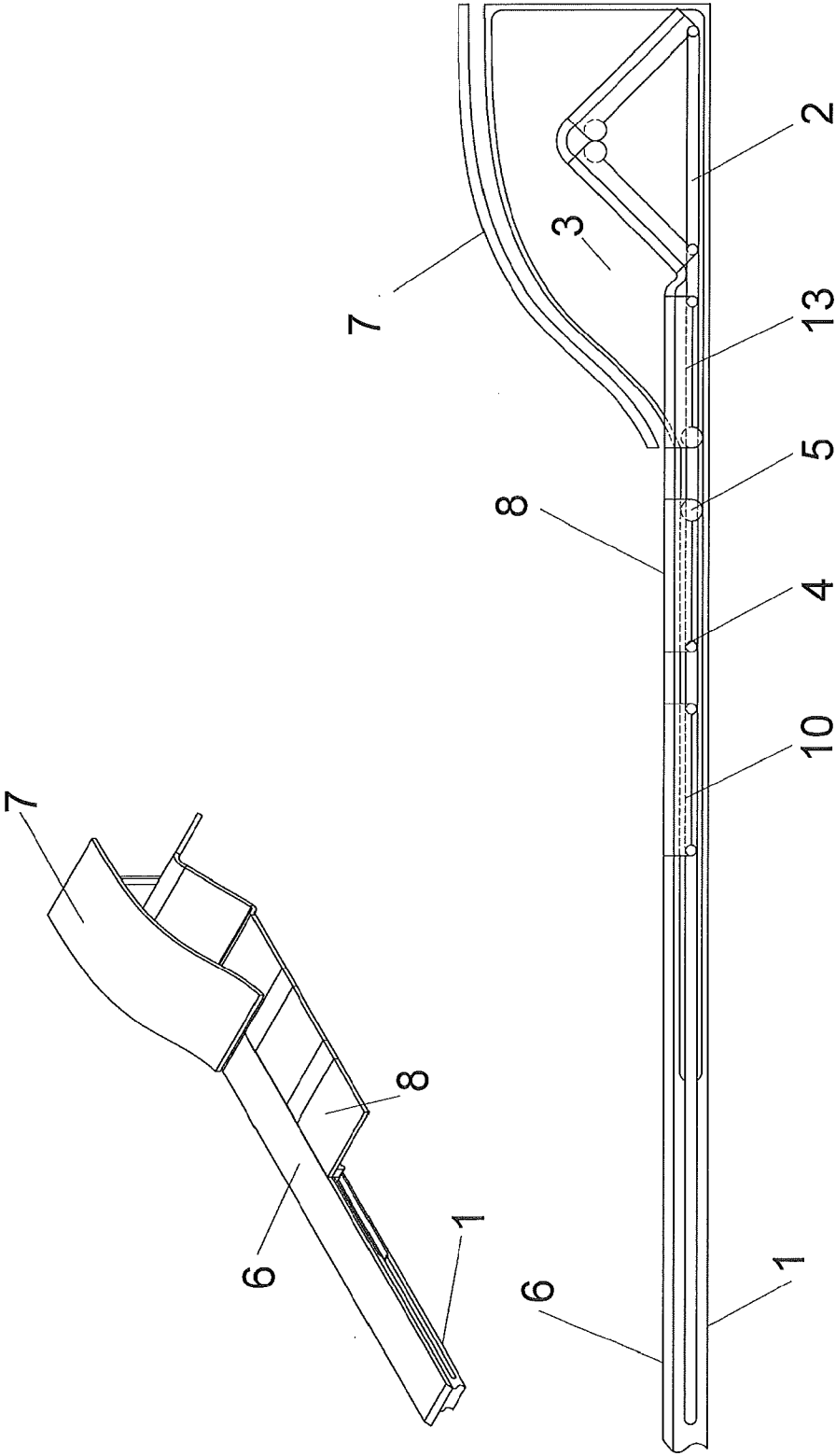
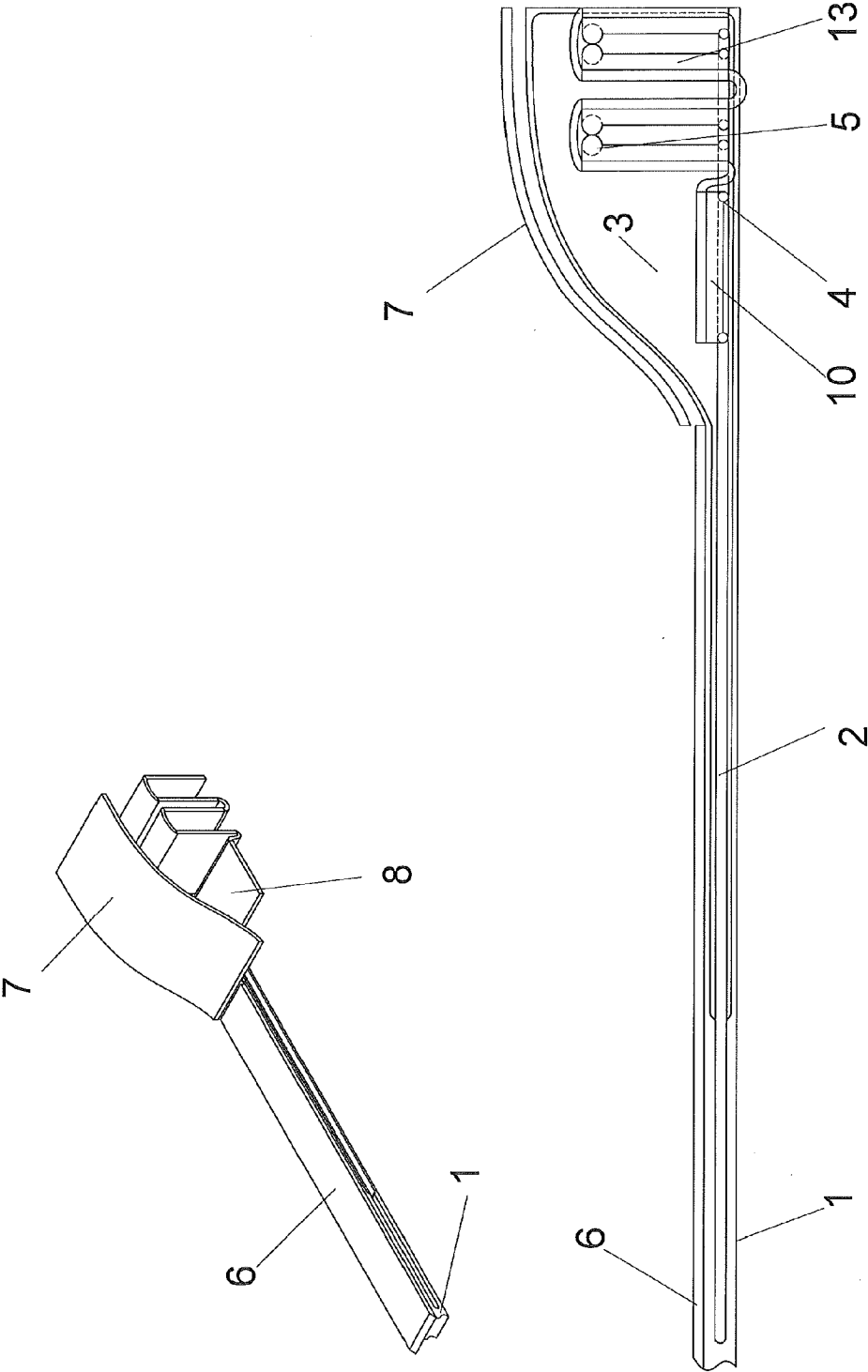
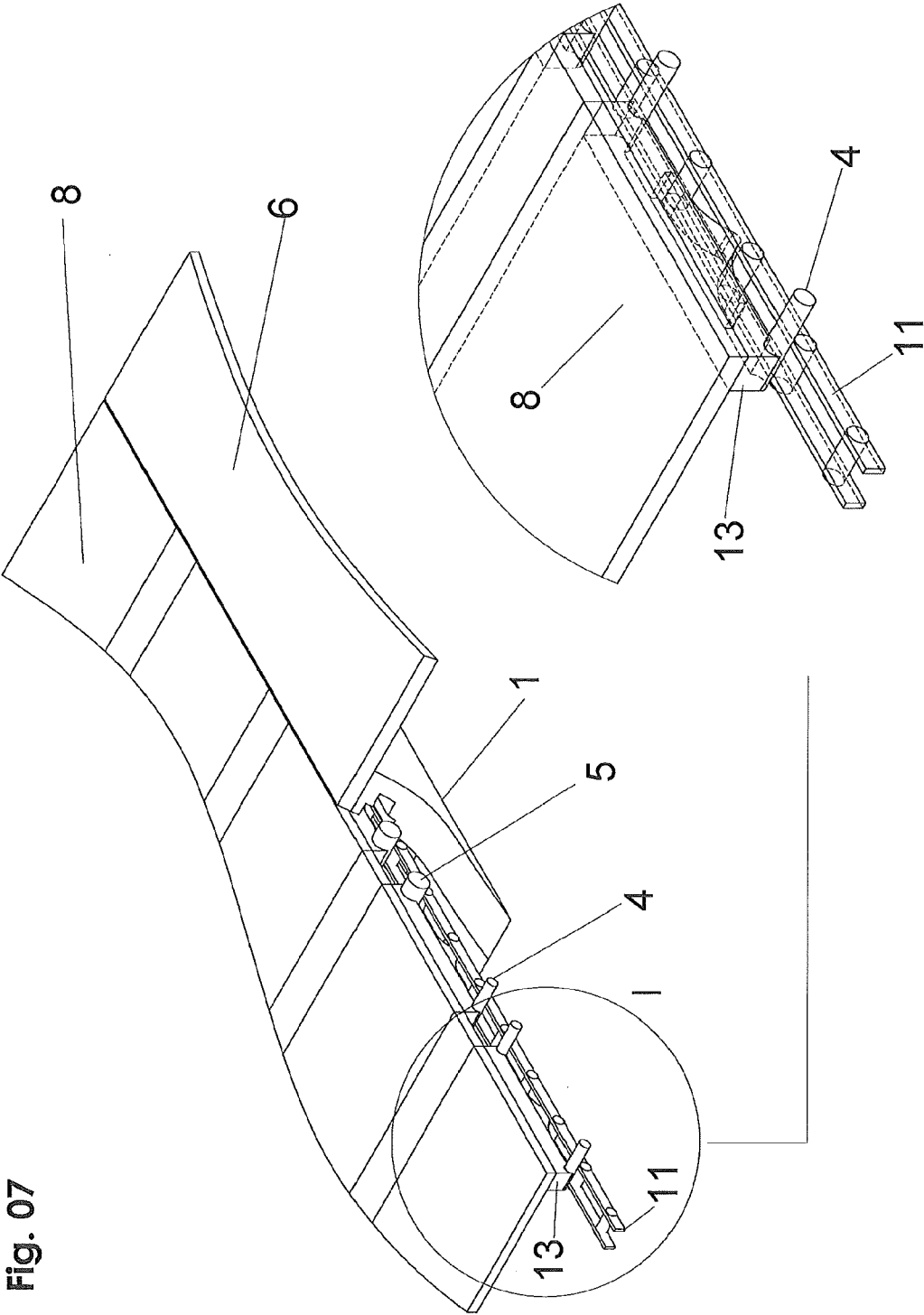


Fig. 06





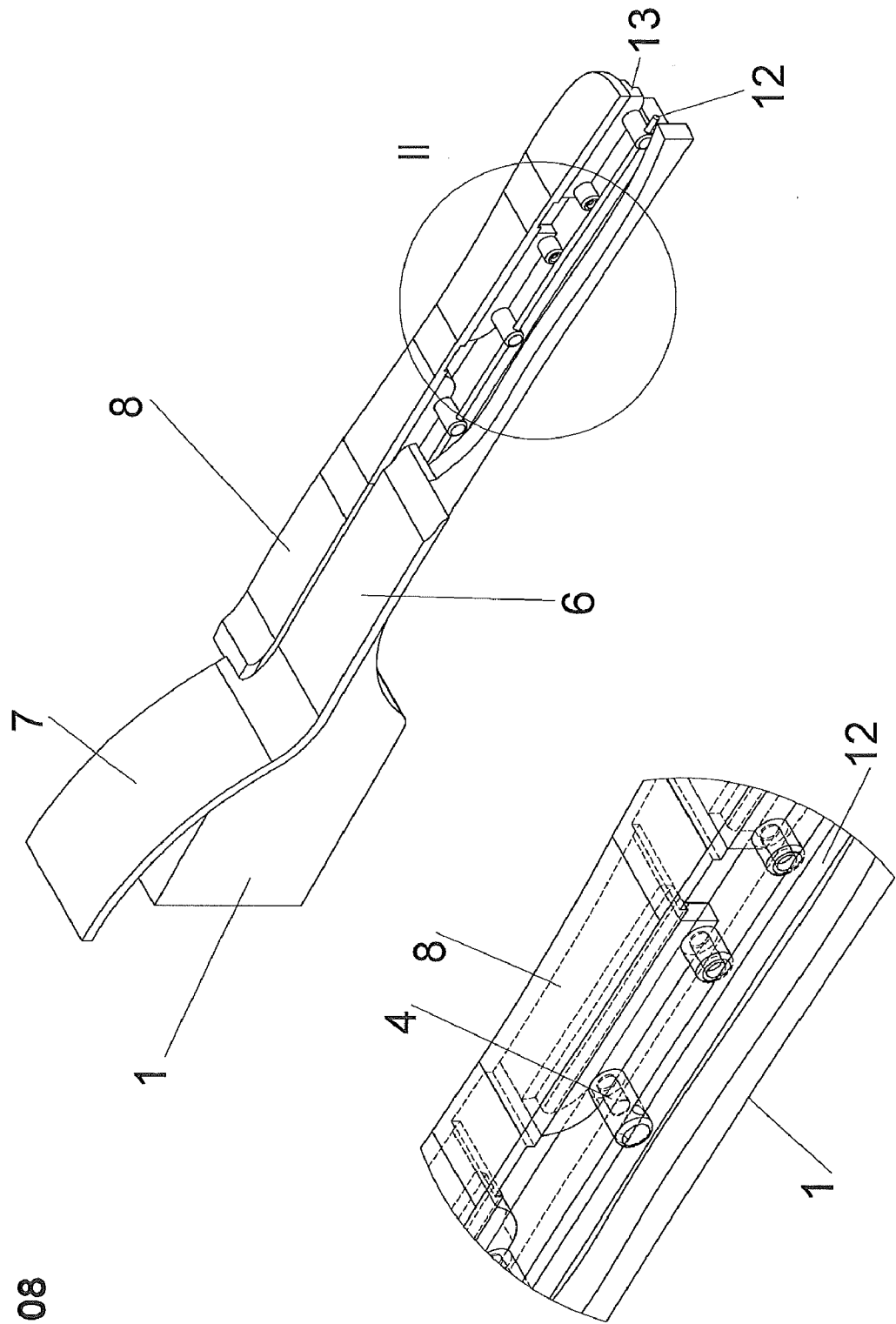


Fig. 08

SEGMENTED ROOF COMPRISING DIFFERENTLY DIMENSIONED PINS

[0001] The present invention relates to a segmented roof for a motor vehicle comprising a plurality of segments which are connected to one another in a cohesively bonded and/or interlocking manner, are guided laterally in guide rails by means of pins and are movable between a closed position, in which the segments are closely contiguous to one another, and an open position, in which the segments are pushed together and folded in a roof region, characterized in that, apart from the last segment [10], each segment [8] has two opposite sides A and two opposite sides B, and the segments are connected to one another along the sides B, and each side A has two pins [4], [5], one subset of the pins [4] being differently dimensioned from the other subset of the pins [5], two pins located on one side A being differently dimensioned, and two opposite pins on the opposite sides A of a segment each being identically dimensioned.

[0002] For the vehicle roof according to Germany utility model 1 811 690, the two guide points of each segment are formed by pins which each protrude laterally from a guide cheek attached to the lower side of the segment in question. The two pins are located at a different height and engage in guide tracks of a roof-mounted guide rail, the guide tracks being located parallel at a distance from each other. When the roof is opened, the pins located in each case at the front in the opening direction leave the associated guide track successively while, at the same time, the segment in question is caused in a manner not disclosed specifically to pivot about the other pin which remains in its guide track.

[0003] Another vehicle roof in which the two guide points of the segments are kept in engagement with the guides over the entire displacement region of the segments in order to increase the stability and to securely support the segments is described in German patent application P 41 23 229.1. Patent application EP 0 591 644 A2 describes a vehicle roof in which the segments are guided continuously in two guide rails and thus ensure permanent stability. The guide rails are arranged at a distance from each other and guide the segments in such a manner that they are located under one another in the manner of a roller blind when a roof is in an open state. The patent DE 44 15 649 describes the guiding of segments in a vehicle roof, in which each segment is provided laterally with a respective slotted guide in which a rear bearing point of the next segment adjoining in each case to the front is forcibly guided, and the final segment to the rear can be erected by means of a separate control device.

[0004] The cited references all describe segmented systems, none of which are connected to one another in a cohesively bonded and/or interlocking manner.

[0005] It was therefore an object of the present invention to develop a kinematic guide mechanism for a segmented structure connected in a cohesively bonded and/or interlocking manner. Said kinematic guide mechanism is intended to be able to be inserted, for example, in a vehicle roof. Said guide rail is intended firstly to take up as little construction space as possible. Furthermore, the guide rail is intended to be as simple as possible geometrically and to only have one groove over the height. Furthermore, the segments are intended to run plane-parallel to the roof plane and to be able to be folded up only at the end in a device, such as, for example, a con-

vertible top compartment, and, for rigidity reasons, to be mounted at all four corner points in the region of the plane-parallelism.

[0006] This object is achieved by a segmented roof for a motor vehicle comprising a plurality of segments which are connected to one another in a cohesively bonded and/or interlocking manner, are guided laterally in guide rails by means of pins and are movable between a closed position, in which the segments are closely contiguous to one another, and an open position, in which the segments are pushed together and folded in a roof region, characterized in that, apart from the last segment [10], each segment [8] has two opposite sides A and two opposite sides B, and the segments are connected to one another along the sides B, and each side A is provided with two pins [4], [5], one subset of the pins [4] being differently dimensioned from the other subset of the pins [5], two pins located on one side A being differently dimensioned, and two opposite pins on the opposite sides A of a segment each being identically dimensioned.

[0007] The expression segmented roof here means a device comprising alternating stiff and flexible elements arranged parallel to one another, such as, for example, at least 2 segments [8] arranged parallel to one another and made of plastic, such as polycarbonate (PC), polymethylmethacrylate (PMMA, acrylic glass or Plexiglas), wherein the segments are connected over the major part, i.e. as a rule over 75% and ideally 100% of the longitudinal sides of the segments in a cohesively bonded manner by means of elastomer, such as, for example, polyurethane, thermoplastic polyurethane, or silicone, and/or in an interlocking manner.

[0008] The guide rail [1], for example in FIG. 01, FIG. 01a and FIG. 01b, comprises a deep plane [2] and a further, shallow plane [3] which run one behind the other. One behind the other here means that there is a front plane and a rear plane, and the two planes run parallel to each other along parts of the roof skin. The rear plane is arranged in such a manner that a long pin can protrude through the front plane and can be guided in the rear plane. At the same time, a shorter pin can be guided in the front plane without being affected by the rear plane. This arrangement is intended to ensure that the pins of differing length (with different cross sections under some circumstances) are guided in a targeted manner in the guide rail, i.e. first of all follow a curved path and then follow different paths in a defined region. Of course, the number of planes may be freely varied, for example a third or even fourth plane may be added in order, if appropriate, to be able to guide individual segments differently or even individually.

[0009] The kinematic folding-up mechanism makes it necessary for at least one element to furthermore be guided "in a controlled manner" and for the other to be able to move "freely". Said planes are formed via grooves. Differently shaped pins [4] and [5] protrude into said grooves. The path of the pins in the planes of the guide rail is regulated via different pin lengths or widths. The longer pin [4] runs along the deep plane [2], the shorter pin [5] runs along the shallow plane [3]. Construction space height can therefore be saved by means of the planes located one behind the other. The grooves may also be located one above the other. The two planes run parallel to the outer skin (roof skin) [6] as far as the convertible top compartment [7], and therefore the segments [8] can be displaced as a continuous surface. Only within the convertible top compartment do the planes diverge, for example in a V-shaped manner, such that, for example, as shown in FIG. 04, 05 or 06, the pins for the deep plane continue to run along

the roof contour or horizontally with respect thereto and the short pins are deflected upward.

[0010] Of course, contrary to the figures, the segments may also be folded up downward or centrally. It is likewise conceivable for the deflection to be undertaken not exclusively by the long pin, but for the short pin also to be able to deflect the segments.

[0011] However, the planes do not have to be activated only via the length of the pins. There is also the possibility of regulating the activation via different cross sections, as shown in FIG. 02 and FIG. 03.

[0012] For example, on both sides A [9] on each segment there are in each case two pins, and there are in each a short pin and a long pin at each end side. Only in the case of the last segment [10] can there be two identical pins, if said segment is not intended also to be folded up. By means of these two pins per side, it is ensured that the roof, even in the semi-open state, can run parallel to the roof skin and does not sag in an uncontrolled manner in the event of wind and snow loads.

[0013] The segments can be driven by, for example, a chain [11] "chain drive" (FIG. 08) or a threaded rod [12] "spindle drive" (FIG. 09) or belt drive. A cable pull should also be possible (as in the case of conventional sliding roofs).

[0014] The pins themselves constitute both a translatable bearing along the guide rail and a rotatory bearing about their own axis.

[0015] Segmented structures connected in a cohesively bonded and/or interlocking manner can be moved with said kinematic guide mechanism, but it is also conceivable for individual segments which are not connected to one another in a cohesively bonded and/or interlocking manner to be able to be moved in this way.

[0016] The complete disappearance of the segments and the possibility of partial opening in the case of plane-parallel surfaces are favorable both for the aerodynamic performance and for the external appearance.

[0017] The segments may be located below, above or level with the guide elements [13], i.e. the holder with pins. If the segments are located level with the guide elements, a depression is therefore formed by the segments, and the same applies to the situation in which the segments are located below the guide elements. If the segments are located above the guide elements, a continuous roof skin can therefore be produced, which can likewise be regarded as favorable to the external appearance. Furthermore, corners or edges on which people could be injured in the event of an accident therefore do not protrude.

[0018] The guide rails can be used both for roof structures with segments which are arranged transversely and longitudinally to the direction of travel.

[0019] The invention will be explained further by means of the following figures:

[0020] FIG. 01 side view section—cohesively bonded segments with convertible top compartment

[0021] FIG. 01a section—guide rail with pin

[0022] FIG. 01b view of a detail—section—segments with guide elements

[0023] FIG. 02 isometric view segments with pins on the end sides and guide elements

[0024] FIG. 03 top view segments with guide elements

[0025] FIG. 04 closed roof and corresponding isometry

[0026] FIG. 05 semi-open roof and corresponding isometry

[0027] FIG. 06 open roof and corresponding isometry

[0028] FIG. 07 driving concept chain drive with corresponding detail

[0029] FIG. 08 driving concept spindle drive with corresponding detail

[0030] The reference numbers in the figures have the following meanings:

[0031] [1] guide rail

[0032] [2] deep plane

[0033] [3] shallow plane

[0034] [4] longer pin

[0035] [5] shorter pin

[0036] [6] roof skin

[0037] [7] convertible top compartment

[0038] [8] segment

[0039] [9] side A

[0040] [10] last segment

[0041] [11] chain

[0042] [12] threaded rod

[0043] [13] guide element (holder with pins)

1.-12. (canceled)

13. A segmented roof for a motor vehicle comprising a plurality of segments which are connected to one another in a cohesively bonded and/or interlocking manner, are guided laterally in guide rails by means of pins and are movable between a closed position, in which the segments are closely contiguous to one another, and an open position, in which the segments are pushed together and folded in a roof region, wherein, apart from the last segment, each segment has two opposite sides A and two opposite sides B, and the segments are connected to one another along the sides B, and each side A has two pins, one subset of the pins being differently dimensioned from the other subset of the pins, two pins located on one side A being differently dimensioned, and two opposite pins of on the opposite sides A of a segment each being identically dimensioned.

14. The segmented roof as claimed in claim 1, wherein the segments are connected to one another in a cohesively bonded manner.

15. The segmented roof as claimed in claim 1, wherein the segments are connected to one another in an interlocking manner.

16. The segmented roof as claimed in claim 1, wherein the two opposite sides A run along the transverse direction of the vehicle and the two opposite sides B run along the longitudinal direction of the vehicle.

17. The segmented roof as claimed in claim 1, wherein two pins located next to each other upstream and downstream of the cohesively bonded and/or interlocking connection on two segments connected to each other are each identically dimensioned.

18. The segmented roof as claimed in claim 1, wherein one subset of the pins is longer than the other subset of the pins.

19. The segmented roof as claimed in claim 1, wherein one subset of the pins is wider than the other subset of the pins.

20. The segmented roof as claimed in claim 1, wherein the guide rail comprises a deep plane and a shallow plane, the planes running one behind the other and being formed via grooves.

21. The segmented roof as claimed in claim 6, wherein the deep plane and the shallow plane run parallel to the outer skin (roof skin) as far as a convertible top compartment.

22. The segmented roof as claimed in claim 6, wherein the deep plane and the shallow plane diverge in a V-shaped manner within the convertible top compartment.

23. The segmented roof as claimed in claim 1, wherein the last segment only has pins of identical dimensioning.

24. The segmented roof as claim in claim 1, wherein the folding arrangement is moved with a driving device, the driv-

ing device preferably being a chain, a threaded rod or a cable pull or belt drive.

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