(19) DANMARK

(10) **DK 180438 B1**

(12) PATENTSKRIFT

Patent- og
Varemærkestyrelsen

(51) Int.Cl.: ***B60J 7/10 (2006.01)*** ***F16B 2/06 (2006.01)***

(21) Ansøgningsnummer: **PA 2019 70540**

(22) Indleveringsdato: **2019-08-30**

(24) Løbedag: **2019-08-30**

(41) Alm. tilgængelig: **2021-03-01**

(45) Patentets meddelelse bkg. og publiceret den: **2021-04-23**

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(54) Titel: **A clamp member assembly**

(56) Fremdragne publikationer:
US 5827026 A
US 2017/0122491 A1
US 2225875 A
US 2003/0057726 A1
US 5487585 A

(57) Sammendrag:
A clamp member assembly (7) serves for securing a first component (6) on top of a cantilevered second component (1). The clamp member assembly (7) comprises at least a spring clamp member (8) comprised of a U-bend lower spring part including an interior lower spring leg section (18), an exterior lower spring leg section (19) that via a U-bend spring section (20) extends into the interior lower spring leg section (18). An adjustable spring gap (21) is delimited between said spring leg sections (18;19). A tensioning member (22) is operatively connected to said spring leg sections (18;19) for adjusting the size of the adjustable spring gap (21). The interior lower spring leg section (18) extends into an interior upper spring leg section (28) adapted to be secured to the first component (6), and the exterior lower spring leg section (19) extends into an exterior upper spring leg section (27) adapted to engage/disengage the second component (1) by operating the tensioning member (22) to secure the first component (6) to the second component (1).

Fortsættes...

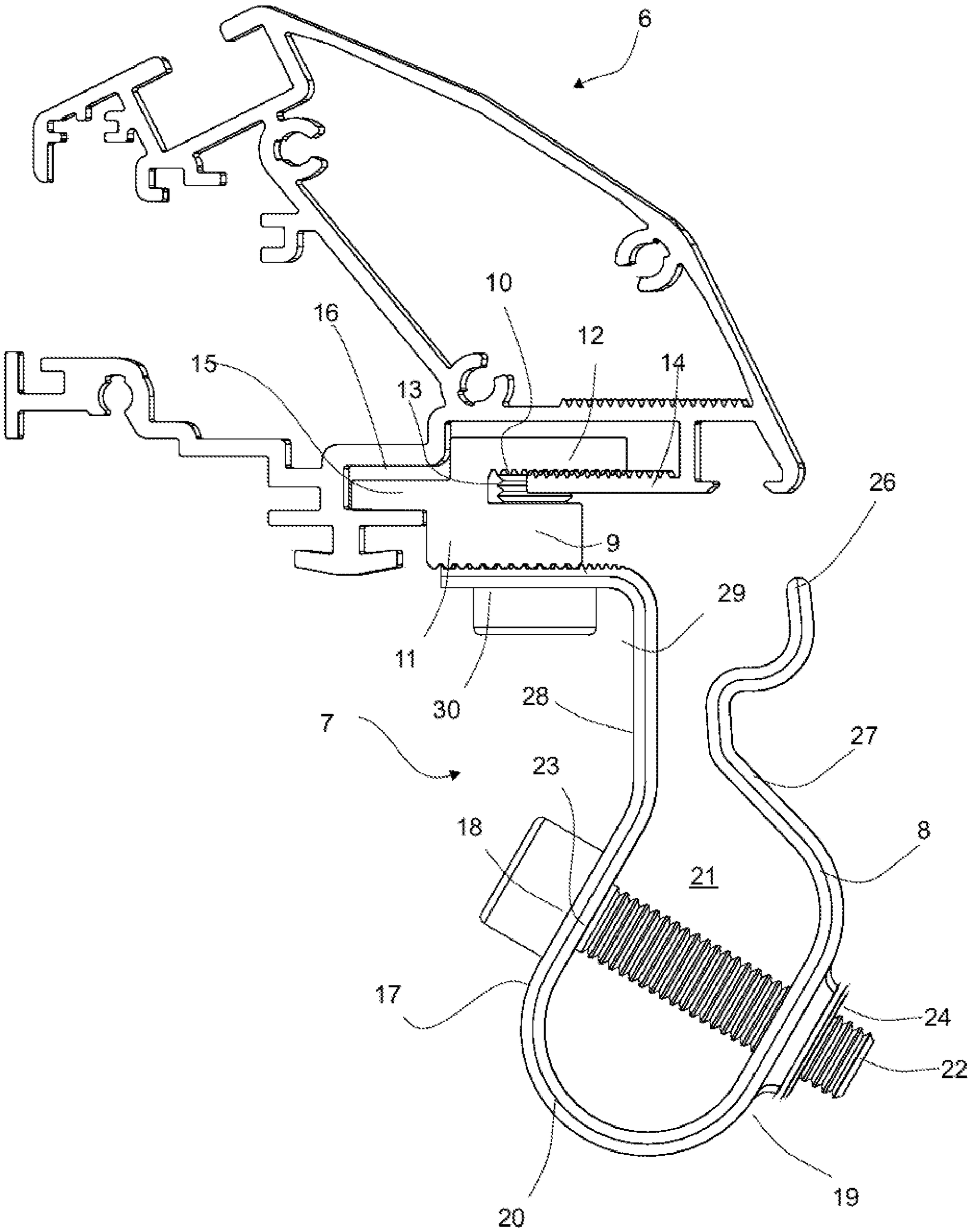


Fig. 4

The present invention relates to clamp member assembly of the kind mentioned in the opening paragraph for securing a first component on top of a cantilevered second component.

More particularly the present invention concerns assembling of and securing of a coupling rail for a roll-up truck bed cover to a side wall of a truck bed by means of said clamp member assemblies.

Many existing clamp devices are used to secure a roll-up truck bed cover to an open cargo bed of a motor vehicle, in such instances as the addition of the roll-up truck bed cover after the vehicle has left the factory thereby upgrading the vehicle off-factory.

Coupling rails for truck bed covers composed of rigid slats of the kind described in the applicant's Danish patent applications no. PA 2018 70246 and PA 2019 70310 are secured by means of clamps on top of the side walls of the truck bed.

US patent application no. 2003230697 concerns a pivotable clamp for mounting a retractable cover system over the cargo space of a vehicle, such as a roll-up cover for a truck bed, wherein the roll-up cover in itself are comprised of pivotably interconnected rigid slats. This known pivotable clamp is a complicated structure having several clamp members pivotably coupled to each other by means of pivots. This known clamp is expensive, not only to manufacture due to the many mold and the amount of metal, but also due to the time needed to assemble the many sub-components correctly. Furthermore this known clamp is heavy to mount.

US 5,827,026 relates to a simple U-clamp wherein a second object can be attached to a first object by inserting a bolt through the second object.

In a main aspect the present invention aims to remedy at least some of the disadvantages and challenges of the prior art clamp members.

In a further aspect of the present invention is provided a clamp member assembly of the kind mentioned in the opening paragraph, which clamp member assembly is easy to install, in particular being easy to install to secure a coupling rail of a roll-up bed cover to the side wall of a vehicle.

In a further aspect of the present invention is provided a clamp member assembly of the kind mentioned in the opening paragraph, which clamp member assembly is comprised of very few sub-components.

In a further aspect of the present invention is provided a clamp member assembly of the kind mentioned in the opening paragraph, which clamp member assembly has no pivots or hinges.

In a further aspect of the present invention is provided a clamp member assembly of the kind mentioned in the opening paragraph, which clamp member assembly has spring properties.

In a further aspect of the present invention is provided a clamp member assembly of the kind mentioned in the opening paragraph, which clamp member assembly is a non-drill clamp-on system.

The novel and unique features whereby these and other aspects are achieved according to the present invention consist in that an upright first interior upper leg part that forms a first angle with the interior lower spring leg section opposite the U-bend spring section, and a first interior upper leg part that extends cantilevered from the upright first interior upper leg part via a second angle away from the exterior lower spring leg section.

In the context of the present invention the terms “interior” and “exterior”, when used in combination with a component or feature, are mainly used to indicate that the clamp member assembly has two different leg sections. The different leg sections of the clamp member assembly are in extension of each other following different courses, and are intended to have different orientations in use. The “interior” leg sections are the sections of the spring clamp member facing the second component, such as a side wall of a truck bed, whereas the “exterior” leg sections faces away from the second component, such as towards the cargo space of the truck bed.

In the context of the present invention the term “angle” in relation to two consecutive leg sections refers to the smallest angle between said consecutive leg sections. Thus the reference to the “angle” is to the smallest angle, whether it be the exterior angle or the exterior angle between two legs section in angular extension of each other.

In the context of the present invention the term “truck”, “truck bed”, etc. is used in a non-limiting way in relation the preferred uses for the clamp member assembly. Other kinds of vehicles and structures where a rigid cover that requires coupling rails to be mounted for making the bed cover retractable and to be rolled-up is however also intended within the scope of the present invention.

Operation of the tensioning member can move the interior lower spring leg section and the exterior lower spring leg section closer together and further apart. When the spring gap is adjusted the interior upper spring leg section moves in relation to the interior upper spring leg section. Reducing the spring gap results in movement of the spring leg sections so that the exterior upper spring leg section moves upwards and/or forward and the interior upper spring leg section

simultaneously moves downwards and/or backwards. Increasing the spring gap by loosening tension of the tensioning member results in the opposite movements so that the exterior upper spring leg section moves downwards and/or backwards thereby disengaging the second component, and the interior upper spring leg section simultaneously moves upwards and/or forward thereby loosing pulling power on the first component.

In the installed position of the clamp member assembly on both a truck bed side wall and a coupling rail for a truck bed cover the general orientation of the clamp member assembly will be substantially vertical so that the interior upper spring leg section and the exterior upper spring leg section are moved up and down when the tensioning member is operated.

The upright first interior upper leg part increased the overall length of the spring clamp member to a length that arranges the tensioning member a suitable distance from the first component, which distance provides sufficient space for the tensioning member to be free to be operated and manipulated manually. The first angle turns the upright first interior upper leg part away from the exterior lower spring leg section. So when the clamp member assembly is installed on a truck bed the upright first interior upper leg part may be substantially perpendicularly suspended, typically below an upper edge projection of a vehicle side wall, such as a truck bed side wall, which upper edge projection faces towards the opposite side wall of the vehicle, e.g. the opposite truck bed side wall.

The cantilevered first interior upper leg part may serve as an expedient angle brace for mounting the clamp member assembly detachably to the first component, directly or via one or more intermediate components, such as spacers, damping members, extenders or gaskets.

In a similar manner the exterior upper spring leg section may have

- a first exterior upper leg part that forms a third angle with the exterior lower spring leg section opposite the U-bend spring section to arrange the first exterior upper leg part in the direction towards the upright first interior upper leg part,
- the first exterior upper leg part extends into an upright second exterior upper leg part via a fourth angle,
- the upright second exterior upper leg part extends into a third exterior upper leg part via a fifth angle,
- the fifth angle turns the third exterior upper leg part away from the first exterior upper leg part,
- the third exterior upper leg part extends into an upright fourth exterior upper leg part via a sixth angle, and
- the upright fourth exterior upper leg part has a free exterior end.

The third angle turns the first exterior upper leg part against the upright first interior upper leg part. When the first exterior lower leg part is pushed towards the first exterior lower leg part by operating the tensioning member the upright second exterior upper leg part is, due to the fourth angle, capable of being moved towards the upright first interior upper leg part and to slide substantially parallel to said upright first interior upper leg part whereby the upright first interior upper leg part is pulled down, and so is the first component, such as a coupling rail, due to the first component being secured to the cantilevered first interior upper leg part. At the same time the upright second exterior upper leg part is pushed up to engage the second component, e.g. a side wall of the vehicle. Due to the fifth angle and the sixth angle the upright fourth exterior upper leg part is arranged a suitable distance from the upright first interior upper leg part that allow the free end of the fourth exterior upper leg part to apply an upwards force to the second component with the

final result that the clamp member assembly secures the first component to the second component quickly and easyly. In use to secure a coupling rail to the free upper edge of the side wall of a truck bed the upright second exterior upper leg part and the upright first interior upper leg part may clamp on opposite sides of descending leg(s) of a cantilevered bed rail of the side wall.

The design of the clamp member assembly is unique. Moving of the opposite lower leg sections make the clamp member assembly generally self-tensioning in response to operating the tensioning member.

In a very simply embodiment the tensioning member is a screw means, e.g. a screw means that can be turned using a wrench, a spanner, an Allen key. No holes need to be drilled in either of the first component or the second component.

The interior lower spring leg section and the exterior lower spring leg section may be substantially parallel in the non-biased condition, however according to the constructor's choice said leg sections may also converge or diverge in the non-biased condition. Due to the first angle, the third angle and the fourth angle of the clamp member assembly the spring clamp member turns away from the second component, e.g. the truck bed side wall, when the clamp member assembly is mounted to said second component, whereby the spring clamp member protrude below first component. So the spring clamp member may protrudes below the part of the coupling rail for the roll-up truck bed cover that protrudes laterally above the cargo space and serves for mounting the interconnected array of rigid slats that constitutes the truck bed cover to the truck bed side wall.

The clamp member assembly may further comprise an intermediate component that facilitates firm securing of the spring clamp member to the first component. Such an intermediate component

can e.g. be a mounting member having a first mounting part adapted for securing to the first interior upper leg part and a second mounting part adapted for engaging the first component, such as being configured to engage a bottom groove or track of a coupling rail for receiving the roll-up truck bed cover.

In a preferred embodiment of the present invention the mounting member may be made of a resilient material.

The mounting member makes the spring clamp member suited for use with different coupling rails in that various individual mounting members can be used with one and the same spring clamp member of the spring member assembly. This way the number of different subparts for different truck beds and different truck bed covers are substantially reduced. The garage and mechanic need not keep a huge number of different clamp members assembly structures on stock, and the car owner need not wait a long time for special spare parts to have his/her truck bed cover properly mounted.

Due to the spring properties of the spring clamp member the spring clamp member adapts to different truck bed designs. Only the small mounting member may be different for different coupling rail designs. For most uses the first mounting part will be the same for different applications.

The first interior upper leg part may have a first screw hole, and the mounting member may have a second screw hole axially aligned with the first screw hole for said first and second screw holes in common receiving a first screw member.

The interior lower spring leg section may have a third screw hole, the exterior lower spring leg section may have a fourth screw hole axially aligned with the third screw hole for said third and fourth screw holes in common receiving a tensioning

member in from of a second screw member across the adjustable spring gap.

The above-mentioned angles arranges the tensioning member, e.g. the second screw member, with the head on the exterior lower spring leg section closer to the coupling rail than the tip of the second screw member that passes through the fourth screw hole in interior lower spring leg section.

In the non-biased condition of the spring clamp member the interior lower spring leg section and the exterior lower spring leg section may, as mentioned above, be substantially parallel. A screw axis through the third screw hole and through the fourth screw hole may then be substantially perpendicular to the interior lower spring leg section and the exterior lower spring leg section, respectively.
In preferred embodiment of the clamp member assembly of the present invention the first angle, the third angle and the fourth angle are more than 90°, thus obtuse, optionally blunt.

Preferably the first angle and the fourth angle have same or different size and are between 130° and 160°, more preferred between 135° and 155°, and most preferred between 138° and 152°.

Preferably the third angle is smaller than one or both of the first angle and the fourth angle. So preferably the third angle is above 90° and below 130°, more preferred between 95° and 125°, and most preferred between 100° and 120°.

A resilient mounting member is gentle to the surrounding components and provides in itself, due to its compressibility, a frictional engagement, so that the clamp member assembly does not move unintended along the side wall and the coupling rail, e.g. during driving, or if influenced by other kinds of external forces.

An additional friction between the first interior upper leg part and the mounting member can be obtained if the free upper surface of the first interior upper leg part has a first friction means and a free lower surface of the first mounting part has a second friction means. The first and second friction means can e.g. be a roughened or serrated surface topography.

For use to secure roll-up truck bed covers to truck beds to retractably cover the cargo space of the truck the first component may be a coupling rail for a roll-up truck bed cover and the second component may be the side wall of a truck bed.

The invention will now be described in further details with references to the drawing in which

fig. 1 is plane view of a side wall of a truck bed, where the side wall has a coupling rail mounted on top of its free edge by means of a clamp member assembly of the present invention,

fig. 2 is an enlarged scale view of the fragment framed by the box seen in fig. 1,

fig. 3 is an enlarged scale fragmentary end view of fig. 1,

fig. 4 shows the same but without the side wall of the truck bed,

fig. 5 shows the spring clamp member seen in fig. 4 from the side to illustrate the different curvatures of the opposite leg sections,

fig. 6 shows the same in a perspective view seen from the exterior spring leg sections, and

fig. 7 is a perspective view of the mounting member seen from the interior section.

Below the inventions is described in relation to a preferred embodiment under the assumption that the first component is a coupling rail for a roll-up truck bed cover, and that the second component is the side wall of the truck bed. It is emphasized that the design of the coupling rail and of the side wall are examples, and that other uses are within the scope of the present invention. Replacing the mounting member shown in the figures with another mounting member suited for engaging another coupling rail design makes the spring clamp member extremely versatile in use.

Fig. 1 shows the side wall 1 of a truck bed. The side wall 1 has an inner bed structure 2 having a first bed rail 3a on which a second bed rail 3b of the exterior bed side 4 is hanging. The first bed rail 3a and second bed rail 3b are seen best in fig. 3. The exterior bed side 4 is thus cantilevered towards the cargo space of the truck bed to provide a free side wall edge 5 onto which a coupling rail 6 can be arranged and secured by means of a clamp member assembly 7, as shown in the enlarged scale view of fig. 2 of the framed box in fig. 1, and in the end view of fig. 3.

Fig. 4 corresponds to fig. 3 but the side wall of the truck bed has been removed for visual purposes to better illustrate the structure of the clamp member assembly 7 and how the clamp member assembly 7 is secured to the coupling rail 6.

The clamp member assembly 7 comprises a spring clamp member 8 that is secured to the coupling rail 6 by means of a mounting member 9 and a first screw 10. The mounting member 9 has a first mounting part 11 in extension of a second mounting part 12. A mounting groove 13, which serves to receive a lateral coupling web 14 of the coupling rail 6, is delimited between

the first mounting part 11 and the second mounting part 12. Opposite the mounting groove 13 the mounting member 9 has a mounting web 15 that engages a coupling groove 16 of the coupling rail 6.

The spring clamp member 8 has a U-bend lower spring part 17, which includes an interior lower spring leg section 18, an exterior lower spring leg section 19 that via a U-bend spring section 20 extends into the interior lower spring leg section 18. An adjustable spring gap 21 is delimited between said interior lower spring leg section 18 and said exterior lower spring leg section 19.

A tensioning member in form of a second screw 22 extends through a third screw hole 23 in the interior lower spring leg section 18 and a fourth screw hole 24 in the exterior lower spring leg section 19 to reduce or increase the size of the spring gap 21 for the opposite the interior lower spring leg section 18 and exterior lower spring leg section 19 to clamp around the adjacent free descending leg 25a of the first bed rail 3a and the free descending leg 25b of the second bed rail 3b, as seen best in fig. 3, and whereby a free exterior end 26 of an exterior upper spring leg section 27 can be arranged inside the channel cavity 27 of the first bed rail 3a. In the situation shown in figs. 4 and 5 the interior lower spring leg section 18 and the exterior lower spring leg section 19 are substantially parallel, and an axis X extends perpendicularly through both the third screw hole 23 and the fourth screw hole 24.

The interior lower spring leg section 18 extends into an interior upper spring leg section 28 adapted to be secured to the coupling rail 6 via the mounting member 9 by means of the first screw 10.

As seen in views of figs. 5 and 6 the interior upper spring leg section 28 has an upright first interior upper leg part 29 that forms a first angle α with the interior lower spring leg section 18 opposite the U-bend spring section 20. A first interior upper leg part 30 extends cantilevered from the upright first interior upper leg part 29 via a second angle β away from the exterior lower spring leg section 19. The first interior upper leg part 30 has an upper engagement surface 31 that has a serrated upper surface 31a for improved frictional engagement with the mounting member 9, and a first screw hole 32 for receiving the first screw 10.

The exterior upper spring leg section 27 has a first exterior upper leg part 33 that forms a third angle δ with the exterior lower spring leg section 19 opposite the U-bend spring section 20 thereby arranging the first exterior upper leg part 33 facing towards the upright first interior upper leg part 29. The first exterior upper leg part 33 extends into an upright second exterior upper leg part 34 via a fourth angle γ, and the upright second exterior upper leg part 34 extends into a third exterior upper leg part 35 via a fifth angle φ. The fifth angle φ turns the third exterior upper leg part 35 away from first exterior upper leg part 33 to extend via a sixth angle θ into an upright fourth exterior upper leg part 36 having a free exterior end 26.

In fig. 7 the mounting member 9 is illustrated from below. The mounting member 9 has a second screw hole 37 in the first mounting part 11, which in alignment with the second screw hole 32, receives the first screw 10 to secure the clamp member assembly 7 to the first component. The first mounting part 11 has a serrated first mounting surface 38 for engaging the serrated upper surface 31a of the first interior upper leg part 30, and the second mounting part 12 has a serrated7second

mounting surface 39 to engage corresponding means on the lateral coupling web 14 of the coupling rail 6.

As shown in figs. 4 and 5 by turning the second screw 22 the spring gap 21 can be reduced or increased.

When the spring gap 21 is reduced by moving the upright second exterior upper leg part 34 in the direction B1 the first interior upper leg part 30 moves vertically downwards, as indicated by arrow A1, bringing along the coupling rail to which the first interior upper leg part 30 is firmly secured by means of the first screw 10. The first interior upper leg part 30 cannot move laterally in relation to the coupling rail 6. At the same time the upright second exterior upper leg part 34 moves in the direction C1 towards the upright first interior upper leg part 29 to clamp against the free descending leg 25a of the first bed rail 3a (not shown in fig. 5). At the same time the free exterior end 26 of the exterior upper spring leg section 27 moves upwards in the direction D1 inside the channel cavity 27 of the overlapping bed rails 3a;3b as indicated by arrow D1. So as a result of turning the second screw 22 to reduce the spring gap 21 the spring clamp assembly 7 pulls the coupling rail 6 downwards and the upright second exterior upper leg part 34 to engage the descending leg of the first bed rail 3a thereby firmly securing the coupling rail 6 on top of the truck bed side wall 2,4 in detachable manner and without drilling holes in the truck bed.

The spring gap 21 is increased by turning the second screw 22 in the opposite direction than the direction that reduced the spring gap 21. In doing so the upright second exterior upper leg part 34 moves in the direction B2, whereby the first interior upper leg part 30 is relieved to move vertically upwards, as indicated by arrow A2. At the same time the upright second exterior upper leg part 34 is also relieved to move in the direction C2 away from the upright first interior upper leg

part 29 to release the clamping force against the free descending leg of the first bed rail whereby the free exterior end 26 of the exterior upper spring leg section 27 moves downwards in the direction D2. When the first screw 10 has been released the rest of the clamp member assembly 7 can be removed.

Krav

1. Sammensat tilspændingselement (7) til at fastgøre en første komponent (6) ovenpå en udkraget anden komponent (1), det sammensatte tilspændingselement (7) omfatter mindst

- et fjedertilspændingselement (8), som omfatter
  - en U-bukket, nedre fjederdel indbefattende
    - en indre, nedre fjederbensektion (18),
    - en ydre, nedre fjederbensektion (19), som via en U-bukket fjedersektion (20) strækker sig ind i den indre, nedre fjederbensektion (18),
    - et justerbart fjedermellemrum (21), som er afgrænset mellem nævnte indre, nedre fjederbensektion (18) og nævnte ydre, nedre fjede-bensektion (19), og
- et strammeelement (22), som operativt er forbundet til nævnte indre, nedre fjederbensektion (18) og nævnte ydre, nedre fjederbensektion (19) og er indrettet til at justere størrelsen af det justerbare fjedermellemrum (21),

hvori

- den indre, nedre fjederbensektion (18) strækker sig ind i en indre, øvre fjederbensektion (28), som er indrettet til at blive fastgjort til den første komponent (6), og
- den ydre, nedre fjederbensektion (19) strækker sig ind i en ydre, øvre fjederbensektion (27), som er indrettet til at indgribe med/frigøre den anden komponent (1) ved betjening af strammeelementet (22) for at fastgøre den første komponent (6) til den anden komponent (1),

kendetegnet ved at

den indre, øvre fjederbensektion (28) har

- en opretstående første, indre, øvre bendel (29), som danner en første vinkel (α) med den indre, nedre fjederbensektion (18) modsat den U-bukkede fjedersektion (20), og
- en første, indre, øvre bendel (30), som strækker sig udkraget fra den opretstående første, indre, øvre bendel (29) via en anden vinkel (β) væk fra den ydre, nedre fjederbensektion (19).

2. Sammensat tilspændingselement (7) ifølge krav 1, **kendetegnet** ved at den ydre, øvre fjederbensektion (27) har

- en første, ydre, øvre bensektion (33), som danner en tredje vinkel (δ) med den ydre, nedre fjederbensektion (19) modsat den U-bukkede fjedersektion (20) for at arrangere den første, ydre, øvre bensektion (33) vendende mod den opretstående, første, indre, øvre bendel (29),
- den første, ydre, øvre bendel (33) strækker sig ind i en opretstående, anden, ydre, øvre bendel (34) via en fjerde vinkel (γ),
- den opretstående, anden, ydre, øvre bendel (34) strækker sig ind i en tredje, ydre, øvre bendel (35) via en femte vinkel (ϕ),
- den femte vinkel (ϕ) vender den tredje, ydre, øvre bendel (35) væk fra den første, ydre, øvre bendel (33),
- den tredje, ydre, øvre bendel (35) strækker sig ind i en opretstående, fjerde, ydre, øvre bendel (36) via en sjette vinkel (θ), og
- den opretstående, fjerde, ydre, øvre bendel (36) har en fri ydre ende (26).

3. Sammensat tilspændingselement (7) ifølge ethvert af kravene 1 eller 2, **kendetegnet** ved at det sammensatte tilspændingselement (7) yderligere omfatter et

monteringselement (9), som har en første monteringsdel (11), som er indrettet til at fastgøre den første, indre, øvre bendel (30), og en anden monteringsdel (12), som er indrettet til at indgribe med den første komponent (6), valgfrit er monteringselementet (9) fremstillet af et fjedrende materiale.

4. Sammensat tilspændingselement (7) ifølge krav 3, **kendetegnet** ved at den første, indre, øvre bendel (30) har et første skruehul (32), monteringselementet (9) har et anden skruehul (37), som er aksialt på linje med det første skruehul (32) for at nævnte første (32) og anden skruehuller (27) i fællesskab modtager et første skrueelement (10).

5. Sammensat tilspændingselement (7) ifølge ethvert af de foregående krav 1 - 4, **kendetegnet** ved at den indre, nedre fjederbensektion (18) har et tredje skruehul (23), den ydre, nedre fjederbensektion (19) har et fjerde skruehul (24), som er aksialt på linje med det tredje skruehul (23) for at nævnte tredje (23) og fjerde skruehuller (24) i fællesskab sammen kan modtage et strammeelement (22) på tværs af det justerbare fjedermellemrum (21), fortrinsvis er strammeelementet (22) et anden skrueelement.

6. Sammensat tilspændingselement (7) ifølge krav 5, **kendetegnet** ved at en skrueakse (X) gennem det tredje skruehul (23) og gennem det fjerde skruehul (24) er i det væsentlige vinkelret på den indre, nedre fjederbensektion (18) og den ydre, nedre fjederbensektion (19).

7. Sammensat tilspændingselement (7) ifølge ethvert af de foregående krav 2 - 6, **kendetegnet** ved at den første vinkel (α), den tredje vinkel (δ), og den fjerde vinkel (δ) er mere end 90°,

- fortrinsvis har den først vinkel (α) og den fjerde vinkel (γ) den samme eller forskellige størrelse og er mellem 130° og 160°, mere foretrukket mellem 135° og 155°, og mest foretrukket mellem 138° og 152°, og
- fortrinsvis er den tredje vinkel (δ) mindre end en eller begge af den først vinkel (α) og den fjerde vinkel (γ), fortrinsvis er den tredje vinkel (δ) over 90° og mellem 90° og 130°, mere foretrukket mellem 95° og 125°, og mest foretrukket mellem 100° og 120°.

8. Sammensat tilspændingselement (7) ifølge ethvert af de foregående krav 3 - 7, **kendetegnet** ved at en fri, øvre flade (31) på den første, indre, øvre bendel (30) har et første friktionsmiddel (31a), og en fri, nedre flade (38) på den første monteringsdel (11) har et anden friktionsmiddel (38a).

9. Sammensat tilspændingselement (7) ifølge ethvert af de foregående krav 1 - 8, **kendetegnet** ved at den første komponent (6) er en koblingsskinne (6) til et rullelåg til et lad på en ladvogn, og den anden komponent (1) er en af sidevæggene (2,4) på laddet af en ladvogn.

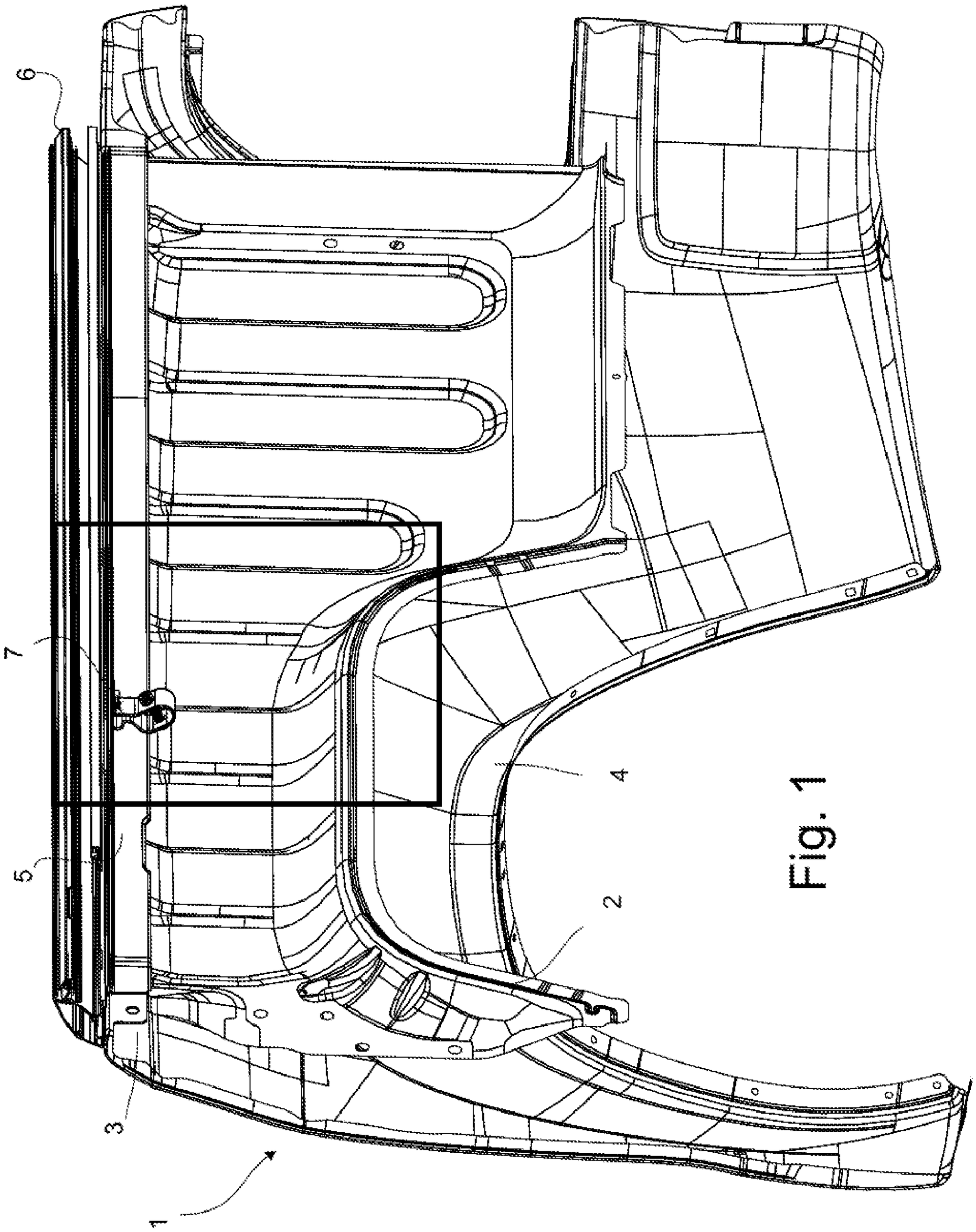


Fig. 1

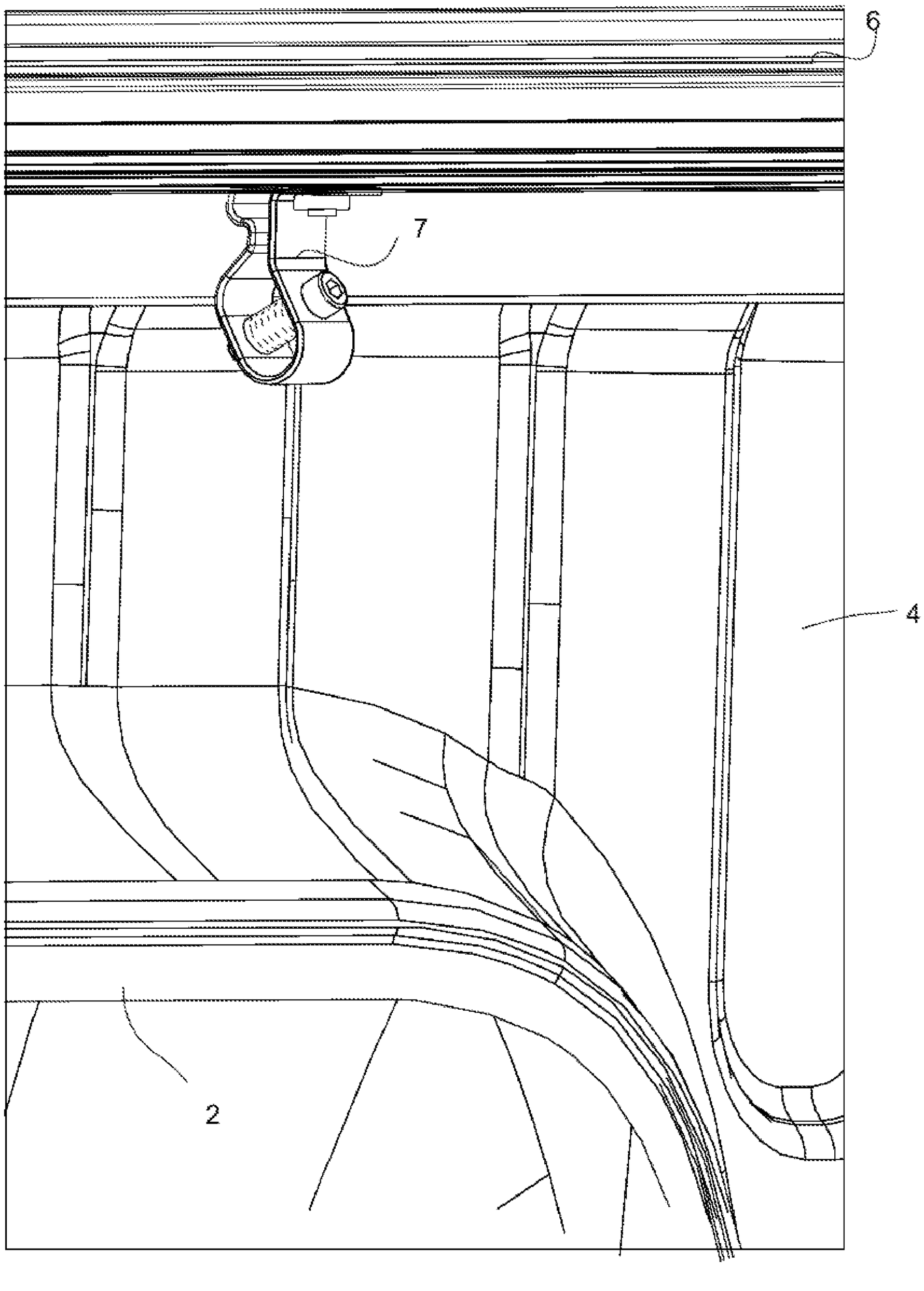


Fig. 2

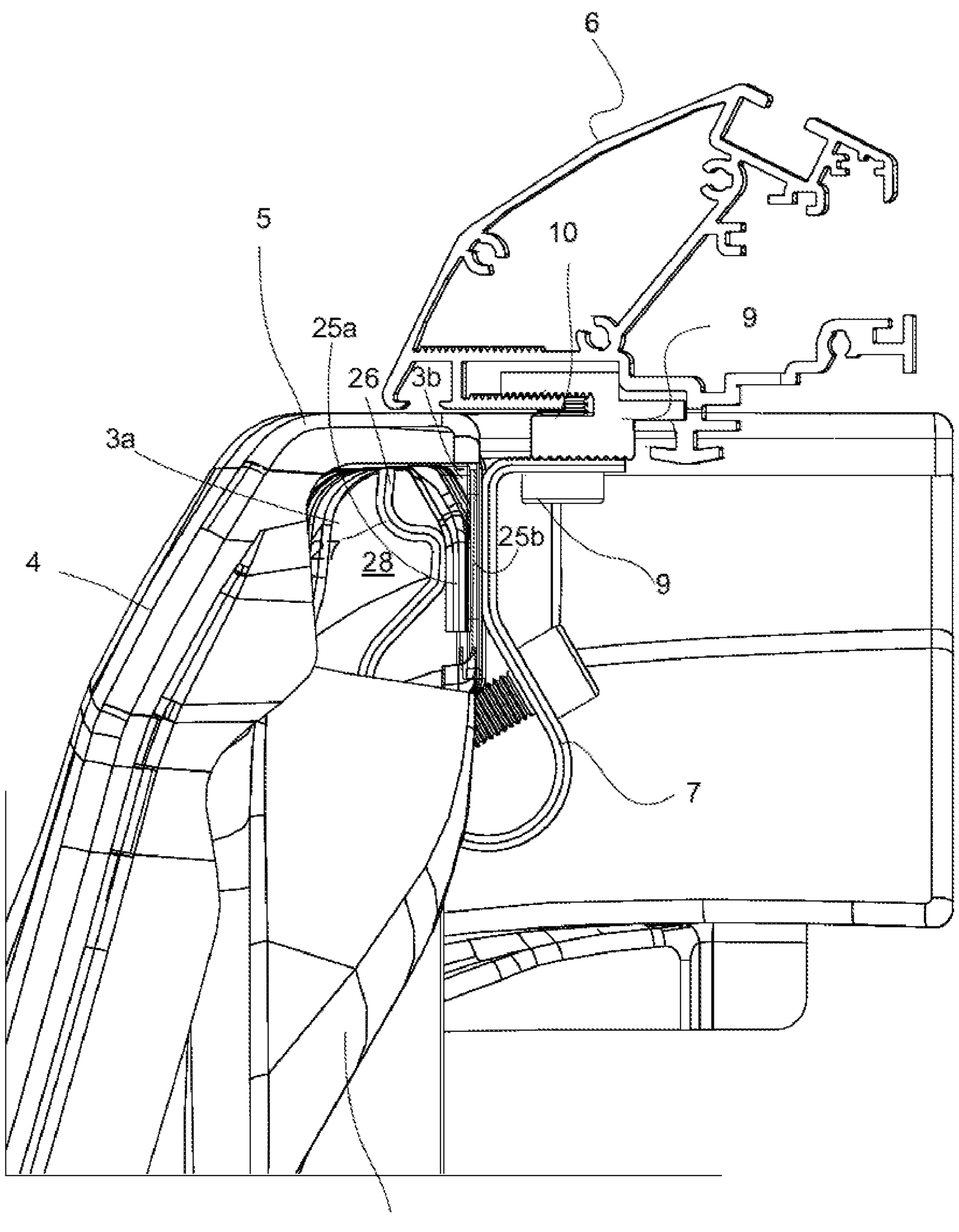
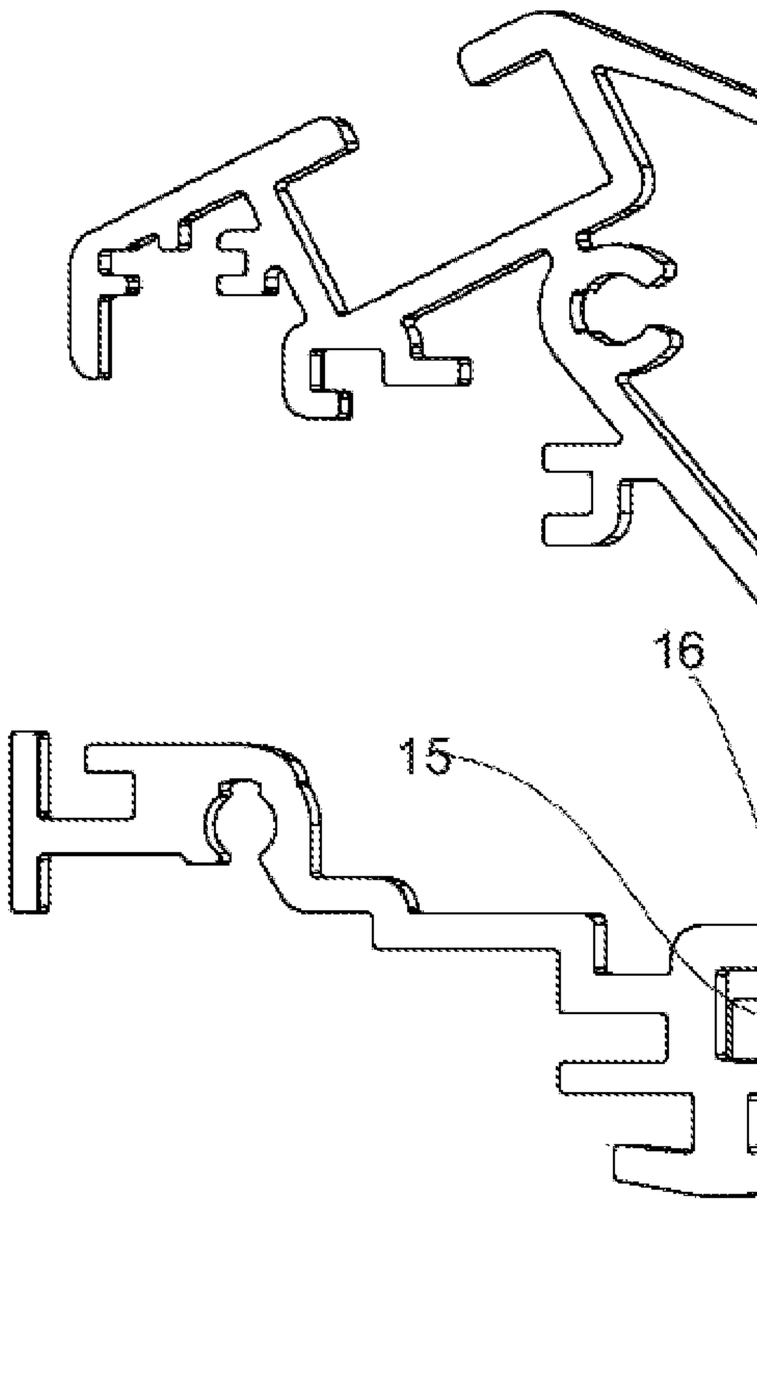


Fig. 3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12
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39

Fig. 7

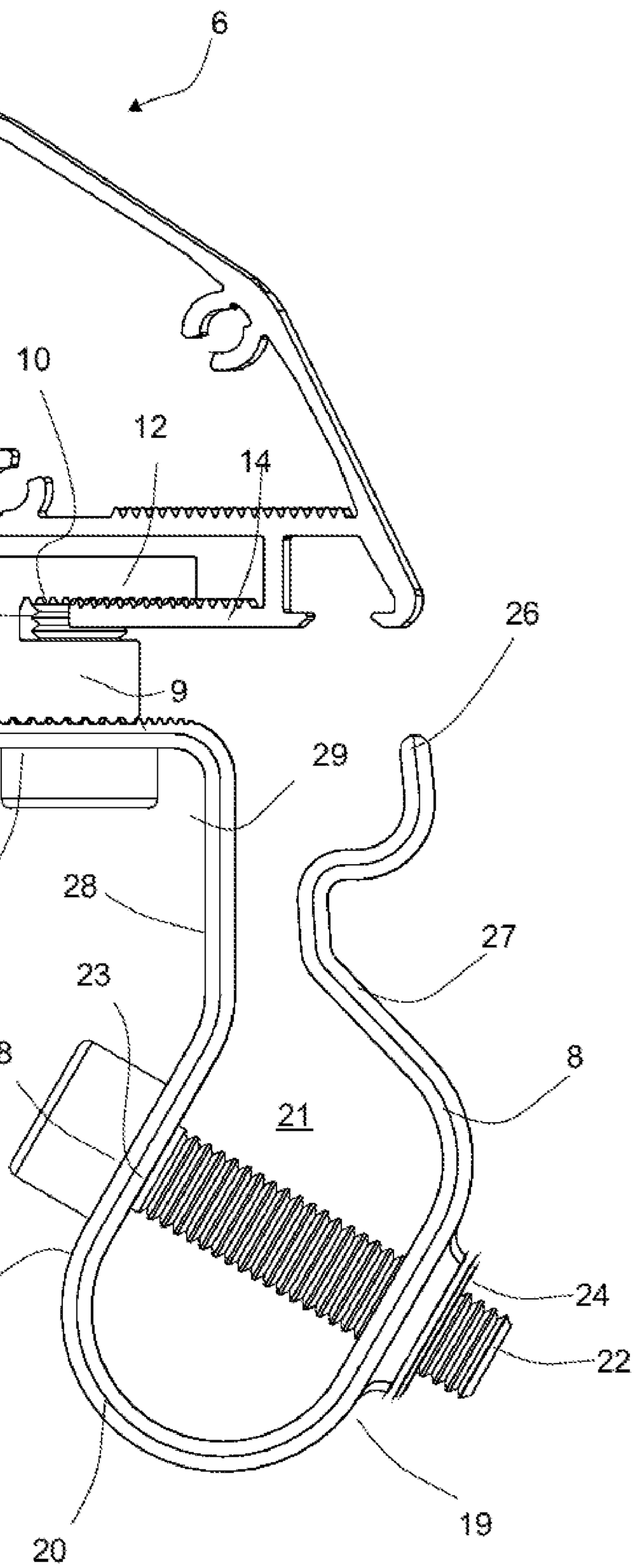
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Fig. 4

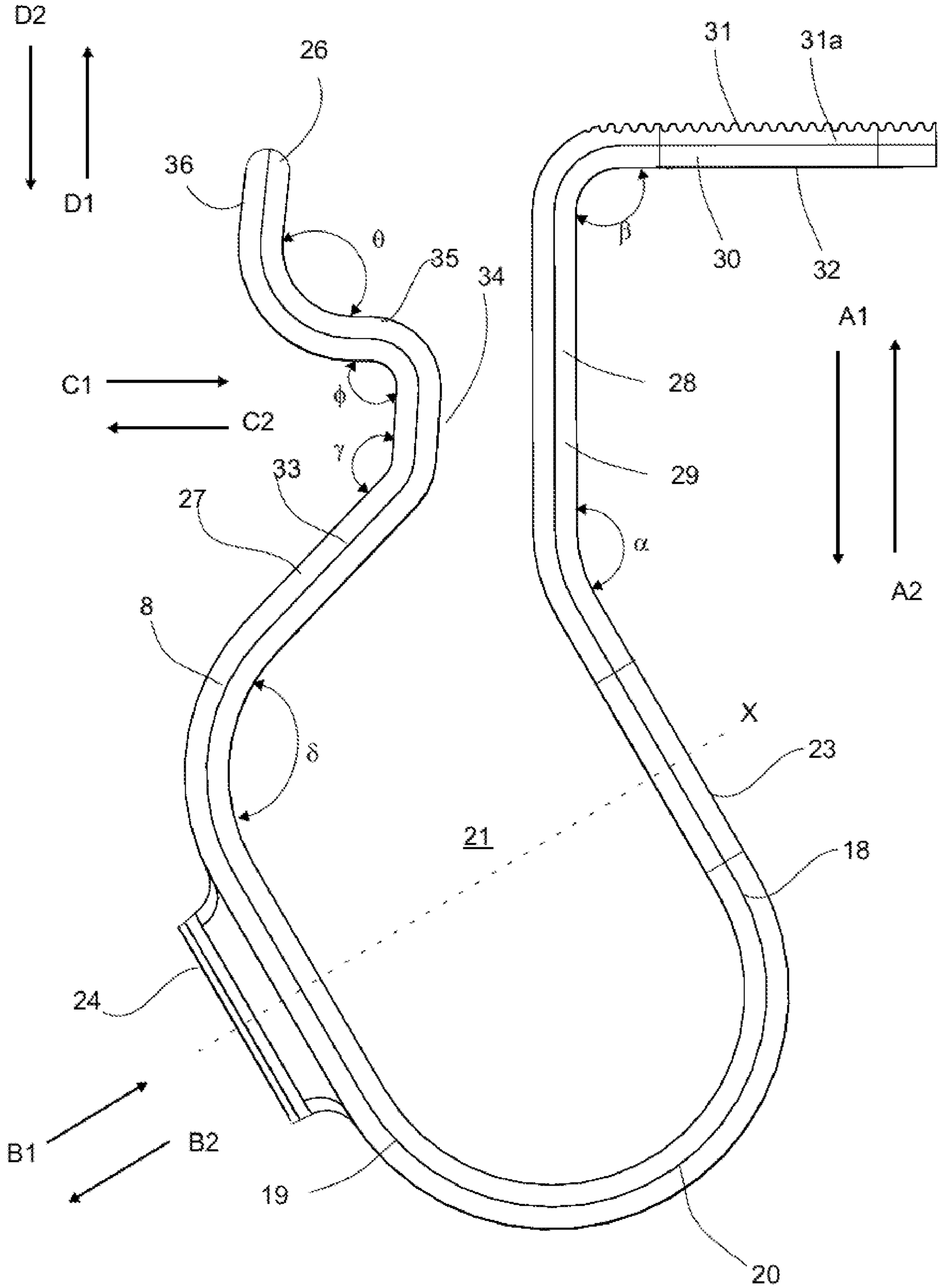
D2
D1
26
36
θ
35
34
C1
C2
φ
γ
33
27
8
δ
24
B1
B2
19
21
31
31a
30
32
β
A1
A2
28
29
α
X
23
18
20

Fig. 5

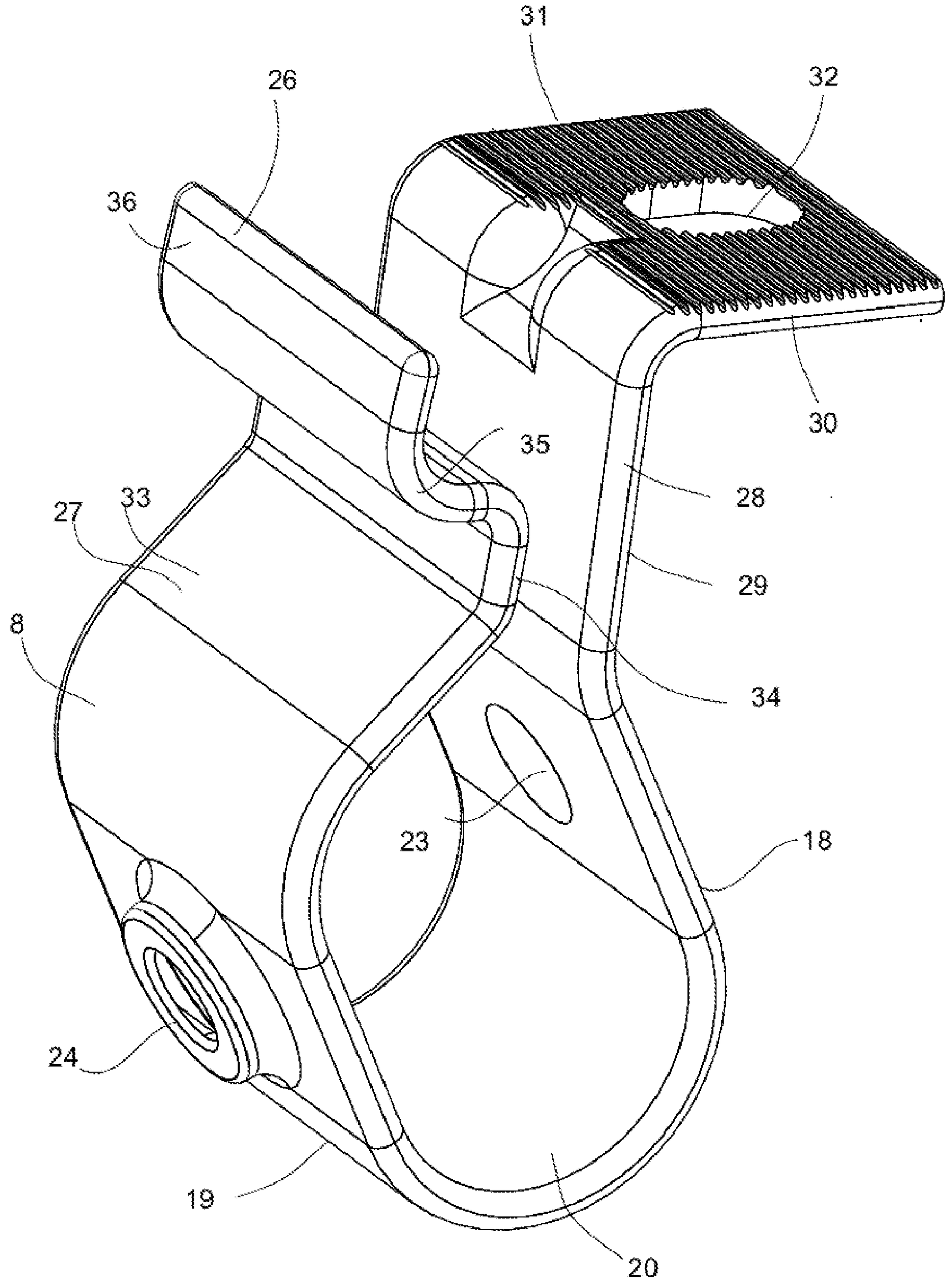

Fig. 6

DANISH PATENT AND TRADEMARK OFFICE

SEARCH REPORT - PATENT	Application No. PA 2019 70540

1. ☐ Certain claims were found unsearchable (See Box No. I).

2. ☐ Unity of invention is lacking prior to search (See Box No. II).

A. CLASSIFICATION OF SUBJECT MATTER

B60J 7/10 (2006.01); F16B 2/06 (2006.01)

According to International Patent Classification (IPC)

B. FIELDS SEARCHED

PCT-minimum documentation searched (classification system followed by classification symbols)

IPC&CPC: B25B, B60J, F16B; CPC: Y10T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

DK, NO, SE, FI: IPC-classes as above.

Electronic database consulted during the search (name of database and, where practicable, search terms used)

EPODOC, WPI, Fulltext: English

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant for claim No.
X A	US 5827026 A (PATTI) 1998.10.27 See especially abstract and figures	1, 6-7, 10 2-5, 8-9
X A	US 2017/0122491 A1 (MANCUSO et al.) 2017.05.04 See especially paragraph [0035] and figure 1A	1, 6-7, 10 2-5, 8-9
A	US 2225875 A (MOSES) 1940.12.24 See especially figures	1-10
A	US 2003/0057726 A1 (WHEATLEY) 2003.03.27 See figure 1-2	1-10
A	US 5487585 A (WHEATLEY) 1996.01.30 See figure 1-2	1-10

☐ Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

"A" Document defining the general state of the art which is not considered to be of particular relevance.

"D" Document cited in the application.

"E" Earlier application or patent but published on or after the filing date.

"L" Document which may throw doubt on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified).

"O" Document referring to an oral disclosure, use, exhibition or other means.

"P" Document published prior to the filing date but later than the priority date claimed.

"T" Document not in conflict with the application but cited to understand the principle or theory underlying the invention.

"X" Document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone.

"Y" Document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" Document member of the same patent family.

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Date of completion of the search report

24 February 2020

Authorized officer

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SEARCH REPORT - PATENT		Application No. PA 2019 70540
C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant for claim No.

SEARCH REPORT - PATENT	Application No. PA 2019 70540

Box No. I Observations where certain claims were found unsearchable

This search report has not been established in respect of certain claims for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched, namely:

2. ☐ Claims Nos.:
because they relate to parts of the patent application that do not comply with the prescribed requirements to such an extent that no meaningful search can be carried out, specifically:

3. ☐ Claims Nos.:
because of other matters.

Box No. II Observations where unity of invention is lacking prior to the search

The Danish Patent and Trademark Office found multiple inventions in this patent application, as follows:

SEARCH REPORT - PATENT	Application No. PA 2019 70540

SUPPLEMENTAL BOX

Continuation of Box [.]