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(54) **Telescopic hang-on ladder**

(57) A telescopic hang-on ladder including a set of ladder elements (1¹, 1², 1³, 1⁴...) coupled to each other so that the sequential ladder elements are telescopically movable relative to each other in order to extend and collapse the ladder. Each ladder element includes two parallel stringers (2¹, 2²) spaced apart from each other. The cross-sectional profile of a stringer comprises a planar web (3), and both long edges of the web comprise guide members, wherein the guide members of the stringer of each upper ladder element constitute a slide guide for the stringer of the adjacent lower ladder element. A step (4) extends between the stringers substantially perpendicularly to the lengthwise direction of the stringers (2¹, 2²) and is mounted at each end to the web (3) of the stringer. The stringers (2¹, 2²) of each ladder element are substantially fitted, for the most of their part, within the corresponding stringers of the adjacent upper ladder element. Both long edges of the web (3) comprise a planar flange (5, 6) bent at an acute angle relative to the plane of the web, wherein the flanges together with the web constitute said guide members, so that each stringer of the upper ladder element constitutes a dovetail guide for the stringer of the lower ladder element fitted within said stringer.

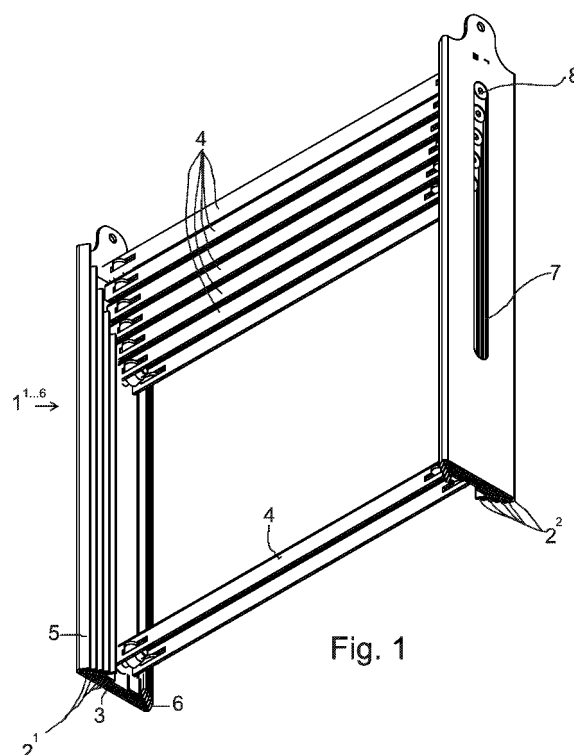


Fig. 1

Description

FIELD OF THE INVENTION

[0001] The invention relates to a ladder as defined in the preamble of claim 1.

BACKGROUND OF THE INVENTION

[0002] Known from the prior art, for example publication EP 1 777 358 A2, is a telescopic hang-on ladder including a set of ladder elements coupled to each other so that the sequential ladder elements are telescopically movable relative to each other in order to extend and collapse the ladder. Each ladder element includes two parallel stringers spaced apart from each other, the cross-sectional profile of each stringer comprising a planar web, and guide members on each of the long edges of the web, wherein the guide members of the stringer of each upper ladder element constitute a slide guide for the stringer of the lower ladder element. A step extends between the stringers substantially perpendicularly to the lengthwise direction of the stringers and is mounted from each end to the web of a stringer approximately in the middle of the cross section of the stringer. In the EP publication, the long edges of the web comprise outwardly opening grooves and adjacent inwardly opening grooves which constitute the guide members. The problem is that with such a structure the stringers of the ladder are all disposed adjacent to each other when the ladder is provided in the collapsed position, and the bunch constituted by the stringers becomes relatively wide. A wide stringer structure appears obtrusive on the façade of a building. In addition, to have a sufficient width for the lowest step, the ladder becomes considerably wide at the upper part. A further problem is that the stringer profile of the EP publication can be reasonably manufactured only by extruding light metal, which limits the available materials. In order to have a sufficiently strong structure from light metal, it must have a high material thickness, whereby the stringer structure becomes thick. For example, the use of steel as the stringer material of the EP publication is practically excluded.

[0003] Furthermore, known from publication US 3,997,026 is a telescopic emergency ladder wherein the stringers of the ladder elements fit telescopically within each other so that all the lower stringers are disposed within the uppermost stringer. In the US publication the cross-sectional profile of a stringer is square or rectangular, which makes the stringer structure thick and obtrusive.

OBJECTIVE OF THE INVENTION

[0004] The objective of the invention is to remedy the drawbacks referred to above.

[0005] Specifically, the objective of the invention is to disclose an emergency ladder wherein the stringers can

be manufactured by bending and wherein the material of the stringers is not limited to light metal.

[0006] In using the telescopic ladder as an emergency ladder to be hung on a wall it is most of the time normally disposed in its collapsed configuration until being deployed in an emergency situation to an extended configuration for emergency exit. The objective of the invention is to disclose a ladder wherein the assembly constituted by the stringers is as narrow as possible when the ladder is disposed in the telescopically collapsed configuration, so that the ladder can be made as unobtrusive as possible.

SUMMARY OF THE INVENTION

[0007] The ladder according to the invention is characterized by what has been presented in claim 1.

[0008] According to the invention the stringers of each ladder element are substantially fitted, for the most of their part, within the corresponding stringers of the adjacent upper ladder element. Both of the long edges of the web comprise a planar flange bent at an acute angle relative to the plane of the web, wherein the flanges together with the web constitute said guide members, so that each stringer of the upper ladder element constitutes a dovetail guide for the stringer of the lower ladder element fitted within said stringer.

[0009] The advantage of the invention is that the stringers of the ladder can be made strong, rigid and when provided in the telescopically nested collapsed configuration the structure is flat and unobtrusive.

[0010] In one embodiment of the ladder the stringers are formed from a metal sheet by bending.

[0011] In one embodiment of the ladder a stringer comprises an elongated slot, the length of which determines the allowed range for the movement of the stringer of the lower ladder element fitted within said stringer.

[0012] In one embodiment of the ladder a projecting member is mounted to the upper end of a stringer, wherein the projecting member is fitted to extend through the slot of the upper stringer substantially not further than the level of the outer surface of the web, so that the lower end of the slot constitutes a stop for the movement of the projecting member.

[0013] In one embodiment of the ladder the projecting member is a countersunk bolt with the head part disposed in the slot, and wherein the edges of the slot comprise a bevel with the bevel angle corresponding to the angle of the head part.

[0014] In one embodiment of the ladder the countersunk bolt is adapted, together with a nut screwed thereto, to constitute a mounting member in order to mount a step to the web of a stringer.

[0015] In one embodiment of the ladder both ends of a step comprise at least one long hole disposed in the lengthwise direction of the step. The nut includes at least one transverse projection extending through the long hole, so that in tightening the nut the transverse projection

tightens against one end of the long hole.

[0016] In one embodiment of the ladder the nut is a wing nut, the wings of which constitute said transverse projections. The step has a cross-sectional profile of an upturned U-shape, wherein both of the U-branches of the step comprise said long hole through which the wing of the wing nut extends.

[0017] In one embodiment of the ladder the uppermost ladder element of the ladder is adapted to be connected to the wall of a building by a connection device.

[0018] In one embodiment of the ladder the connection device includes a wall mounting which is mountable to the wall of a building, and at least two folding arms pivotally mounted from one end to the wall mounting and pivotally mounted from the other end to the uppermost ladder element, wherein the folding arms constitute an articulated parallelogram mechanism by which the ladder is moveable between a storage position close to the wall and a service position spaced apart from the wall. The ladder includes a releasable locking device adapted to hold the ladder in the telescopically collapsed storage position and, once the user has released the locking device, to deploy the ladder to the service position and to extend telescopically.

[0019] In one embodiment of the ladder the ladder is a deployable emergency ladder.

LIST OF FIGURES

[0020] In the following, the invention will be described in detail by means of examples of its embodiments with reference to the accompanying drawing in which

Fig. 1 illustrates one embodiment of the ladder according to the invention as seen obliquely from below,

Fig. 2 illustrates the ladder of Fig. 1 as seen directly from below,

Fig. 3 illustrates the ladder of Fig. 1 in an extended position,

Fig. 4 illustrates detail C of Fig. 3,

Fig. 5 illustrates detail D of Fig. 3,

Fig. 6 illustrates a side view of the ladder according to the invention as seen obliquely from above, applied as an emergency ladder and mounted to a wall by a coupling device, in a collapsed position ready to be deployed, and

Fig. 7 illustrates the emergency ladder of Fig. 6 in a deployed extended position.

DETAILED DESCRIPTION OF THE INVENTION

[0021] Fig. 1 and 3 show a telescopic hang-on ladder including a set of ladder elements 1¹, 1², 1³ ... 1⁶ coupled to each other so that the sequential ladder elements are telescopically movable relative to each other in order respectively to extend and collapse the ladder. Each ladder section includes two parallel stringers 2¹ and 2² spaced apart from each other.

[0022] The cross-sectional profile of a stringer comprises a planar web 3, and both long edges of the web 3 comprise guide members, wherein the guide members of the stringer of each upper ladder element constitute a slide guide for the stringer of the adjacent lower ladder element. A step 4 extends between the stringers 2¹ and 2² substantially perpendicularly to the lengthwise direction of the stringers 2¹, 2² and is mounted from each end to the web 3 of the stringer.

[0023] The stringers 2¹, 2² of each ladder element are substantially fitted, for the most of their part, within the corresponding stringers of the adjacent upper ladder element. As shown best in Fig. 2, both of the long edges of the web 3 comprise a planar flange 5, 6 bent at an acute angle α relative to the plane of the web, wherein the flanges together with the web 3 constitute the guide members, so that each stringer of the upper ladder element constitutes a dovetail guide for of the lower ladder element fitted within said stringer. The stringers 2¹, 2² are preferably formed from a metal sheet by bending.

[0024] As shown in Fig. 3, each stringer 2¹, 2² comprises an elongated slot 7, the length of which determines the allowed movement range of the stringer of the lower ladder element fitted within said stringer.

[0025] Mounted to the upper end of a stringer is a projecting member 8 fitted to extend through the slot 7 of the upper stringer substantially not further than the level of the outer surface of the web 3, so that the lower end of the slot 7 constitutes a stop for the movement of the projecting member 8. As shown in Fig. 5, in the embodiment of the figures the projecting member 8 is a countersunk bolt 8 with the head part 9 disposed in the slot 7, the edges of the slot comprising a bevel 10, the bevel angle of which corresponds to the angle of the head part. At the same time, the countersunk bolt 8 is adapted, together with a nut 11 screwed thereto, to constitute a mounting member in order to mount a step 4 to the web 3 of the stringer.

[0026] As best shown in Fig. 4, both ends of a step 4 comprise a long hole 12. The nut 11 includes a transverse projection 13 extending through the long hole 12, so that in tightening the nut 11 the transverse projection 13 tightens against the end of the long hole 12. The nut 11 is a wing nut, the wings of which constitute the transverse projections 13. The step 4 has a cross-sectional profile of an upturned U-shape. Both of the U-branches 14 of the step 4 comprise a long hole 12, through which the wing of the wing nut extends. When the countersunk screw is tightened, the wings 13 of the wing nut 11 press

against the end of the long hole 12 and tighten the step 4 in place.

[0027] Fig. 6 and 7 show a deployable emergency ladder. The uppermost ladder element 1¹ of the ladder is adapted to be coupled to the wall of a building by a coupling device 15. The coupling device 15 includes a wall mounting 16 that is mountable to the wall of a building, and at least two folding arms 17, 18 pivotally mounted from one end to the wall mounting 16 and pivotally mounted from the other end to the uppermost ladder element 1¹, so that the folding arms 17, 18, the wall mounting 16 and the uppermost ladder element 1¹ constitute an articulated parallelogram mechanism. The path of movement of the articulated parallelogram mechanism is limited by stops so that the movement is stopped when the folding arms are disposed in the horizontal position. By the mechanism, the ladder is moveable between a storage position A close to the wall, as presented in Fig. 6, and a service position B spaced apart from the wall, as presented in Fig. 7. The ladder includes a releasable locking device 19 adapted to hold the ladder telescopically collapsed in the storage position A and, once the user has released the locking device, to deploy the ladder to the service position B and to extend telescopically.

[0028] The invention is not limited merely to the examples of its embodiments referred to above; instead, many variations are possible within the scope of the inventive idea defined by the claims.

Claims

1. A telescopic hang-on ladder including a set of ladder elements (1¹, 1², 1³, 1⁴...) coupled to each other so that the sequential ladder elements are telescopically movable relative to each other in order to extend and collapse the ladder, each ladder element including

- two parallel stringers (2¹, 2²) spaced apart from each other, the cross-sectional profile of a stringer comprising a planar web (3), and guide members on each of the long edges of the web, wherein the guide members of the stringer of each upper ladder element constitute a slide guide for the stringer of the adjacent lower ladder element, and

- a step (4) extending between the stringers substantially perpendicularly to the lengthwise direction of the stringers (2¹, 2²) and mounted from both ends to the web (3) of the stringer, **characterized in that** the stringers (2¹, 2²) of each ladder element are substantially fitted for the most of their part within the corresponding stringers of the adjacent upper ladder element; and that both of the long edges of the web (3) comprise a planar flange (5, 6) bent at an acute angle relative to the plane of the web, wherein

the flanges together with the web constitute said guide members so that each stringer of the upper ladder element constitutes a dovetail guide for the stringer of the lower ladder element fitted within said stringer.

2. The ladder according to claim 1, **characterized in that** the stringers (2¹, 2²) are formed from a metal sheet by bending.
3. The ladder according to claim 1 or 2, **characterized in that** a stringer (2¹, 2²) comprises an elongated slot (7), the length of which determines the allowed movement range of the stringer of the lower ladder element fitted within said stringer.
4. The ladder according to claim 3, **characterized in that** a projecting member (8) is mounted to the upper end of a stringer, wherein the projecting member is fitted to extend through the slot (7) of the upper stringer substantially not further than the level of outer surface of the web (3), so that the lower end of the slot constitutes a stop for the movement of the projecting member.
5. The ladder according to claim 3, **characterized in that** the projecting member (8) is a countersunk bolt (8), the head part (9) of which is disposed in the slot (7), and wherein the edges of the slot comprise a bevel (10), the bevel angle of which corresponds to the angle of the head part.
6. The ladder according to claim 5, **characterized in that** the countersunk bolt (8) is adapted together with a nut (11) screwed thereto to constitute a mounting member in order to mount a step (4) to the web (3) of a stringer.
7. The ladder according to claim 6, **characterized in that** both of the ends of a step (4) comprise at least one long hole (12); and that the nut (11) includes at least one transverse projection (13) extending through the long hole (12) so that in tightening the nut (11) the transverse projection (13) tightens against one end of the long hole.
8. The ladder according to claim 7, **characterized in that** the nut (11) is a wing nut, the wings of which constitute said transverse projections (13); and that the step (4) has a cross-sectional profile of an up-turned U-shape, wherein both of the U-branches (14) of the step comprise said long hole (12) through which the wing of the wing nut extends.
9. The ladder according to any one of claims 1 to 8, **characterized in that** the uppermost ladder element of the ladder is adapted to be coupled to the wall of a building by a coupling device (15).

10. The ladder according to any one of claims 1 to 8,
characterized in that the coupling device (15) in-
cludes a wall mounting (16) that is mountable to the
wall of a building, and at least two folding arms (17,
18) pivotally mounted from one end to the wall 5
mounting and pivotally mounted from the other end
to the uppermost ladder element, so that the folding
arms constitute an articulated parallelogram mech-
anism by which the ladder is moveable between a
storage position (A) close to the wall and a service 10
position (B) spaced apart from the wall; and that the
ladder includes a releasable locking device (19)
adapted to hold the ladder telescopically collapsed
in the storage position (A), and, once the user has 15
released the locking device, to deploy the ladder to
the service position (B) and to extend telescopically.
11. The ladder according to any one of claims 1 to 10,
characterized in that the ladder is a deployable
emergency ladder. 20

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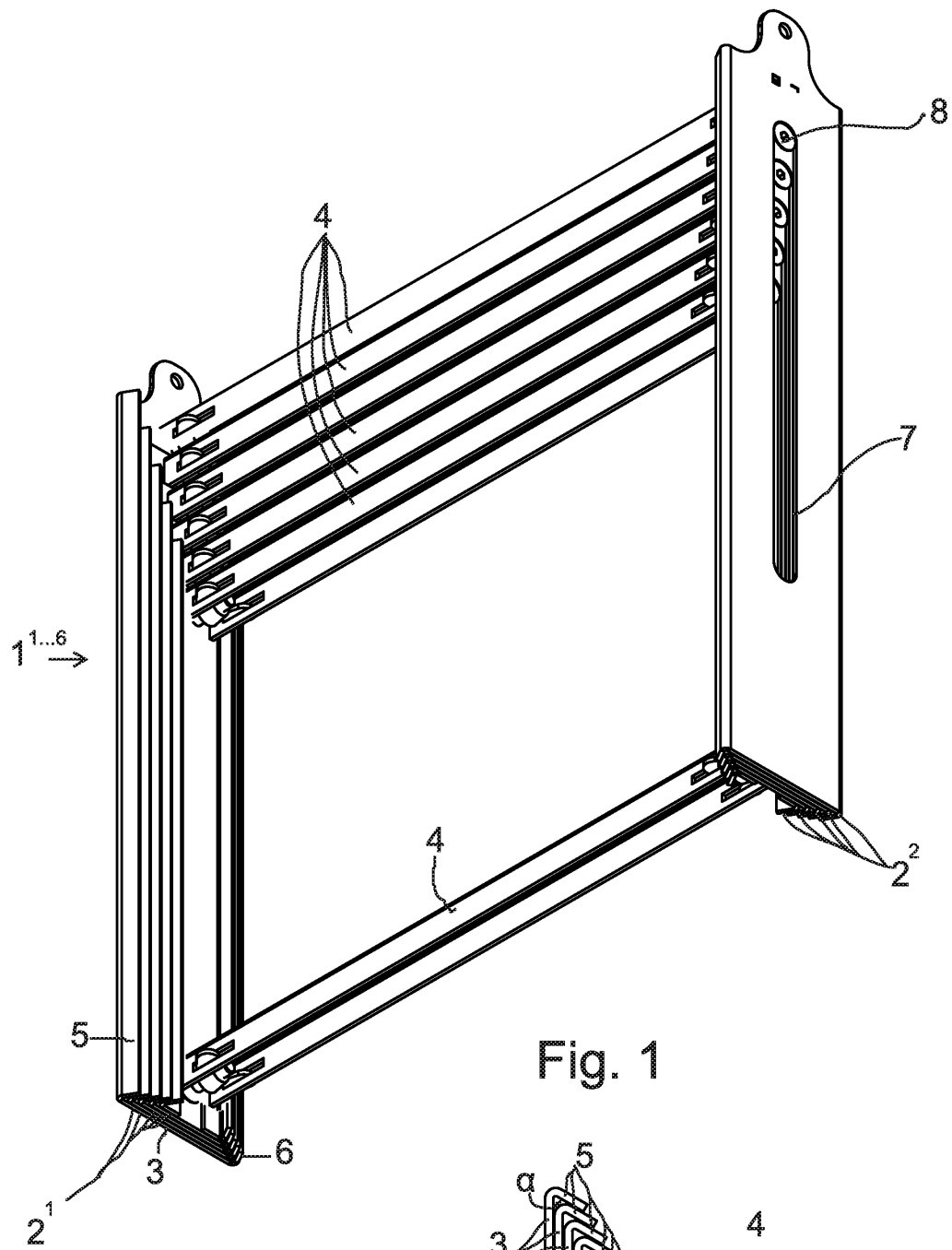


Fig. 1

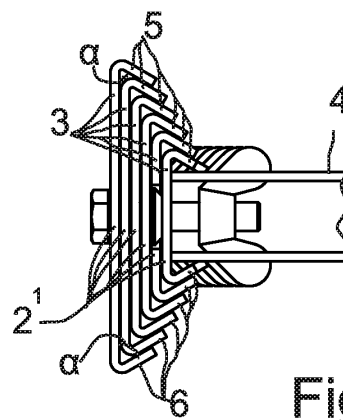


Fig. 2

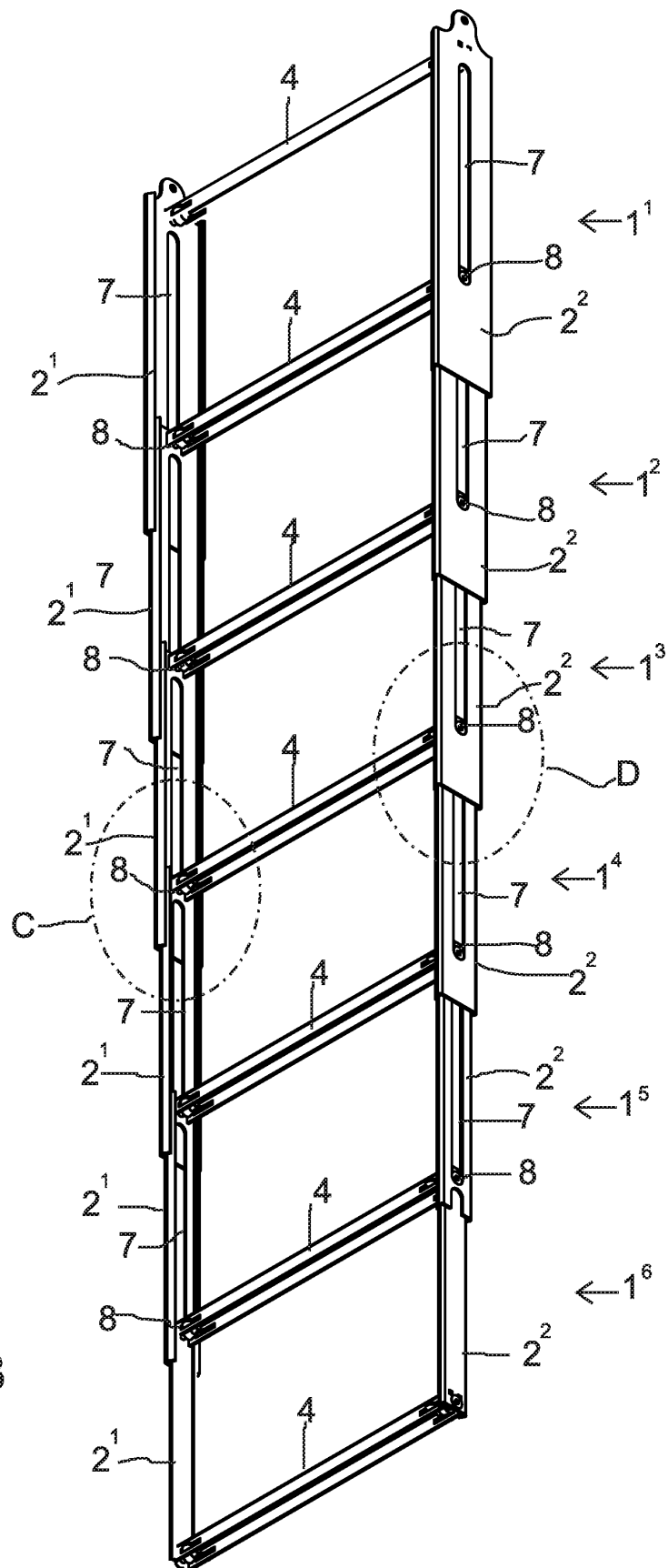


Fig. 3

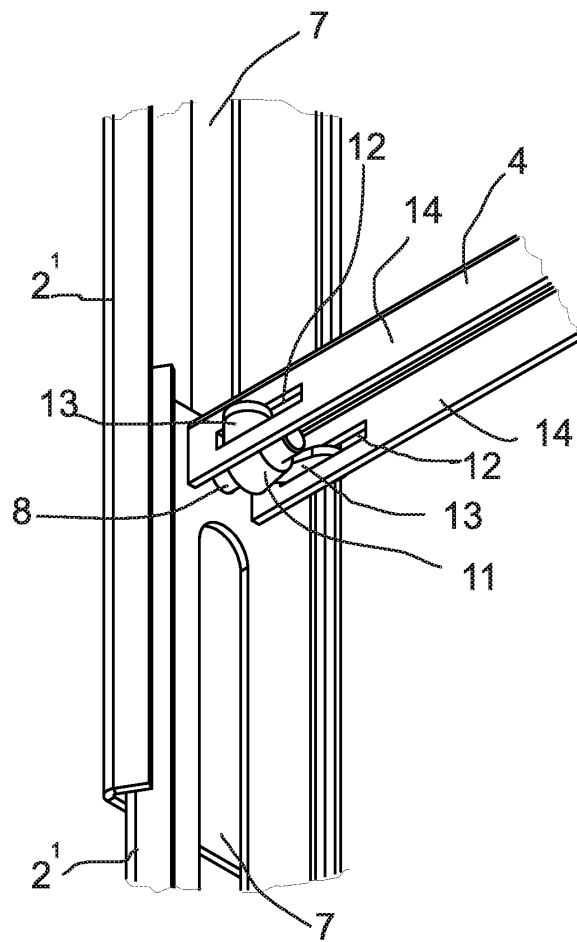


Fig. 4

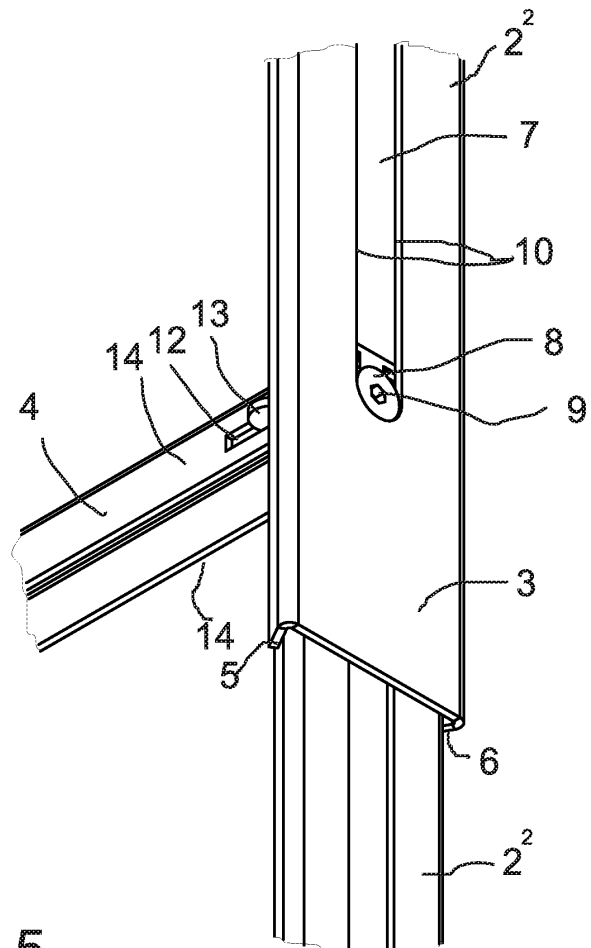


Fig. 5

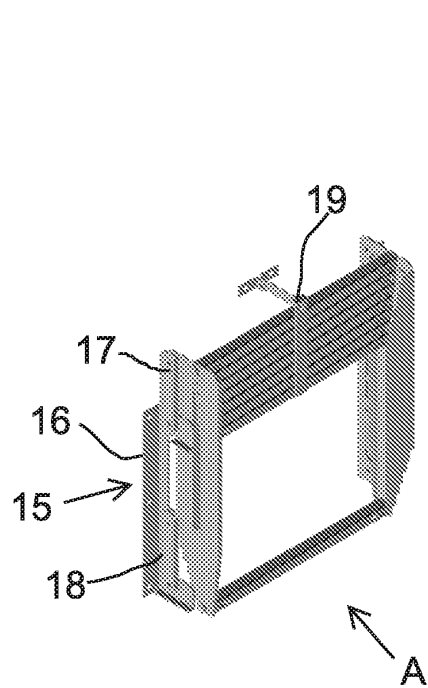


Fig. 6

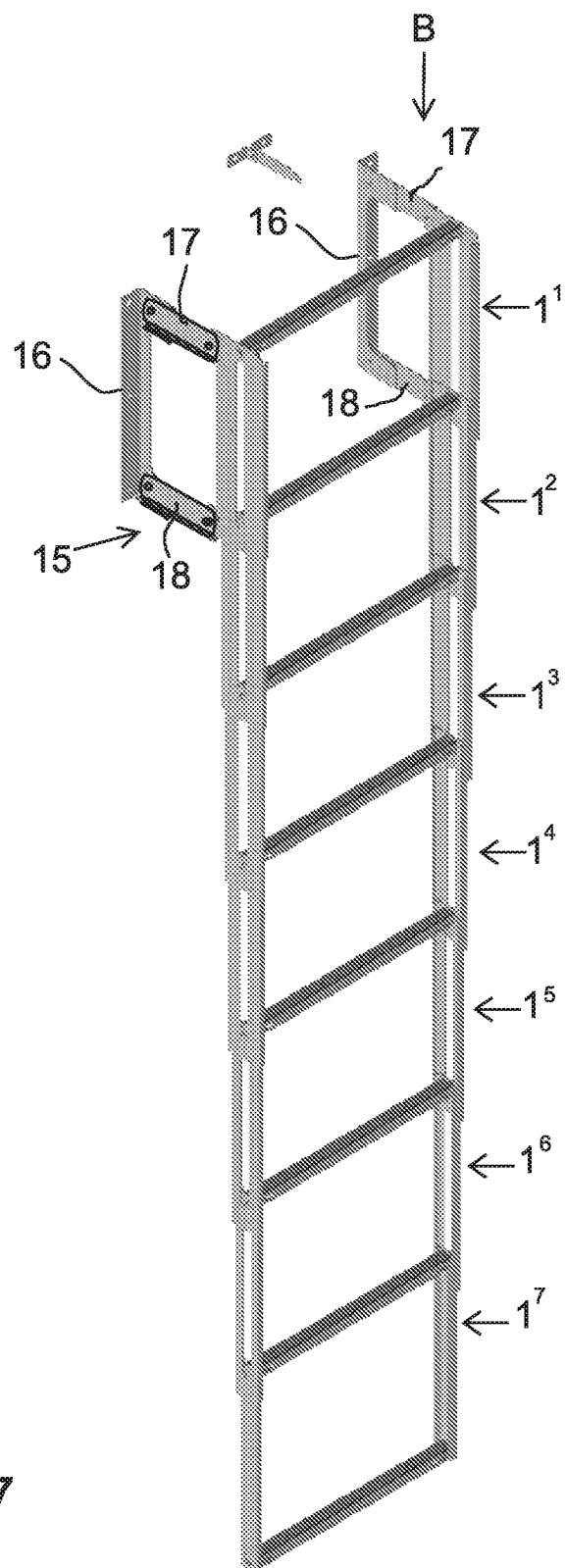


Fig. 7

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1777358 A2 [0002]
- US 3997026 A [0003]