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(72) Inventor: **LAMPE, Caspar Bernard**
1118 CR LUCHTHAVEN SCHIPHOL (NL)

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(74) Representative: **EP&C**
P.O. Box 3241
2280 GE Rijswijk (NL)

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(71) Applicant: **Lampe Holding B.V.**
1118 CR Luchthaven Schiphol (NL)

(54) **A TELESCOPIC LADDER ASSEMBLY**

(57) A telescopically extendable and collapsible ladder assembly having at least three ladder sections with two tubular stile members arranged parallel to each other and interconnected at one end by a ladder rung to form a U-shaped ladder section.

The ladder assembly comprises latch mechanisms being associated with actuators for locking the telescopically inserted stile members relative to one another when the ladder sections are extended.

Each ladder section includes a connector at each end of a rung, the connector having first and second collar segments with spaced apart opposed ends. A fastener bridges the opposed ends of the collar segments for securely coupling the collar segments around the stile member. The first collar segment extends over an angle of between 120 and 150 degrees with respect to the longitudinal axis of the rung, whereas the second collar segment extends over a complementary angle.

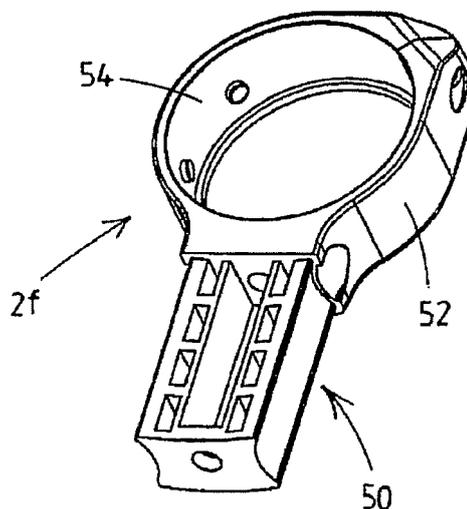


Fig. 9A

Description

[0001] The present invention relates to a telescopically extendable and collapsible ladder assembly having at least three ladder sections, each of said ladder sections having two tubular stile members arranged parallel to each other and interconnected at one end by a ladder rung to form a U-shaped ladder section; the stile members of each ladder section being telescopically inserted into the stile members of an adjacent ladder section. The ladder assembly further comprises automatic latch mechanisms for locking the telescopically inserted stile members relative to one another when the ladder sections are extended, the latch mechanisms being associated with one or more actuators for unlocking the stile members in order to allow for collapsing of the ladder assembly.

[0002] These ladder assemblies have become quite popular as portable ladders, such as a straight telescopic ladder or a step ladder, but also for stationary mounting, such as a loft ladder providing access to a loft.

[0003] Prior art designs of such ladder assemblies have already been disclosed as early as 1929 in the US patent 1712942 (Smith). More recent designs are disclosed in EP 527 766, EP 1 402 143, GB 2263932 (Tel-esteps), WO2004/013445 (Core Distribution), US 5743355 (McDonnell), US 5738186 (Foxdale).

[0004] The prior art designs have details that are not satisfactory, either with regard to their construction and/or their practical use. Therefore the present invention aims to propose measures that allow for improvements. These measures can either be applied alone or in combination. In a most preferred embodiment of the invention all measures are applied in a ladder assembly to obtain an optimum result.

[0005] The present invention relates to a ladder assembly according to the preamble of claim 1.

[0006] In EP 1 402 143, upon which the preamble of claim 1 is based, each ladder section includes a connector at each end of a rung, the connector having a rung portion connected to the end of the rung and having a front and a rear collar segment, each integral at one end thereof with the rung portion, the two collar segments substantially encircling the stile member, the collar segments having spaced apart opposed ends, a fastener assembly being provided bridging the opposed ends of the collar segments for rigidly coupling the collar segments around the stile member. As can be seen in figures 11, 12 of said EP 1 402 143 document the opposed ends lie along the longitudinal axis of the rung. The ends have a lateral protruding boss to accommodate the bolt and nut which pull the ends towards one another in order to fix the collar around the stile member. This lateral protruding boss is awkward, in particular in view of storage of the ladder, e.g. in a small cabinet or in a van.

[0007] In WO2007/079379 a different design of connector is shown which has two pieces. The one piece is connected to the rung and includes a half of the collar.

The other piece is a collar half, that is fastened by two bolts on the other piece. The dividing plane (where the ends of the collar halves meet) lies at right angles to the longitudinal axis of the rung. This solution is complex and unsatisfactory as two bolts are used to clamp the collar on the stile member.

[0008] The invention aims to provide a telescopic ladder assembly according to the preamble of claim 1, having an improved design with respect to ladder manufacturing and handling of the ladder.

[0009] This object is achieved by a ladder assembly according to the preamble of claim 1, which is characterized in that the first collar segment extends over an angle of between 120 and 150 degrees, more preferably between 130 and 140 degrees, with respect to the longitudinal axis of the rung, whereas the second collar segment extends over a complementary angle.

[0010] It has been found that this position of the "split" of the collar has the effect of effective clamping of the collar onto the stile.

[0011] Preferably the outer face of the collar segments at the opposed ends thereof form a substantially triangular protrusion with respect to adjacent portions of the outer face of the collar segments. It is noted that this design can be used advantageously for the telescopic ladders wherein the actuators are located in close proximity to the stile member.

[0012] In an embodiment the first collar segment is the front collar segment and the second collar segment is the rear collar segment.

[0013] In a highly preferred embodiment a telescopic ladder assembly, e.g. a straight ladder, has automatic latch mechanisms (e.g. at each end of a rung) with one or more associated manually operable actuators for unlocking the stile members in order to allow for collapsing of the ladder assembly, wherein these one or more actuators are arranged centrally on a ladder rung (preferably on the front) and are operable simultaneously with a single hand of the user. It has been found that a damper allows to obtain a very controlled motion of the ladder section upon collapse of the ladder. The user can now operate the one or more actuators simultaneously with one hand and use - at the same time - his other hand to guide the descending ladder section and/or stabilize the ladder during this operation. This allows for safe and gentle handling of the ladder during collapse, and avoids fast motions and undesirable impacts of the descending ladder sections as can be observed in known telescopic ladders.

[0014] In EP 1 402 143 it is disclosed to mount the actuators at the front of the rung and in close proximity to the stile members so that each actuator is manually and individually operable by a user holding his hands around the stile members, in particular around the connectors at the upper end of the stile members. This prior art design thus requires the user to hold both his hands around the ladder stiles during the collapse of the ladder. It is alleged that this design increases safety for the user

with regard of a user's hand being seized between two rungs upon collapse of a ladder. Whilst that may be correct from said perspective, this arrangement does not take into account the fact that in many situations the user also needs to stabilize the ladder so it does not sway or hit against something during the collapse.

[0015] In an embodiment the actuators are arranged centrally on the front side of the rung so as to be operable simultaneously with a single hand, wherein the front wall of the rung has an elongated recessed portion over the length thereof and the actuators are arranged in said recessed portion, each actuator having a rear extension, extending through a slot in said front wall into the interior of the rung, each of said rear extensions being connected to an operating rod which extends inside said rung to the latch mechanism at the outer end of the rung.

[0016] Preferably the actuators are slidable actuators, sliding within the recessed portion of the front wall.

[0017] Arranging the, preferably slidable, actuators in the elongated recessed portion has the advantage that the actuators are generally protected from the feet of a person on the ladder, yet can have a suitable thickness to be operated by a single hand, e.g. by thumb and index finger.

[0018] The slots or single contiguous slot in the front wall are preferably located in the recessed portion of the front wall.

[0019] Preferably the actuators are effectively arranged at a mutual distance of less than 10 centimetres to facilitate single handed operation.

[0020] Preferably the actuators protrude at the front of the rung at most 10 mm from the rung, preferably at most 5 millimetres, more preferably between 1 and 4 millimetres. As mentioned above the location of these actuators in the elongated recessed portion of the front wall provides protection for the actuators. Yet it has been found that "some forward protrusion" of these centrally located actuators cause the effect that the actuators provide additional grip for a hand grasping around the central portion of the rung. In practice the actuators will fall in the palm of the hand and so provide additional grip.

[0021] Commonly the ladder rungs are made from an extruded aluminium tubular profile, the profile including a top wall, a bottom wall, as well as a front and a rear wall extending between the top wall and the bottom wall.

[0022] In an embodiment a telescopic ladder assembly is provided with a rung wherein the front wall and the rear wall of the rung each have an elongated recessed portion over the length thereof, the recessed portion having a height of preferably between 15 and 25 millimetres, the recessed portion having a depth of at least 2 millimetres.

[0023] The provision of recessed portions in the front and rear wall give the rung an enhanced stability, allowing in particular the provision of one or more holes or slots in said recessed wall portion in the central region of the rung for the mounting of one or more actuators associated with the latch mechanisms.

[0024] In a preferred embodiment of the rung the top

wall is in cross section upwardly convex, and the bottom wall is in cross section upwardly concave, preferably of substantially identical curvature.

[0025] It is preferred that the front wall and the rear wall are symmetrical.

[0026] It will be appreciate that the aspects of the invention can be applied both alone and in various combinations in a ladder assembly. It is envisaged that application of all aspects in a ladder assembly provides the optimum result.

[0027] The invention will now be explained in more detail under referral to the appended drawings. In the drawings:

Fig. 1 shows in side view a straight telescopic ladder in collapsed condition,

Fig. 2 shows the ladder of figure 1 in plan view,

Fig. 3 shows in cross-section a rung of a ladder,

Fig. 4 shows two rungs stacked against one another,

Fig. 5. shows a perspective view of a portion of a ladder with a rung as in figure 3 and with slidable actuators,

Fig. 6 shows the rung of figures 3 and 5 with the slidable actuator,

Figs. 7a-c show the slidable actuator,

Fig. 8 shows a hand gripping a central portion of the rung of figure 5, and

Figs. 9a-d show a connector of a ladder assembly according to the invention.

[0028] Figures 1 and 2 show an example of a ladder assembly, here embodied as a straight telescopic ladder 1. As explained above the ladder assembly may also be part of another "ladder product" such as a stepladder or combination ladder, a work platform with ladder like telescopic legs, etc.

[0029] The ladder 1 includes a lowermost ladder section 2 having two tubular stile members 2a, b which are arranged parallel to each other. Each stile member 2a, b of the lowermost ladder section 2 here is provided with a ground engaging foot member 2c (e.g. of rubber or the like).

[0030] The stile members 2a, b are interconnected at their upper ends by a ladder rung 2d and in this example (as is preferred) also by a lowermost ladder rung 2e.

[0031] The ladder 1 further comprises at least two additional ladder sections; here seven additional ladder sections 3-9. These ladder sections 3-9 each have two tubular stile members arranged parallel to each other and interconnected at the upper end by a ladder rung to form a U-shaped ladder section. The stile members of each ladder section are telescopically inserted into the stile members of a lower and adjacent ladder section.

[0032] The ladder 1 further comprising automatic latch mechanisms (as will be explained by example in more detail below) for locking the telescopically inserted stile members relative to one another when the ladder sections are extended, the latch mechanisms being associ-

ated with actuators for unlocking the stile members in order to allow for collapsing or retracting of the ladder assembly.

[0033] As can be seen in figure 1 these actuators are manually operated actuators, indicated with reference numeral 10 in figure 1, The actuators 10 are the slidable actuators and are arranged centrally on the front side of the rung 2d so as to be operable simultaneously with a single hand.

[0034] The rungs 2d-9d are connected to the associated stile members 2a, b via connectors 2f, g of which preferred embodiments will be illustrated with reference to figures 9a-d.

[0035] Referring to figures 3-9 now further aspects and preferred details of the ladder assembly according to the invention will now be explained.

[0036] Figures 3, 4, 6 show a preferred design of a rung for a telescopic ladder, which is preferably incorporated in a ladder according to the invention.

[0037] Here the rung is considered to be any of the rungs of the ladder 1 of figure 1, so that reference numeral 2d is used here.

[0038] The rung 2d is made from an extruded aluminium tubular profile, the profile including a top wall 41, a bottom wall 42, as well as a front wall 43 and a rear wall 44 extending between the top wall and the bottom wall. The front wall 41 here corresponds to the side on which the slidable actuators 10 are mounted. As can be seen in figure 1 the slidable actuators 10 are arranged on the front side of the rung.

[0039] As is preferred the top wall 41 is in cross section upwardly convex, whereas the bottom wall 42 is in cross section upwardly concave. As is preferred the curvature is identical so that in a design of the ladder wherein the rungs contact one another in collapsed state of the ladder (as is preferred) the top wall and bottom wall are in close contact (see figure 4). This provides stability of the ladder in said collapsed condition and avoids items entering in the space between the rungs.

[0040] The front wall has an elongated recessed portion 43a extending over the entire length thereof. This recessed portion is offset inwardly with respect to the above and below located edge portions 43b, c of the front wall 43. The rear wall has a similar recessed portion 44a.

[0041] As is also preferred (especially for manufacturing reasons) the front wall and rear wall are symmetrical. These recessed portions extend over a substantial portion of the height of the respective front and rear wall, preferably over at least 15 millimetres, more preferably between 15 and 25 millimetres. The depth may vary, and lies preferably between 3 and 6 millimetres. The rungs have a great stability, even when weakened by one or more holes or slots in a central region of the rung to accommodate one or more actuators for the latch mechanisms.

[0042] The upper surface of the top wall of the rung is preferably provided with a pattern of axial grooves/ribs to avoid slipping of the feet of a person climbing the lad-

der.

[0043] As can be seen in figures 1, 5, 6 and 8 the slidable actuators 10 are arranged in said recessed portion 43a.

5 **[0044]** As shown in figures 1, 5, 8 the slidable actuators 10 here are arranged centrally on the front side of the rung 2d -9d so as to be operable simultaneously with a single hand.

[0045] In this example each rung 2d is provided with two slots in the recessed portion 43a and each actuator 10 has a rear extension portion 11, which extends through a slot into the interior of the rung (see figure 6).

[0046] As is preferred each of said rear extension portions 11 is connected to an operating rod (partly shown in figure 9b with reference numeral 60) which extends inside said rung to the latch mechanism (not shown) at the outer end of the rung.

[0047] As is preferred the slidable actuators 10 are not fully hidden within the recess, but protrude at the front of the rung at most 10 mm from the front side of the rung, preferably at most 5 millimetres, more preferably between 1 and 4 millimetres. This is depicted in figure 6 showing a forward protrusion of 2 mm.

[0048] By being hidden for a major part within the recess it is avoided that the actuators 10 are damaged by the feet of someone climbing or descending the ladder and/or during storage and transportation.

[0049] As is also preferred the manual slide actuators 10 are spaced apart at most 15 centimetres, more preferably at most 10 centimetres. This allows for easy single hand operation of both actuators 10 in a central portion of the rung, so that the operator or ladder user can use his or hers other hand for other purposes, e.g. holding the ladder stable by grabbing the ladder at a higher location than the actuators 10 to be operated for release of a ladder section.

[0050] In combination with some "forward protrusion" these actuators then add to the grip that a person may have on a ladder rung when the person holds a hand centrally around the rung as is shown in figure 8. This is a normal routine for persons climbing and descending a ladder and any additional grip is useful.

[0051] For ergonomic reasons the slidable actuators 10 preferably have a height of at least 10 millimetres, preferably between 15 and 25 millimetres.

[0052] As is shown in figures 6, 7a-d the rear extension portions 11 of the actuators 10 preferably include a snap provision adapted to snap around the rod. This facilitates the assembly process of the ladder assembly.

50 **[0053]** Referring to figures 9a-d now the invention will be explained in more detail.

[0054] The figures 9a-d show a connector, here connector 2f, which connects a rung (such as rung 2d) at an end thereof to the upper end of a stile member (here 2a). It is noted that preferably all connectors of a ladder assembly are of generally the same design, albeit with dimensions adapted to the diameter of the stile member (as is shown in figure 1 and common for this field).

[0055] The connector 2f has a body (here of a unitary plastic design) having a rung portion 50, which is here -as is preferred - adapted to be inserted into the end of the rung and be fastened therein (e.g. by press fit or otherwise). The connector body further includes a first or front collar segment 52 and a second or rear collar segment 54, these segments 52, 54 each being integral at one end thereof with the rung portion 50.

[0056] The two collar segments 52, 54 substantially encircle the stile member. The collar segments 52, 54 have slightly spaced apart opposed ends and a fastener assembly is provided bridging the opposed ends of the collar segments for rigidly coupling the collar segments around the stile member.

[0057] According to the invention the first collar segment 52 extends over angle of between 120 and 150 degrees, more preferably between 130 and 140 degrees, with respect to the longitudinal axis 55 of the rung, whereas the second collar segment 54 extends over a complementary angle. In figures 9a-d the first collar segment extends over 135 degrees which is preferred. The opposed ends of the collar segments are provided with a bore 56 through which a screw or bolt is fitted (not shown), the bore e.g. having at one end a recess for a bolt head and a nut being recessed in the opposed collar segment end.

[0058] As is highly preferred the outer face of the collar segments 52, 54 - at the opposed ends thereof - form a substantially triangular protrusion 57 with respect to adjacent portions of the outer face of the collar segments (as can be seen in figures 9a,b). This protrusion 57 provides a body portion for accommodation of a fastener, such as a screw or a bolt, in a manner which is not laterally extending as with the Telesteps ladders. It has been found that this orientation of the split between the collar segments allows easy and accurate tensioning of the collar around the stile, better than the known 180 degrees design and better and easier than the mentioned 90 degrees design of Core Distribution.

[0059] The body of the connector preferably is made of plastic material, preferably as a unitary body by injection moulding, preferably of fibre reinforced plastic material.

[0060] The skilled person will appreciate that the body of the connector here includes a passage 58 for a locking pin 60 (which can form an extension of or be connected to the mentioned rod attached to the slide actuators 10) and allows to accommodate a spring 61 for biasing said locking pin 60 towards a locked position (commonly the stile member having an associated locking pin opening to receive said locking pin in extended state of the ladder section).

[0061] It will be appreciated that the invention may be applied in combination with telescopic ladder assemblies having actuators in close proximity to the ladder stile members, e.g. manual operated or automatic as in EP 527 766.

[0062] As is preferred - and known in the art - the au-

tomatic latch mechanisms of the inventive ladder each include a locking pin having a length which is sufficient for extending through a locking hole of the ladder section positioned there above and into the hollow space inside the stile member and the stile member having an extension below the locking hole, so that when an upper ladder section is released and telescopically inserted into an intermediate ladder section, which is locked in relation to a lower ladder section by the locking pin of the lower ladder section engaging the locking hole of the intermediate ladder section, the upper ladder section being stopped in a safety position from being fully inserted in the intermediate ladder section, by a safe distance, e.g. between 3 and 10 cm, by engagement of the extension of the lower ends of the stile members of the upper ladder section with the locking pins of the lower ladder section extending through the locking holes into the hollow space of the stile members of the intermediate ladder section.

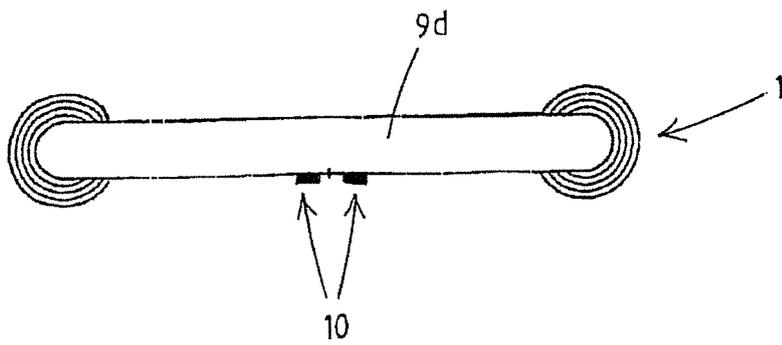
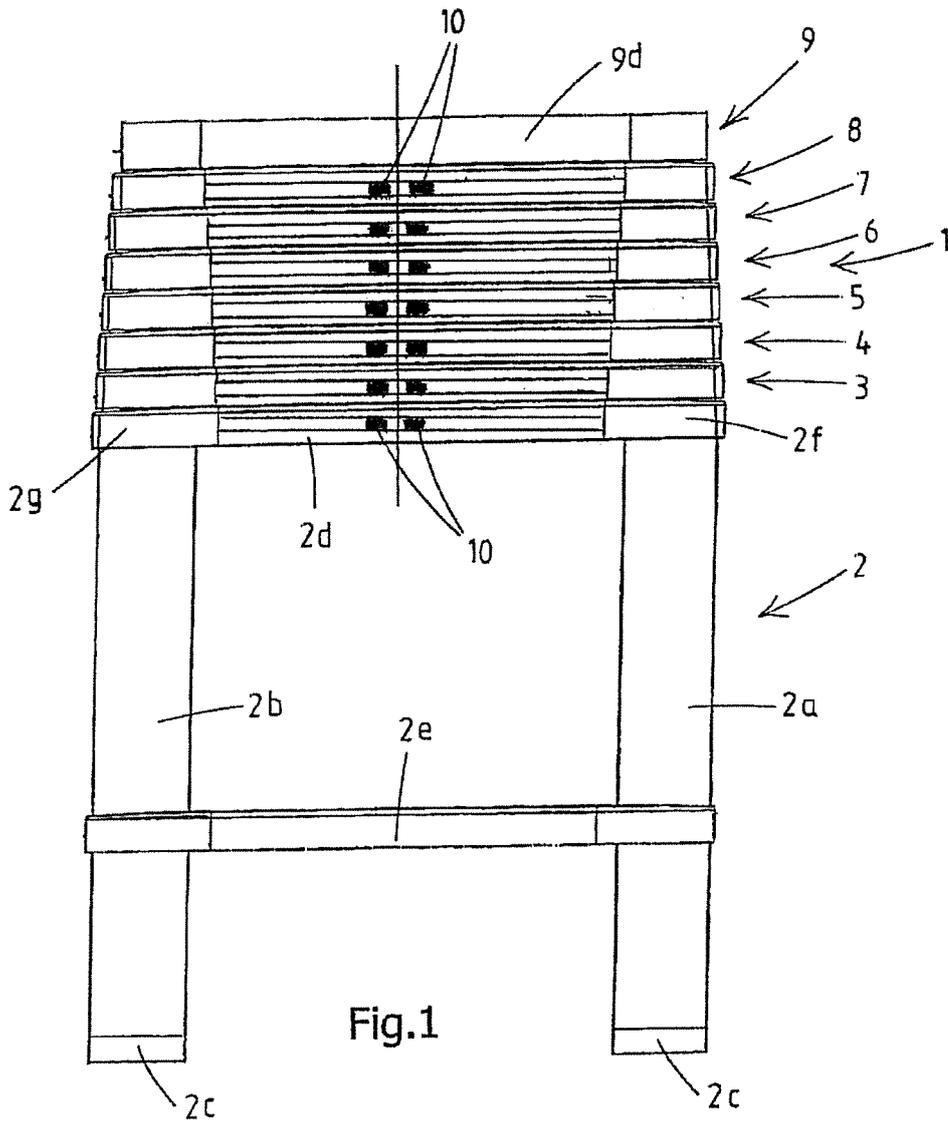
Claims

1. A telescopically extendable and collapsible ladder assembly (1) having at least three ladder sections (2-9), each of said ladder sections having two tubular stile members (2a, 2b) arranged parallel to each other and interconnected at one end by a ladder rung (2d, 9d) to form a U-shaped ladder section; the stile members of each ladder section being telescopically inserted into the stile members of an adjacent ladder section, the ladder assembly further comprising automatic latch mechanisms (60,61) for locking the telescopically inserted stile members relative to one another when the ladder sections are extended, the latch mechanisms being associated with one or more actuators (10) for unlocking the stile members in order to allow for collapsing of the ladder assembly, wherein each ladder section includes a connector (2f) at each end of a rung, the connector having a rung portion connected to the end of the rung and having a first and a second collar segment, each integral at one end thereof with the rung portion, the two collar segments substantially encircling the stile member, the collar segments having spaced apart opposed ends, a fastener being provided bridging the opposed ends of the collar segments for securely coupling the collar segments around the stile member,

characterized in that

the first collar segment (52) extends over an angle of between 120 and 150 degrees with respect to the longitudinal axis of the rung (2d), whereas the second collar segment (54) extends over a complementary angle.
2. Ladder assembly according to claim 1, wherein the first collar segment (52) extends over an angle of

- between 130 and 140 degrees with respect to the longitudinal axis of the rung (2d).
3. Ladder assembly according to claim 1 or 2, wherein the outer face of the collar segments at the opposed ends thereof form a substantially triangular protrusion (57) with respect to adjacent portions of the outer face of the collar segments. 5
 4. Ladder assembly according to claim 3, wherein the opposed ends of the collar segments are provided with a bore (56) through which a fastener is fitted. 10
 5. Ladder assembly according to one or more of the preceding claims, wherein the one or more actuators (10) associated with the latch mechanisms are arranged centrally on a ladder rung and are operable simultaneously with a single hand of the user. 15
 6. Ladder assembly according to one or more of the preceding claims, wherein the actuators (10) are arranged on a front side of the rung. 20
 7. Ladder assembly according to one or more of the preceding claims, wherein the connector has a unitary body made of plastic material. 25
 8. Ladder assembly according to one or more of the preceding claims, wherein a front wall (43) of the rung has an elongated recessed portion (43a) over the length thereof and the one or more actuators (10) are arranged in said recessed portion, and wherein each actuator (10) extends through a slot in said front wall into the interior of the rung, each of said actuators being connected to a operating rod which extends inside said rung to the latch mechanism (60, 61) at the outer end of the rung. 30
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 9. Ladder assembly according to claim 8, wherein the one or more actuators protrude at the front of the rung at most 10 mm from the rung, preferably at most 5 millimetres, more preferably between 1 and 4 millimetres. 40
 10. Ladder assembly according to claim 8, wherein the one or more actuators have a height of at least 10 millimetres, preferably between 15 and 25 millimetres. 45
 11. Ladder assembly according to one or more of the preceding claims, wherein the ladder rungs (2d,9d) are made from an extruded aluminium tubular profile, the profile including a top wall, a bottom wall, as well as a front and a rear wall extending between the top wall and the bottom wall. 50
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 12. Ladder assembly according to one or more of the preceding claims, wherein the rung has a top wall is in cross section upwardly convex, whereas the bottom wall is in cross section upwardly concave.
 13. Ladder assembly according to claim 8, wherein the actuators are slidable actuators and each have a rear extension which includes a snap provision adapted to snap around the rod.
 14. Ladder assembly according to claim 11, wherein the front wall (43) and the rear wall (44) of the rung each have an elongated recessed portion (43a, 44a) over the length thereof, the recessed portion having a height of preferably between 15 and 25 millimetres, the recessed portion having a depth of at least 2 millimetres.



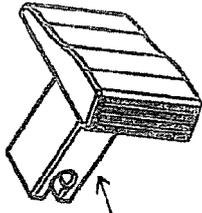


Fig. 7A

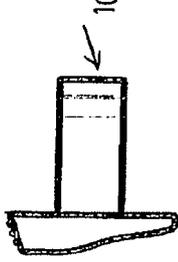


Fig. 7C

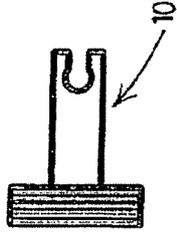


Fig. 7B

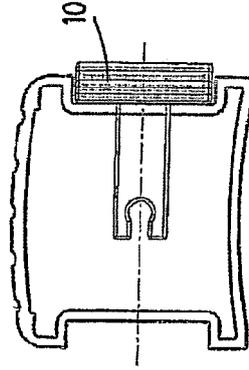


Fig. 6

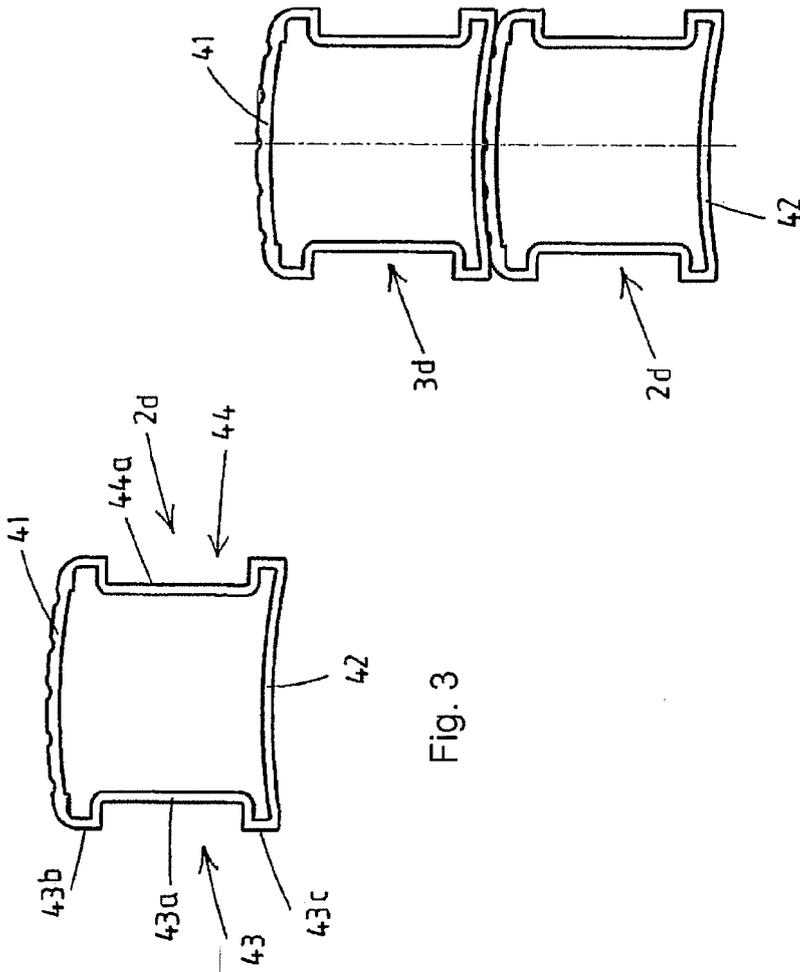
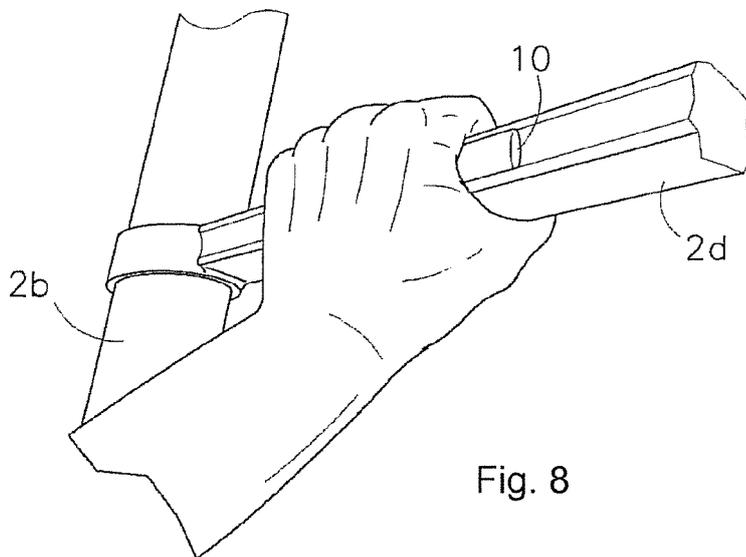
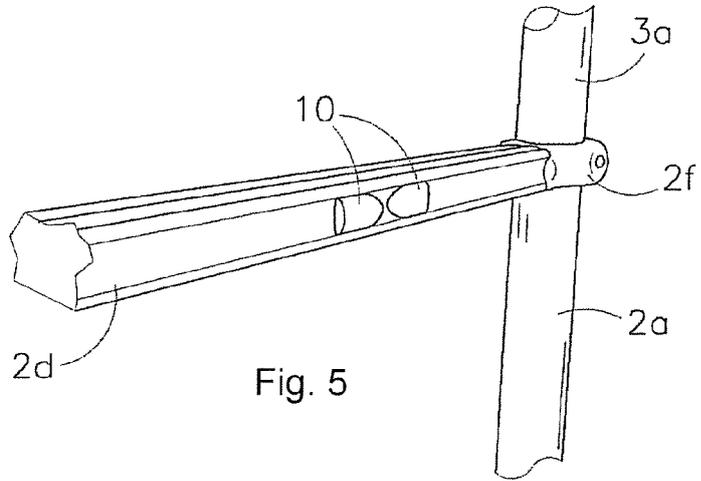


Fig. 3

Fig. 4





EUROPEAN SEARCH REPORT

Application Number
EP 15 18 8391

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Y	* figures 1,4-6 * * paragraphs [0021], [0026], [0027] *	1-6, 8-11,13, 14	
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			TECHNICAL FIELDS SEARCHED (IPC)
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CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons	
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EPO FORM 1503 03.02 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT
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