Title: A TELESCOPIC LADDER ASSEMBLY

Abstract: 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 actuators for unlocking the stile members in order to allow for collapsing of the ladder assembly.
A TELESCOPIC LADDER ASSEMBLY.

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 of each ladder section being associated with one or more actuators for unlocking the stile members in order to allow for collapsing of the ladder assembly.

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.

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 (Telesteps), WO2004/013445 (Core Distribution), US 5743355 (McDonnell), US 5738186 (Foxdale).

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.

A first aspect of the invention relates to the issue of retardation of gravity-induced velocity of one or more sections of the ladder assembly. As is explained in some detail in US5743355 a telescopic ladder assembly may suffer from the problem of an undesirable velocity of the ladder section or sections in motion, either during collapse (as the ladder sections of straight ladder or stepladder are lowered) and/or during extension (e.g. in a loft ladder arrangement).
In US5743355 it is proposed to provide "air dampers" which provide that upon collapse of the ladder the air has to flow through an orifice in the air damper. This solution has been found to be unpractical.

The first aspect of the invention provides a ladder assembly according to the preamble of claim 1, which is characterized in that the damper members are friction damper members providing retardation on the basis for surface friction with the inside of the stile member of the adjacent ladder section, and in that the damper members of respective ladder sections provide a differing surface friction resistance in order to compensate for the total weight of the ladder sections to be retarded.

It will be understood that upon collapse of a ladder the relatively lightweight upper ladder section only requires minimal or possible no damping, whereas ladder sections located lower down are preferably provided with friction dampers providing an ever increasing surface friction resistance.

In a preferred embodiment the damper members on one ladder section are made from a material having a different modulus of elasticity than the dampers members on another ladder section in order to arrive at different surface friction resistances of these sets of dampers when compared to one another. These materials are preferably plastic materials, most preferably injection-moulded to form the damper members.

In a practical design the damper members are made of a fibre reinforced plastic material, and the difference in modulus of elasticity is obtained by adaptation of the percentage and/or composition of the fibre material. For example a glass filled composite plastic is used, the lower lying damper members having a higher percentage of glass than damper members of higher located ladder sections.

In a highly preferred embodiment a telescopic ladder assembly, e.g. a straight ladder, according to the first aspect of the invention 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 the proposed dampers allow 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 _ladder during collapse, and avoids fast motions and undesirable impacts of the descending ladder sections as can be observed in known telescopic ladders.

A second aspect of the present invention relates to a ladder assembly according to the preamble of claim 7.

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.

The second aspect of the present invention aims to provide an improved telescopic ladder assembly that allows the user to employ a single hand for actuating the manually operable actuators and use his other hand for other purposes, e.g. grip the ladder at a higher up position to keep it stable and/or guide a ladder section during its descend.

The second aspect of the present invention achieves this aim by providing a telescopic ladder assembly according to claim 7, which is characterized in that the actuators are arranged centrally on the front side of the rung so as to be operable simultaneously with a single hand, in that the front wall of the rung has an elongated recessed portion over the length thereof and the actuators being 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.

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

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
finger.

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

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

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.

A third aspect of the present invention relates to a ladder assembly according to the
preamble of claim 13.

In EP 1 402 143, upon which the preamble of claim 13 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.

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.
The third aspect of the invention aims to provide a telescopic ladder assembly according to the preamble of claim 13, having an improved design with respect to ladder manufacturing and handling of the ladder.

This object is achieved by a ladder assembly according to the preamble of claim 13, which is characterized in that the front 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 rear collar segment extends over a complementary angle.

It has been found that this position of the "split" of the collar has the effect of effective clamping of the collar onto the style.

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.

A fourth aspect of the invention relates to the design of a rung of a telescopic ladder assembly. 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.

According to the fourth aspect of the invention, a telescopic ladder assembly is provided as in claim 16 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.

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.

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

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.

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 according to the invention in collapsed condition,

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

Fig. 3a shows in exploded view a stile member and a friction damper of a ladder assembly according to the invention,

Fig. 3b shows the friction damper from a different angle,

Fig. 4 shows in cross-section a rung of a ladder according to the invention,

Fig. 5 shows two rungs stacked against one another,

Fig. 6. shows a perspective view of a portion of a ladder with a rung as in figure 4 and with slidable actuators,

Fig. 7 shows the rung of figures 4 and 6 with the slidable actuator,

Figs. 8a-c show the slidable actuator,

Fig. 9 shows a hand gripping a central portion of the rung of figure 6, and

Figs. 10a-d show a connector of a ladder assembly according to the invention.

Figures 1 and 2 show an example of a ladder assembly according to the invention, 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.

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).

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.
The ladder further comprises at least two additional ladder sections 3-9. These ladder sections 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.

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

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.

The rungs 2d-9d are connected to the associated stile members 2a, b via connectors 2f, g d which preferred embodiments will be illustrated with reference to figures 10a-d.

As explained an issue related to telescopic ladders, such as ladder 1, is the velocity of the telescopic section when the ladder is collapsed (or extended when used as a loft ladder or the like). In order to retard said velocity multiple of the ladder sections are preferably provided with damper members that provide retardation of gravity induced velocity of the ladder section upon collapse and/or extension of the ladder section, each damper member being mounted on a stile member so as to engage on the inside of the stile member of the adjacent ladder section.

In figure 3 an example is shown of an inventive friction damper member 30 that provides, as only substantial source, the desired retardation on the basis of surface friction with the inside of the stile member of the lower ladder section.

The effective weight of the ladder sections to be retarded differs from above to below; it effectively increases in said direction in ladder 1, as the release and subsequent collapse of a ladder section such as section 3 towards the lower ladder section, such as section 2, brings in motion all ladder section above said section 3 as well. Therefore it is proposed that the damper members 30 of the respective ladder sections provide a differing surface friction...
resistance in order to compensate for the total weight of the ladder
so a greater resistance for a lower section compared to a higher section of the ladder.

It is preferred that the damper members that provide a differing surface friction resistance are
made of materials, preferably plastic materials, most preferably injection-moulded, having a
different modulus of elasticity. In a practical solution this can be done by manufacturing the
damper members (preferably as unitary components) from a fibre reinforced plastic material,
the different modulus of elasticity being obtained by adaptation of the percentage and/or
composition of the fibre material.

For example the plastic material of the damper members 30 is glass-filled, e.g. glass-filled
nylon.

In the example shown in figure 3, as is preferred, the damper member 30 has an annular
body having an upper fastening portion 31 which is inserted into the stile member at an end
thereof, and having multiple friction tabs that extend below the annular body and are spaced
from another in circumferential direction.

As is further preferred the upper fastening portion 31 includes integral elastic fasteners 33
that are adapted to snap into associated apertures in the stile member for connecting the
member 30 to the stile member.

It is further preferred for the annular body of the damper member 30 to have an annular
flange which rests against the stile member end face.

Referring to figures 4-10 now further aspects and preferred details of the ladder assembly
according to the invention will now be explained.

Figures 4, 5, 7 show a preferred design of a rung for a telescopic ladder, which is preferably
incorporated in a ladder according to the second aspect of the invention.

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.

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 arranged on the front side of the rung.

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 5). This provides stability of the ladder in said collapsed condition and avoids items entering in the space between the rungs.

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.

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.

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 ladder.

As can be seen in figures 1, 6, 7 and 9 the slidable actuators 10 are arranged in said recessed portion 43a.

As shown in figures 1, 6, 9 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.

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 7).
As is preferred each of said rear extension portions 11 is conned
(partly shown in figure 10b with reference numeral 60) which extends inside said rung to the
latch mechanism (not shown) at the outer end of the rung.

5 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 7 showing
a forward protrusion of 2 mm.

10 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.

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 operating 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.

20 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 9. This is a normal routine for persons climbing and descending a
ladder and any additional grip is useful.

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

As is shown in figures 7, 8a-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.

Referring to figures 10a-d now the third aspect of the invention will be explained in more
detail.

35 The figures 10a-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 field).

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 front collar segment 52 and a rear collar segment 54, these segments 52, 54 each being integral at one end thereof with the rung portion 50.

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.

As in the third aspect of the invention the front 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 rear collar segment 54 extends over a complementary angle. In figures 10a-d the front 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.

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 10a,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 style, better than the known 180 degrees design and better and easier than the mentioned 90 degrees design of Core Distribution.

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.
The skilled person will appreciate that the body of the connector her 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).

It will be appreciated that the third aspect of 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.

As is preferred - and known in the art - the automatic 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.
C L A I M S

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 actuators (10) for unlocking the stile members in order to allow for collapsing of the ladder assembly, multiple of said ladder sections being provided with damper members that provide retardation of gravity induced velocity of the ladder section upon collapse and/or extension of the ladder section, each damper member being mounted on a stile member so as to engage on the inside of the stile member of the adjacent ladder section, characterized in that the damper members are friction damper members (30) providing retardation on the basis for surface friction with the inside of the stile member of the adjacent ladder section, and in that the damper members of respective ladder sections provide a differing surface friction resistance in order to compensate for the total weight of the ladder sections to be retarded.

2. Ladder assembly according to claim 1, wherein the damper members (30) that provide a differing surface friction resistance are made of materials, preferably plastic materials, most preferably injection-moulded, having a different modulus of elasticity.

3. Ladder assembly according to claim 2, wherein the damper members (30) that provide a differing surface friction resistance are made of a fibre reinforced plastic material, and wherein the different modulus of elasticity is obtained by adaptation of the percentage and/or composition of the fibre material.

4. Ladder assembly according to one or more of the preceding claims, wherein a damper member (30) has an annular body having a upper fastening portion (31) which is inserted into the stile member at an end thereof, and wherein multiple friction tabs (32) extend below the annular body and are spaced from another in circumferential direction.
5. Ladder assembly according to claim 4, wherein the upper fastening portion (31) includes integral elastic fasteners (33) that are adapted to snap into associated apertures in the stile member.

6. Ladder assembly according to one or more of the preceding claims, wherein the one or more actuators associated with the latch mechanisms are arranged centrally on a ladder rung (preferably on the front) and are operable simultaneously with a single hand of the user.

7. A telescopically extendable and collapsible ladder assembly having at least three ladder sections, 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) 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) at each end of a rung for locking the telescopically inserted stile members relative to one another when the ladder sections are extended, the latch mechanisms each being associated with an actuator (10) for unlocking the stile members in order to allow for collapsing of the ladder assembly, 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, the actuators (10) being arranged on the front side of the rung, characterized in that, the actuators (10) are arranged centrally on the front side of the rung so as to be operable simultaneously with a single hand, and in that the front wall (43) of the rung has an elongated recessed portion (43a) over the length thereof and the actuators being arranged in said recessed portion, and in that 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.

8. Ladder assembly according to claim 7, wherein 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.

9. Ladder assembly according to claim 7, wherein the actuators have a height of at least 10 millimetres, preferably between 15 and 25 millimetres.
10. 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.

11. Ladder assembly according to one or more of the preceding claims, wherein the front wall and the rear wall are symmetrical.

12. Ladder assembly according to claim 7, wherein the actuators are slidable actuators and each have a rear extension which includes a snap provision adapted to snap around the rod.

13. 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 comprising automatic latch mechanisms for locking the telescopically inserted stile members relative to one another when the ladder sections are extended, the latch mechanisms of each ladder section being associated with one or more actuators 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 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 being provided bridging the opposed ends of the collar segments for securely coupling the collar segments around the stile member, characterized in that the front 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 of the rung (2d), whereas the rear collar segment (54) extends over a complementary angle.

14. Ladder assembly according to claim 13, 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.
15. Ladder assembly according to claim 14, wherein the opposed ends of the collar segments are provided with a bore (56) through which a fastener is fitted.

16. A telescopically extendable and collapsible ladder assembly having at least three ladder sections, 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) 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) at each end of a rung for locking the telescopically inserted stile members relative to one another when the ladder sections are extended, the latch mechanisms of each ladder section being associated with one or more actuators (10) for unlocking the stile members in order to allow for collapsing of the ladder assembly,

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, characterized in that,

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.

17. A loft ladder including a ladder assembly according to one or more of the preceding claims.

18. A stepladder having a first stepladder assembly and a second stepladders assembly hinged to one another so as to be in a storage position folded against one another and a operative position similar to an inverted V each at least one of the stepladder assemblies being a ladder assembly according to one or more of the preceding claims.

19. A work platform including a ladder assembly according to one or more of the preceding claims.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION^ SUBJECT MATTER

INV. E06C 1/12

According to International Patent Classification (IPC) or to both national classification and IPC.

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E06C

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
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<td>X</td>
<td>GB 2 436 584 A (NORMAN WILLIAM LIEFKE [CA]; KUO CHING-YAO [TW]) 3 October 2007 (2007-10-03) abstract; figures 2-8 page 9, paragraph 2</td>
<td>1,6,10, 17-19</td>
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<td>X</td>
<td>EP 1 516 999 A (TELESTEPS AB [SE]) 23 March 2005 (2005-03-23) abstract paragraphs [0012], [0014], [0024]; figures 1,4,9-17</td>
<td>7-12, 16-19</td>
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<td>A</td>
<td>US 4 574 918 A (MARQUES SALVADOR A [ES]) 11 March 1986 (1986-03-11) abstract; figures column 4, lines 9-14</td>
<td>1,7</td>
</tr>
</tbody>
</table>

X Further documents are listed in the continuation of Box C. X See patent family annex.

* Special categories of cited documents :

'A' document defining the general state of the art which is not considered to be of particular relevance

'E' earlier document but published on or after the international filing date

'IL' document which may throw doubts 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 international filing date but later than the priority date claimed

** later document published after the international filing date or priority date and 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

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'B' document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

Date: 29 December 2008

Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk
Tel. (+31-70) 340-2040
Fax: (+31-70) 340-3016

Authorised officer

Tran, Kim-Lien

Form PCT/ISA/210 (second sheet) (April 2005)
<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>US 1 712 942 A (SMITH HIRAM K) 14 May 1929 (1929-05-14) the whole document</td>
<td>1, 7</td>
</tr>
</tbody>
</table>
Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

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

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

3. ☐ Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of additional fees.

3. ☑ As only some of the required additional search fees were timely paid by the applicant, this international search report covers claims Nos. 1-12, 16-19

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (April 2005)
This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-6, 10, 17-19
   A telescopic ladder with friction dampers.

2. claims: 7-12, 16-19
   A ladder with an elongated recess in the front of the rung.

3. claims: 13-19
   A connector between a stile and a rung of a ladder, having non symmetrical collars.
<table>
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<tr>
<th>Patent document cited in search report</th>
<th>Publication date</th>
<th>Patent family member(s)</th>
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<tbody>
<tr>
<td>GB 2436584 A</td>
<td>03-10-2007</td>
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<td>EP 1516999 A</td>
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