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(54) Title: COLLAPSIBLE LADDER

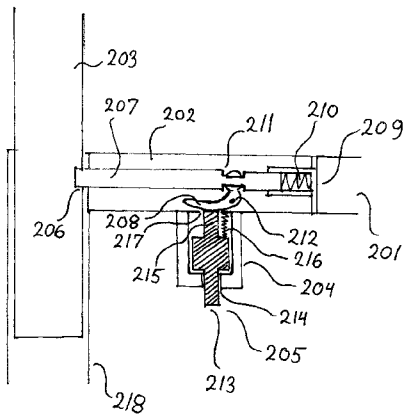


Fig. 2a

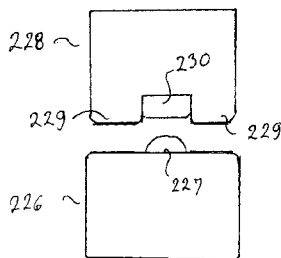


Fig. 2d

(57) Abstract: There is provided a collapsible ladder having several collapsible ladder sections, where each or at least part of the ladder sections comprises two hollow ladder bars arranged parallel to each other and interconnected at an upper end by a rung, and where each collapsible ladder section is telescopically inserted into a lower ladder section. Each ladder bar of a collapsible ladder section has a locking hole adjacent the lower end part of the ladder bar and an extension below the locking hole, and retaining mechanisms are provided in at least part of the rungs for locking the collapsible ladder sections relative to one another when the collapsible ladder sections are extended. Each of or part of the retaining mechanisms comprises a locking pin, which can be brought into an extended and locked position in order to engage a corresponding locking hole provided in the ladder bar of a ladder section positioned there above, and a release part for bringing the locking pin into a retracted and un-locked position. At least part of the rungs holding a retaining mechanism with a locking pin and a release part have spacers provided at the bottom, where at least part of said spacers have a release actuator with a bottom part. The release actuator engages the release part of a retaining mechanism of the rung and is arranged to activate the release part when the bottom part of the release actuator is moved upwards through the spacer thereby bringing the locking pin into the un-locked position.

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COLLAPSIBLE LADDER

FIELD OF INVENTION

- 5 The present invention relates to a collapsible ladder of the type comprising U-shaped ladder sections being telescopically inserted in each other.

BACKGROUND OF THE INVENTION

- 10 Ladders having collapsible and expandable ladder sections are used in order to make the ladder smaller for storage and transport purposes.

In the European patent EP-B1-0 527 766 a collapsible ladder is described comprising ladder bars divided into sections interconnected by rungs. In each ladder section is
15 provided retaining or locking mechanisms, designed to automatically release the upper ladder sections, when a rung reaches a lower rung. This means, that subsequent to the release of the lowermost ladder section, the following ladder sections are automatically released, whereby the ladder collapses. However, when collapsing the ladder, the rungs are collapsing on top of each other, thereby generating a safety problem for the users
20 hands and fingers.

Thus, there is a need for a collapsible ladder, which allows the ladder sections to be automatically released by release of the lowermost ladder section, but which provides safety spacers between the rungs to avoid injuries of a user's hands or fingers.

25

SUMMARY OF THE INVENTION

According to the present invention there is provided a collapsible ladder comprising:
several collapsible ladder sections, each or at least part of the ladder sections comprising
30 two hollow ladder bars arranged parallel to each other and interconnected at an upper end by a rung, and each collapsible ladder section being telescopically inserted into a lower ladder section;
wherein each ladder bar of a collapsible ladder section has a locking hole adjacent the lower end part of the ladder bar and an extension below the locking hole;

wherein retaining mechanisms are provided in at least part of the rungs for locking the collapsible ladder sections relative to one another when the collapsible ladder sections are extended, each of or part of said retaining mechanisms comprising a locking pin, which can be brought into an extended and locked position in order to engage a
5 corresponding locking hole provided in the ladder bar of a ladder section positioned there above, and a release part for bringing the locking pin into a retracted and un-locked position;

wherein at least part of the rungs holding a retaining mechanism with a locking pin and a release part further have spacers provided at the bottom with at least part of said spacers
10 having a release actuator with a bottom part, said release actuator engaging the release part of a retaining mechanism of the rung and being arranged to activate the release part when the bottom part of the release actuator is moved upwards through the spacer thereby bringing the locking pin into the un-locked position; and

wherein at least part of the rungs have one or more projecting parts at the upper surface,
15 said projecting part(s) being arranged below the release actuator(s) arranged in the central part of the spacers(s) provided at the bottom of a rung positioned there above, whereby when the above positioned rung is moved downwards until the spacer(s) rest at the rung surface of the below positioned rung, the release actuator of a spacer provided at the bottom of the above positioned rung is contacting a projecting part at the upper
20 surface of the below positioned rung and moved upwards through the spacer thereby bringing the locking pin into the un-locked position.

It is preferred that at least part of the spacers holding a release actuator have one or more projecting part(s) at the bottom besides or around the bottom part of the release actuator.
25 According to an embodiment of the invention, the projecting part(s) of a spacer and the projecting part(s) of a below positioned rung may be arranged so that when the rung holding the spacer is moved downwards until the spacer rests at the below positioned rung surface, the bottom of the projecting spacer part(s) rests at a rung surface part or parts besides the projecting rung surface part(s), while the bottom of the release actuator
30 of the spacer is contacting the projecting rung surface part.

It is within one or more embodiments of the invention that at least part of the rungs having projecting parts at the upper surface, further have two outer projecting parts forming two receiving grooves for receiving the projecting parts of the spacer. Here, a spacer and its
35 projecting part(s) may be formed so that when the rung holding the spacer is moved

downwards until the spacer rests at the below positioned rung surface in the collapsed condition, an outer lower surface part of the spacer is contacting and resting on an upper surface of an outer projecting part of a rung.

- 5 It is preferred that for a spacer holding a release actuator and one or more projecting parts, then the release actuator has to be moved upwards through the spacer so that the bottom surface of the release actuator is above the bottom surface of the projecting part(s) of the spacer with a predetermined safety length in order to activate the corresponding release part thereby bringing the locking-pin from a locked to an un-locked
10 position. Preferably the predetermined safety length is at least 1 mm or at least 1,5 mm, such as about 2 mm.

It is within one or more embodiments of the invention that for a spacer holding a release actuator and one or more projecting parts at the bottom besides or around the release
15 actuator, then the bottom of the release actuator extends below the projecting part(s) of the spacer or is in plane with the bottom surface of said projecting part(s) when the ladder section of the rung holding the spacer is locked in the extended position. However, it is also within one or more embodiments of the invention that then the bottom of the release actuator is arranged above the bottom surface of the projecting part(s) of the spacer when
20 the ladder section of the rung holding the spacer is locked in the extended position.

It is preferred that a locking pin is spring biased towards the extended position in order to engage said corresponding locking hole provided in the ladder bar of the ladder section positioned there above.

25

It is within an embodiment of the invention that the release part of a retaining mechanism comprises a release lever for retracting the locking pin from the locked position into the un-locked position. Here, the release actuator of a rung spacer may extend through the spacer to engage the release lever of the retaining mechanism.

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The rung spacers may have a height of at least 20 mm, and the distance between a ladder bar and a rung spacer is at least 80 mm. The release actuator may be at least partly rod-shape.

It is preferred that the rung spacers are hollow with a release actuator extending into the hollow part of a rung spacer. Here, the bottom part of the spacers may form a collar and the release actuator may have a thinner lower part extending through said collar when the ladder section above the rung is locked in the extended position, and the release actuator
5 may have a thicker or shoulder part above the lower part, wherein the thicker or shoulder part is held within the spacer by said collar.

According to an embodiment of the invention the release actuator is spring-biased within the corresponding spacer towards the bottom part of the spacer. Preferably, the release
10 actuator is spring biased towards the inner surface of the spacer collar.

The present invention also covers one or more embodiments, wherein for one or more of the collapsible ladder sections, a non-locking ladder bar slot or groove is formed in the extension of each of the ladder bars and reaching from a distance below the locking hole
15 of the ladder bar to the bottom of the ladder bar. The ladder bar slots or grooves provided in the ladder bar extensions of a corresponding ladder section may have a width and length allowing the ladder section to be fully collapsed while the locking pins locking a ladder section positioned there below pass freely in the ladder bar slots or grooves.

20 It is preferred that for a collapsible ladder section the distance from the lower side of the rung to the locking hole is smaller than or equal to the similar distance for a ladder section positioned there below, and according to an embodiment the distance from the lower side of a rung to the locking hole is the same for each collapsible ladder section.

25 According to an embodiment of the invention there is no retaining mechanism in the uppermost rung. It is also within an embodiment of the invention that the ladder bars are formed of circular tubing.

It is preferred that a connector is provided at each end of the rung of a collapsible ladder
30 section for interconnecting the rung with the two ladder bars.

The present invention also covers one or more embodiments, wherein for one or more of the ladder bars having a non-locking ladder bar slot or groove, a plug is provided at the bottom of the ladder bar and reaching into the lower end of the ladder bar, said plug

having a plug slot or groove formed therein, which plug slot or groove matches at least part of the slot or groove of the ladder bar.

BRIEF DESCRIPTION OF THE DRAWINGS

5

Fig. 1 is a front view of a partly collapsed ladder,

Fig. 2a shows part of a cut-through rung with retaining mechanism for locking the above ladder section and with spacers having a release actuator

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Fig. 2b shows a first example of a rung having a projecting part at the upper surface and a spacer with a release actuator and projecting parts arranged besides the bottom part of the release actuator according to an embodiment of the invention,

15 Fig. 2c shows the rung and the spacer of Fig. 2b in a collapsed condition, where the bottom of the release actuator is contacting the projecting part of the rung, and where the projecting parts of the spacer are resting at the rung surface besides the projecting part of the rung surface,

20 Fig. 2d shows a second example of a rung having a projecting part at the upper surface and a spacer with a release actuator and projecting parts arranged besides the bottom part of the release actuator according to an embodiment of the invention,

Fig. 2e shows the rung and the spacer of Fig. 2d in a collapsed condition, where the
25 bottom of the release actuator is contacting the projecting part of the rung, and where the projecting parts of the spacer are resting at the rung surface besides the projecting part of the rung surface,

Fig. 2f shows a third example of a rung having a projecting part at the upper surface and a
30 spacer with a release actuator and projecting parts arranged besides the bottom part of the release actuator according to an embodiment of the invention,

Fig. 2g shows the rung and the spacer of Fig. 2f in a collapsed condition, where the bottom of the release actuator is contacting the projecting part of the rung, and where the

projecting parts of the spacer are resting at the rung surface besides the projecting part of the rung surface,

Figs. 3a and 3b show side and bottom views of a ladder bar according to an embodiment
5 of the invention,

Figs. 4a, 4b and 4c show side and bottom views of a ladder bar with a plug according to an embodiment of the invention, and

10 Figs. 5a and 5b show top and side views of an alternative embodiment of a plug to be inserted into a ladder bar according to an embodiment of the invention.

DETAILED DESCRIPTION OF EMBODIMENTS

15 A prior art collapsible ladder is illustrated in the drawings. Fig. 1 shows a partly collapsed ladder 100, where the ladder has a number of collapsible ladder sections with hollow ladder bars 101a,b,c, 102a,b,c, arranged parallel to each other and interconnected at an upper end by a rung 103a,b,c. In Fig. 1 the two uppermost ladder sections are collapsed while the third uppermost ladder section is in an extended and locked position. Each
20 collapsible ladder section is telescopically inserted into a lower ladder section. The lowermost ladder section, which is not a collapsible ladder section, also has a rung 103d for interconnecting the ladder bars 101d, 102d. Each rung 103a,b,c of the collapsible ladder sections has two spacers 104, 105 provided at the bottom side of the rung 103a. The spacers 104, 105 will maintain a safety distance between the rungs 103a,b,c,d of the
25 collapsed ladder. In a preferred embodiment the spacers 104, 105 have a height of 25 mm and the distance from a spacer 104 to the ladder bar 101c is at least 80 mm. Thus, when this ladder 100 is collapsed, there will be a safety distance between the rungs 103a,b,c of 25 mm and a safety distance between the spacers 104, 105 and the ladder bars 101c, 102c of 80 mm.

30

The spacers 104, 105 are hollow and release actuators 106, 107 are arranged within the spacers 104, 105. As the release actuators 106, 107 are arranged at the bottom of the spacers 104, 105, then subsequent to activating the release actuators of a lower ladder section, the above ladder sections may automatically be released, whereby the ladder
35 sections collapses, while at the same time keeping a safety distance of 25 mm between

the collapsed rungs. The rung 103d of the lowermost ladder section has no spacers but has release activating means 108, 109, which may be arranged directly below the rung 103d. If the ladder is fully extended, then activation of the release activating means 108, 109 will release the above ladder section, which then collapses and the release actuators 5 106, 107 hit the upper surface of the rung 103d, thereby releasing the next ladder section and so on until the ladder is fully collapsed.

In Fig. 1 the release actuators of the collapsed rungs 103a, 103b are shown not fully inserted into the spacers, but when collapsed the actuators may well be fully inserted in 10 the spacers.

The release actuators 106, 107 each has a bottom part extending below a central part of the spacer 104,105 when the ladder section above the rung 103c is locked in the extended position, as illustrated in Fig. 1.

15

The principle of operation of locking and un-locking of a collapsible ladder section is described in connection with Fig. 2a, which shows part of a cut-through rung 201, which rung 201 in each side end has a retaining mechanism 202 for locking a ladder bar 203 of the above ladder section and a spacer 204 with a release actuator 205. The rung is 20 connected to a ladder bar 218 with the ladder bar 203 being inserted therein.

The ladder bar 203 has a locking hole 206 and the retaining mechanism 202 has a corresponding locking pin 207, which can be brought into an extended and locked position in order to engage the locking hole 206 provided in the ladder bar 203, and the retaining 25 mechanism 202 also has a release lever 208 for bringing the locking pin 207 into a retracted and un-locked position.

The retaining mechanism 202 further comprises a shell 209, being press-fitted into the rung 201, where the shell 209 receives the locking pin 207. The locking pin 207 is 30 displaceably mounted in the shell 209 and is in one end biased by a spring 210. The locking pin 207 is provided with a waist or recess portion 211 in the mid portion of the locking pin 207. The waist or recess portion 211 serves to receive the release lever 208.

The release lever 208 is a rotary button or swivelling lever and may be pivotally mounted 35 with a spindle or pivot 212 to the rung 202, and part of the release lever 208 is a

connecting part, which may be forked shaped, and which claps or jams about the waist or recess 211 of the locking pin 207. The release lever 208, which may be roughly L-shaped, has a lower part at least partly extending within a recess 217 of the bottom of the rung 202.

5

The spacer 204 is mounted to the bottom of the rung 202 and has a hollow part, where the recess 217 extends within an upper opening of the hollow part of the spacer 204. The release actuator 205 is displaceably mounted within the hollow part of the spacer 204, and has a lower or bottom part 213 projecting through a lower opening 214 of the spacer,
10 when the locking pin 207 is in the extended position and engaging the locking hole 206. The upper part 215 is shaped to engage the lower part of the release lever 208 through the recess 217 of the rung 202. The mid portion of the actuator 205 is wider than the lower and upper parts 213, 215 and is formed to steer the actuator when moving up and down inside the spacer 204. Preferably, the actuator 205 is biased by a spring 216
15 towards the inner surface of the bottom part of the spacer 204.

When extending the ladder section being arranged above the rung 202, then the ladder bar 203 is moved upwards within the ladder bar 218 and the locking hole 206 will reach the position of the locking pin 207, which will be forced into the locking hole 206 by the
20 spring 210, thereby locking the ladder bar 203 and the associated ladder section. During this locking operation, the release lever 208 is rotated about the spindle 212 and the lower part of the lever 208 is lowered or pressed downwards against the release actuator 205, thereby forcing the bottom part 213 of the actuator 205 to project further below the spacer.

25 When the bottom part 213 of the actuator 205 is pressed upwards, the upper part 215 of the actuator 205 is forced to press the lower part of the lever 208 upwards, thereby rotating the lever about the spindle 212. This rotation brings the connecting part of the lever 208 to push back the locking pin 207 into the shell 209, thereby retracting the locking pin 207 from the engagement with the locking hole 206 bringing the locking pin
30 207 into the retracted or un-locked position, whereby the ladder bar 203 collapses into the ladder bar 218 connected to the rung 201.

Retaining mechanisms operating along the same principles as the retaining mechanism 202 of Fig. 2, but without the spacer 204 and the release actuator 205, have been

described in European Patent No. 1843005 B1 and in US Patent No. 7,316,293 B2, which are both hereby included by reference.

The present invention provides an improvement to the prior art ladder of Fig. 1 and the
5 spacer 204 of Fig. 2a. This is illustrated in Figs. 2b and 2c, which shows a preferred embodiment of rungs and spacers according to the present invention.

Fig. 2b shows a cut through of a first example of a rung 220 having a projecting part 221 at the upper surface and a spacer 222 with a release actuator 223 and projecting parts
10 224 arranged besides the bottom part of the release actuator 223. Fig. 2c shows the rung 220 and the spacer 222 of Fig. 2b in a collapsed condition, where the bottom of the release actuator 223 is contacting the projecting part 221 of the rung 220, and where the projecting parts 224 of the spacer are resting at the rung surface 225 besides the projecting part 221 of the rung surface.

15

Thus, for a ladder having rungs 220 and spacers 222 according to the present invention as described in connection with Figs. 2b and 2c, then the rungs may have one or more projecting parts 221 at the upper surface, where the projecting part(s) 221 are arranged below the release actuator(s) 223, which are arranged in the central part of the spacers(s)
20 222, which again are provided at the bottom of a rung positioned there above, whereby when the above positioned rung is moved downwards until the spacer(s) 222 rest at the rung surface 221, 225 of the below positioned rung, the release actuator 223 of a spacer 222 provided at the bottom of the above positioned rung is contacting a projecting part 221 at the upper surface of the below positioned rung 220 and moved upwards through
25 the spacer 220 thereby bringing the locking pin (207 of Fig. 2a) into the un-locked position.

It is preferred that the spacer 222 has two projecting parts 224 at the bottom with one on each side of the bottom part of the release actuator 223. The projecting parts 224 of the
30 spacer 222 and the projecting part 221 of a below positioned rung 220 are arranged so that when the upper rung holding the spacer 222 is moved downwards until the spacer 222 rests at the below positioned rung surface 221, 225, the bottom of the projecting spacer parts 224 rests at a rung surface part or parts 225 besides the projecting rung surface part 221, while the bottom of the release actuator 223 of the spacer 222 is
35 contacting the projecting rung surface part 221. It is also preferred that the release

actuator 223 has to be moved upwards through the spacer 222 so that the bottom surface of the release actuator 223 is above the bottom surface of the projecting parts 224 with a predetermined safety length when activating the corresponding release part or lever 208 and thereby bringing the locking-pin 207 from a locked to an un-locked position. This
5 predetermined safety length may be set to at least 1 mm or at least 1.5 mm.

By having such a safety length for un-locking the locking pin 207 and thereby release an above positioned ladder section, the release actuator 223 cannot unintentionally be pushed so much upwards as to release or un-lock the locking pin, as the release actuator
10 is protected by the projecting spacer parts 224 and the predetermined safety length or distance.

In preferred embodiments the release actuator 223 has to be moved upwards by as much as 4, 5, or 6 mm in order to activate the corresponding release part or lever 208.
15

It is within embodiments of the invention that the bottom of the release actuator 223 extends below the projecting parts 224 of the spacer 222 as shown in Fig. 2b, or is in plane with the bottom surface of the projecting parts 224 when the ladder section of the rung holding the spacer 222 is locked in the extended position.
20

However, the release actuator 223 may also have the bottom surface a bit above the bottom surface of the projecting parts 224. In this case the projecting parts 224 of the spacer 222 and the projecting part 221 of the rung 220 may have a greater length than shown in Figs. 2b and 2c. This is illustrated in the example of Figs. 2d and 2e.
25

Fig. 2d shows a second example of a rung 226 having a projecting part 227 at the upper surface and a spacer 228 with a release actuator 230 and projecting parts 229 arranged besides the bottom part of the release actuator 230. Fig. 2e shows the rung 226 and the spacer 228 of Fig. 2d in a collapsed condition, where the bottom of the release actuator
30 230 is contacting the projecting part 230 of the rung 226, and where the projecting parts 229 of the spacer 228 are resting at the rung surface besides the projecting part 227 of the rung surface.

Thus, for a ladder having rungs 226 and spacers 228 according to the present invention
35 as described in connection with Figs. 2d and 2e, then the rungs may have one or more

projecting parts 227 at the upper surface, where the projecting part(s) 227 are arranged below the release actuator(s) 230, which are arranged in the central part of the spacers(s) 228, which again are provided at the bottom of a rung positioned there above, whereby when the above positioned rung is moved downwards until the spacer(s) 228 rest at the
5 rung surface of the below positioned rung, the release actuator 230 of a spacer 228 provided at the bottom of the above positioned rung is contacting a projecting part 227 at the upper surface of the below positioned rung 226 and moved upwards through the spacer 228 thereby bringing the locking pin (207 of Fig. 2a) into the un-locked position.

10 It is preferred that the spacer 228 has two projecting parts 229 at the bottom with one on each side of the bottom part of the release actuator 230. The projecting parts 229 of the spacer 228 and the projecting part 227 of a below positioned rung 226 are arranged so that when the upper rung holding the spacer 228 is moved downwards until the spacer 228 rests at the below positioned rung surface, the bottom of the projecting spacer parts
15 229 rests at a rung surface part or parts besides the projecting rung surface part 227, while the bottom of the release actuator 230 of the spacer 228 is contacting the projecting rung surface part 227. For the locked condition as shown in Fig. 2d, then for security reasons the release actuator 230 may have the bottom surface a bit above the bottom surface of the projecting parts 229. In this case the projecting parts 229 of the spacer 228
20 and the projecting part 227 of the rung 226 may have a greater length than shown in Figs. 2b and 2c. It is preferred that the release actuator 230 has to be moved upwards through the spacer 228 so that the bottom surface of the release actuator 230 is above the bottom surface of the projecting parts 229 with a predetermined safety length when activating the corresponding release part or lever 208 and thereby bringing the locking-pin 207 from a
25 locked to an un-locked position. Here, this predetermined safety length may be set to at least 2, 3 or 4 mm.

In preferred embodiments the release actuator 230 has to be moved upwards by as much as 4, 5, or 6 mm in order to activate the corresponding release part or lever 208.

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Fig. 2f shows a third example of a rung 231 having a projecting part 232 at the upper surface and a spacer 233 with a release actuator 234 and projecting parts 235 arranged besides the bottom part of the release actuator 234. Fig. 2g shows the rung 231 and the spacer 233 of Fig. 2f in a collapsed condition, where the bottom of the release actuator
35 234 is contacting the projecting part 232 of the rung 231, and where the projecting parts

235 of the spacer 233 are resting at the rung surface besides the projecting part 232 of the rung surface.

The rung 231 and spacer 233 of Figs. 2f and 2g operates in the same way as the rung 5 227 and spacer 228 of Figs. 2d and 2e, but the rung 231 and spacer 233 of Figs. 2f and 2g are designed a bit different in that the rung 231 has two outer projecting parts 236 forming two receiving grooves 237 for receiving the projecting parts 235 of the spacer 233. The spacer 233 and the projecting parts 235 are designed to fit into the grooves 237, and it is preferred that when in the collapsed condition, the outer lower surfaces 238 10 of the spacer 233 is contacting and resting on the upper surfaces 239 of the projecting parts 236.

The invention also covers a collapsible ladder, wherein for one or more of the collapsible ladder sections, a non-locking ladder bar slot or groove is formed in the extension of each 15 of the ladder bars and reaching from a distance below the locking hole of the ladder bar to the bottom of the ladder bar. This is illustrated in Figs. 3a and 3b.

Thus, for a ladder section having ladder bars with non-locking ladder bar slots or grooves 301, then the ladder section has two ladder bars 302 connected by a rung with locking 20 holes 304 in each of the ladder bars 302 and a slot or groove 301 in each of the ladder bars 302 below the locking hole 304. The ladder bar slot or groove 301 reaches from the bottom of the ladder bar 302 to a distance below the locking hole 304. As illustrated in Fig. 3 b, the ladder bars 302 are formed of circular tubing. When the ladder section with the ladder bars 302 is brought into a locked position, the locking pins of the first lower ladder 25 section, 207 of Fig. 2, are engaging the locking holes 304, and when the ladder section with the ladder bars 302 is released by retracting the locking pins from the locking holes 304, then each locking pin of the second lower ladder section, where the second lower ladder section is arranged directly below the first lower ladder section, will be free to extend into a slot or groove 301 allowing the ladder section with the ladder bars 302 to be 30 fully collapsed without resting on the locking pins of the second lower ladder section.

The width and length of the ladder bar slots or grooves 301 shall be dimensioned so as to allow the corresponding ladder section to be fully collapsed while the locking pins of a ladder section positioned therebelow pass freely in the ladder bar slots or grooves 301.

Figs. 4a, 4b and 4c show side and bottom views of a further embodiment of the invention, wherein a plug or stopper 305 is provided at the bottom of the ladder bar 302, which ladder bar is part of a collapsible ladder section. The plug or stopper 305 may reach into the lower end of the ladder bar 302 to thereby increase the strength of the combination of
5 the ladder bar 302 and plug 305. The plug 305 should have a plug slot or groove 306, which should match the slot or groove 301 of the ladder bar 302.

The plug 305 shown in Fig. 4 is solid, but it is also within the invention that only part of the plug 305 is solid. The plug slot or groove 306 is formed to be deep and wide enough to let
10 a locking pin extending through a locking hole 304 of a ladder bar 302 of a ladder section positioned there below pass freely.

Figs. 5a and 5b show top and side views of an alternative embodiment of a plug 505 to be inserted into a ladder bar according to an embodiment of the invention. The plug 505 is
15 partly solid, and almost formed like a wheel with a rim 507 and spokes 508. The bottom part of the plug 505 is provided with a collar or shoulder 509 having a width corresponding to the thickness of the ladder bars. The plug 505 is to be inserted into the lower end of a ladder bar 502 with the collar or shoulder 509 maintaining the plug 505 at the position at the end of the ladder bar 502. The plug 505 also has a plug slot or groove 506, which
20 matches the slot or groove 301 of the ladder bar 302.

Although not shown in the drawings, the present invention also covers embodiments wherein a thin plastic sleeve is covering the outer bottom part of the ladder bars 302 and thereby also covering the bottom part of the plugs 305, 505. Furthermore, the sleeve is
25 formed with a slot or groove to fit into the groove 301 of the ladder bar 302 and the plug slot or groove 306, 506. The sleeve may cover about 1 cm of the lower end of a ladder bar 302.

CLAIMS

1. A collapsible ladder comprising:
several collapsible ladder sections, each or at least part of the ladder sections comprising
5 two hollow ladder bars arranged parallel to each other and interconnected at an upper
end by a rung, and each collapsible ladder section being telescopically inserted into a
lower ladder section;
wherein each ladder bar of a collapsible ladder section has a locking hole adjacent the
lower end part of the ladder bar and an extension below the locking hole;
10 wherein retaining mechanisms are provided in at least part of the rungs for locking the
collapsible ladder sections relative to one another when the collapsible ladder sections
are extended, each of or part of said retaining mechanisms comprising a locking pin,
which can be brought into an extended and locked position in order to engage a
corresponding locking hole provided in the ladder bar of a ladder section positioned there
15 above, and a release part for bringing the locking pin into a retracted and un-locked
position;
wherein at least part of the rungs holding a retaining mechanism with a locking pin and a
release part further have spacers provided at the bottom with at least part of said spacers
having a release actuator with a bottom part, said release actuator engaging the release
20 part of a retaining mechanism of the rung and being arranged to activate the release part
when the bottom part of the release actuator is moved upwards through the spacer
thereby bringing the locking pin into the un-locked position; and
wherein at least part of the rungs have one or more projecting parts at the upper surface,
said projecting part(s) being arranged below the release actuator(s) arranged in the
25 central part of the spacers(s) provided at the bottom of a rung positioned there above,
whereby when the above positioned rung is moved downwards until the spacer(s) rest at
the rung surface of the below positioned rung, the release actuator of a spacer provided at
the bottom of the above positioned rung is contacting a projecting part at the upper
surface of the below positioned rung and moved upwards through the spacer thereby
30 bringing the locking pin into the un-locked position.
2. A ladder according to claim 1, wherein at least part of the spacers holding a
release actuator have one or more projecting part(s) at the bottom besides or around the
bottom part of the release actuator.

3. A ladder according to claim 2, wherein the projecting part(s) of a spacer and the projecting part(s) of a below positioned rung are arranged so that when the rung holding the spacer is moved downwards until the spacer rests at the below positioned rung surface, the bottom of the projecting spacer part(s) rests at a rung surface part or parts
5 besides the projecting rung surface part(s), while the bottom of the release actuator of the spacer is contacting the projecting rung surface part.
4. A ladder according to claim 2, wherein at least part of rungs having projecting parts at the upper surface, further have two outer projecting parts forming two receiving
10 grooves for receiving the projecting parts of the spacer.
5. A ladder according to claim 4, wherein a spacer has outer lower surface parts besides the projecting part(s) of the spacer, and wherein when in the collapsed condition, an outer lower surface part of the spacer is contacting and resting on an upper surface of
15 a outer projecting part of a rung.
6. A ladder according to any one of the claims 2-5, wherein for a spacer holding a release actuator and one or more projecting parts, then the release actuator has to be moved upwards through the spacer so that the bottom surface of the release actuator is
20 above the bottom surface of the projecting part(s) of the spacer with a predetermined safety length in order to activate the corresponding release part thereby bringing the locking-pin from a locked to an un-locked position.
7. A ladder according to any one of the claims 2-6, wherein for a spacer holding a
25 release actuator and one or more projecting parts at the bottom besides or around the release actuator, then the bottom of the release actuator extends below the projecting part(s) of the spacer, is in plane with the bottom surface of said projecting part(s), or is arranged above the bottom surface of said projecting part(s) when the ladder section of the rung holding the spacer is locked in the extended position.
30
8. A ladder according to claim 6 or 7, wherein said predetermined safety length is at least 1 mm or at least 1,5 mm.

9. A ladder according to any one of the claims 1-8, wherein a locking pin is spring biased towards the extended position in order to engage said corresponding locking hole provided in the ladder bar of the ladder section positioned there above.
- 5 10. A ladder according to any one of the claims 1-9, wherein the release part of a retaining mechanism comprises a release lever for retracting the locking pin from the locked position into the un-locked position.
11. A ladder according to claim 10, wherein the release actuator of a rung spacer
10 extends through the spacer to engage the release lever of the retaining mechanism.
12. A ladder according to any one of the claims 1-11, wherein the rung spacers have a height of at least 20 mm, and wherein the distance between a ladder bar and a rung spacer is at least 80 mm.
- 15 13. A ladder according to any one of the claims 1-12, wherein the release actuator is at least partly rod-shaped.
14. A ladder according to any one of the claims 1-13, wherein the rung spacers are
20 hollow with a release actuator extending into the hollow part of a rung spacer.
15. A ladder according to claim 14, wherein the bottom part of the spacers form a collar and the release actuator has a thinner lower part extending through said collar when the ladder section above the rung is locked in the extended position, and the
25 release actuator has a thicker or shoulder part above the lower part, said thicker or shoulder part being held within the spacer by said collar.
16. A ladder according to any one of the claims 1-15, wherein a release actuator is spring-biased within the corresponding spacer towards the bottom part of the spacer.
30
17. A ladder according to claims 15 and 16, wherein the release actuator is spring biased towards the inner surface of the spacer collar.

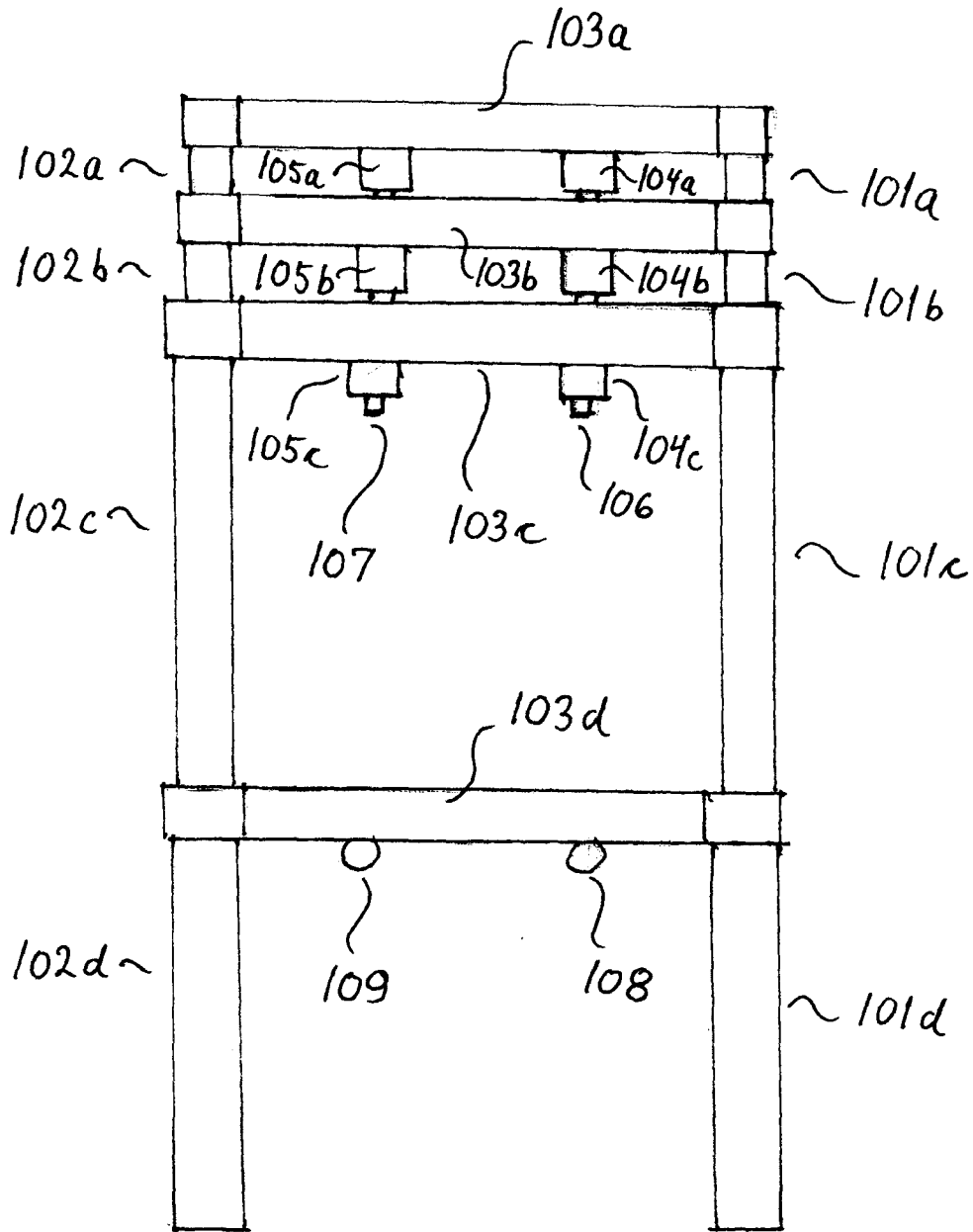


Fig. 1

100

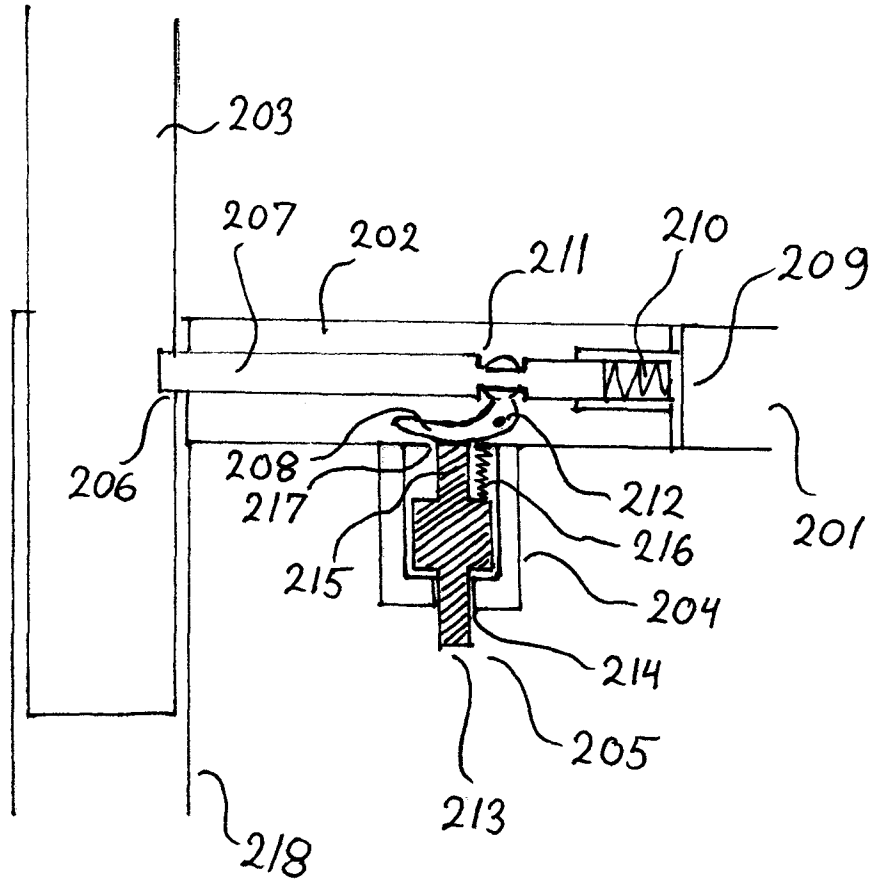


Fig. 2a

Fig. 2b

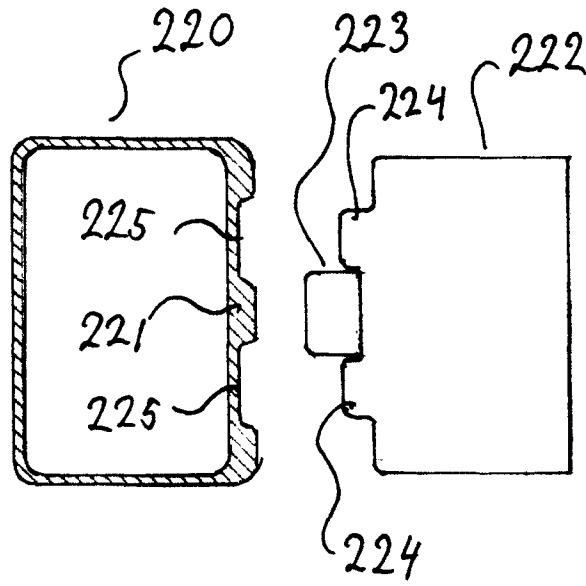
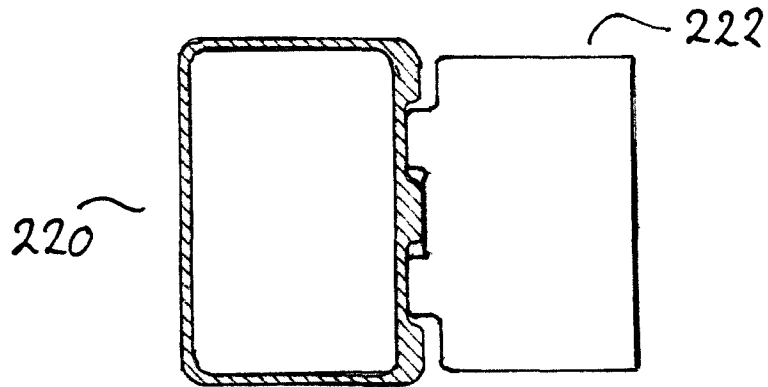


Fig. 2c



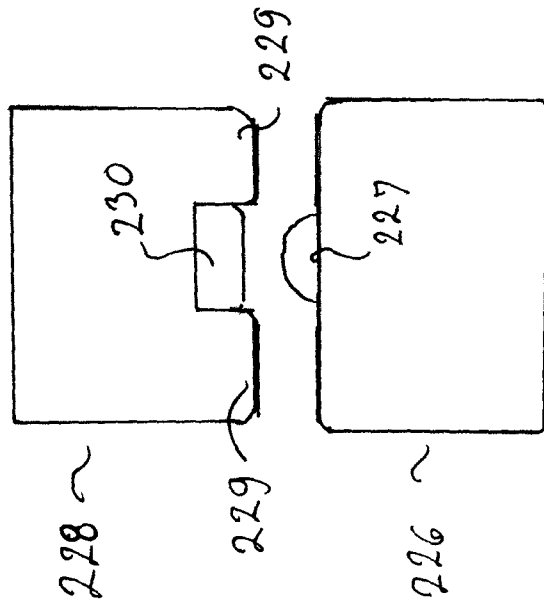


Fig. 2d

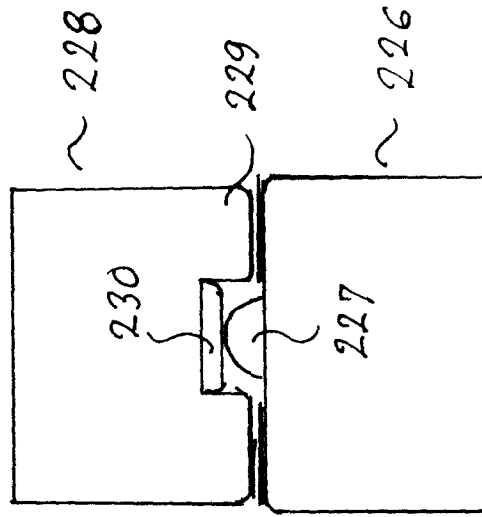


Fig. 2e

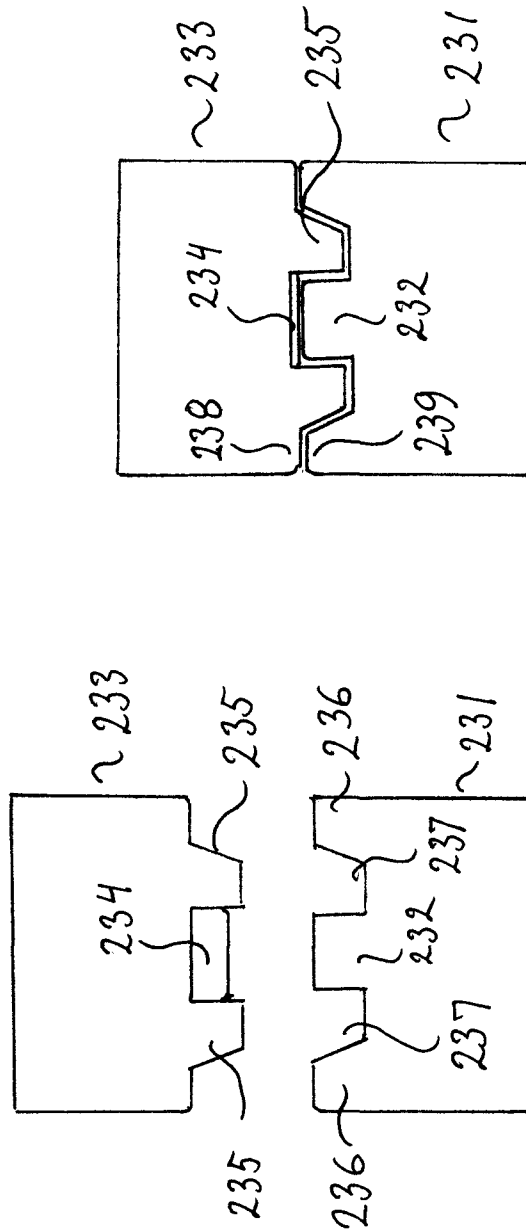


Fig. 2g

Fig. 2f

Fig. 3a

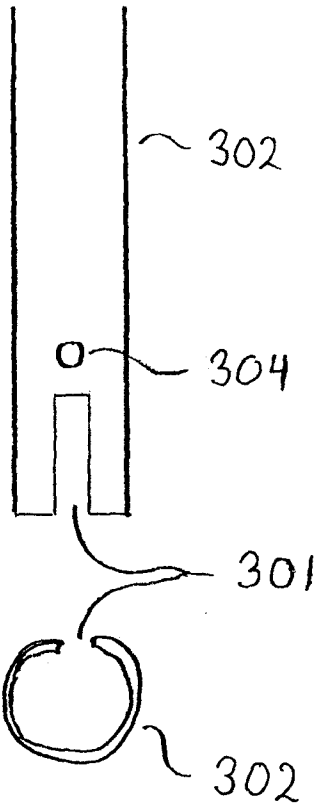
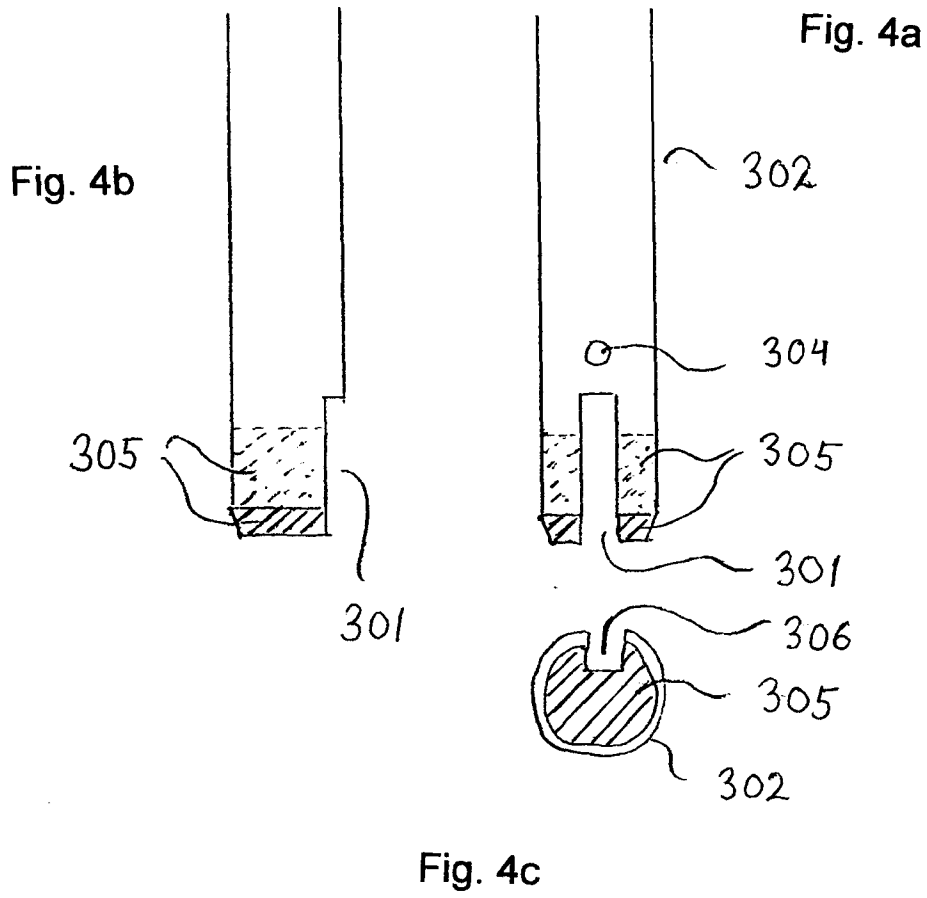


Fig. 3b



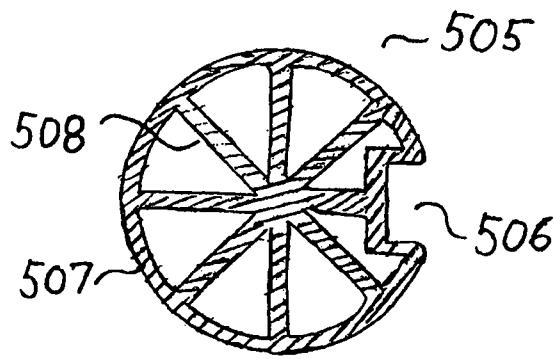


Fig. 5a

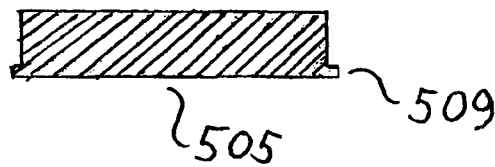


Fig. 5b

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/054564

A. CLASSIFICATION OF SUBJECT MATTER
 INV. E06C1/12 E06C7/08
 ADD.
 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 practicable, search terms used)
 EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
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| A | JP H08 93371 A (TERAMOTO TAKASHI) 9 April 1996 (1996-04-09) figures 2, 3 ----- | 1-17 |

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

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|---|---|
| <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" 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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> | <p>"T" 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</p> <p>"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</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p> |
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| Date of the actual completion of the international search 4 June 2014 | Date of mailing of the international search report 11/06/2014 |
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| 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 | Authorized officer Bauer, Josef |
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2014/054564

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