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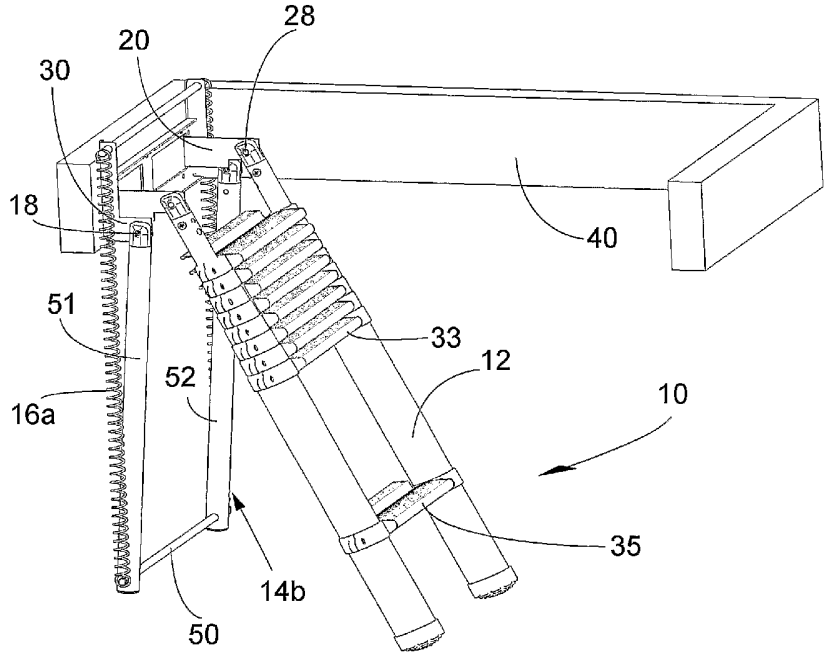
(54) Title: LOFT LADDER ASSEMBLY



(57) Abstract: A loft ladder assembly 10 is described which comprises a telescopically collapsible ladder 12 in combination with a frame 14 for mounting the ladder 12 within a hatch opening. The frame 14 comprises a mounting bracket 14a to be secured in use to the hatch opening, to which bracket 14a the uppermost section of the ladder 12 is pivotably connected, and a carriage 14b pivotably connected to the mounting bracket 14a for supporting the weight of the ladder 12 in its stowage position and preventing the ladder 12 from extending unintentionally.

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LOFT LADDER ASSEMBLY

FIELD OF THE INVENTION

The present invention relates to a loft ladder assembly.

BACKGROUND OF THE INVENTION

Hatch doors are commonly provided in a ceiling to allow access to the loft or roof space of a building. Loft ladders are also known which are stored in the roof space and which are deployed by being pulled down after the hatch door has been opened.

Conventional loft ladders are usually of the extendable type. This means that the ladder is formed of two (or sometimes three) ladder sections arranged in different planes, which can slide over one another and can be locked to each other in a stacked and in an extended position. Even after the sections have been stacked, they are longer than the hatch door. Consequently, to stow away the ladder, it first has to be raised into the loft and then pivoted for its lower end to be able to pass through the hatch. The stacked ladder is normally pivoted about an axis, which is near its centre so that the ladder is nearly balanced. As a result, the ladder tends to stay in its horizontal position in the loft when the hatch door is opened and, to deploy it, a user must first pivot its lower end of the hatch and then release its various catches manually to allow it to be extended to reach the floor.

Because such ladders are not very compact, even in their stacked condition, they have the disadvantage of taking up roof space. It is therefore preferable to form the ladder as a telescopically collapsible ladder where the stiles are formed of sections that collapse into one another, as described for example in EP-B1-0 527 766. Such a ladder is more compact than an extendable ladder when it

is collapsed and can be made sufficiently small to fit entirely within the hatch opening.

However, if the top rung of a telescopically collapsible ladder is pivoted on one side of the hatch opening, it will tend to drop and extend itself under the action of its own weight as soon as the hatch door is opened. This could cause injury to an unsuspecting user.

SUMMARY OF THE INVENTION

The present invention therefore seeks to provide a loft ladder assembly that can fit within a hatch opening without taking up loft space and can be deployed and stowed away simply and safely.

According to the present invention, there is provided a loft ladder assembly which comprises a telescopically collapsible ladder in combination with a frame for mounting the ladder within a hatch opening, the frame comprising a mounting bracket to be secured in use to the hatch opening, to which bracket the uppermost section of the ladder is pivotably connected, and a carriage pivotably connected to the mounting bracket for supporting the weight of the ladder in its stowage position and preventing the ladder from extending unintentionally.

To prevent the ladder from extending under the action of its own weight, the carriage may be provided with means for releasably engaging the lowermost section of the ladder. The latter means may suitably comprise a pair of hooks for receiving lugs projecting laterally from the lowermost section of the ladder.

Preferably, the carriage is connected to the mounting bracket by means of at least one spring urging the carriage into the stowage position against the action of the weight of the ladder. Conveniently, each spring should be connected to the mounting bracket and the carriage in such a manner as to act as an over-centre toggle spring, so as

to urge the carriage away from the ladder when the latter is deployed.

The collapsible ladder is preferably constructed in the manner taught by EP-B1-0 527 766. In particular, the ladder may have locking pins built into the rungs that are spring biases to move laterally outwards into holes formed in the stiles to lock the sections of the stiles together when the ladder is in its extended position, the locking pins for the next higher section of the ladder being retracted as the rung carrying the locking pins approaches the rung beneath it. When constructed in this manner, the ladder will open naturally from the top downwards when its lowermost section is released from the carriage and it will collapse in sequence from the lowermost section upwards as it is raised into its stowage position.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described further, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a first embodiment of a loft ladder assembly of the present invention in its stowage position;

Fig. 2 is a side view of the loft ladder assembly in Fig. 1;

Fig. 3 is a side view of the loft ladder assembly with the carriage lowered into a vertical position;

Fig. 4 is a view similar to that of Fig. 3 with the ladder in its deployed position;

Fig. 5 is a perspective view of a second embodiment of a loft ladder assembly of the present invention in a partially lowered position;

Fig. 6 is a view similar to that of Fig. 5 with the ladder in its deployed position;

Fig. 7 is a side view of the loft ladder assembly in Fig. 6;

Fig. 8 is a perspective view of a third embodiment of a loft ladder assembly of the present invention in its stowage position;

Fig. 9 is a side view of the loft ladder assembly in Fig. 8;

Fig. 10 is a perspective view of the loft ladder assembly of Fig. 8 in a partially lowered position;

Fig. 11 is a side view of the loft ladder assembly of Fig. 8 with the carriage lowered into a vertical position;

Fig. 12 is a view similar to that of Fig. 11 with the ladder in its deployed position;

Fig. 13 is a perspective view of a fourth embodiment of a loft ladder assembly of the present invention in its stowage position; and

Fig. 14 is a side of the loft ladder assembly of Fig. 13 with the ladder in its deployed position.

DETAILED DESCRIPTION OF THE EMBODIMENTS

A first embodiment of a loft ladder assembly 10 is shown in Fig. 1, which comprises a telescopically collapsible ladder 12 and a frame 14 for mounting the ladder in a hatch opening. The frame 14 is formed of a mounting bracket 14a and a carriage 14b pivotable relative to the mounting bracket 14a between a horizontal position shown in Fig. 1 and a vertical position shown in Figs. 3 and 4. Two coil springs 16a and 16b act as toggle springs, as will be described below, to spring bias the carriage 14b into its two end positions.

The hatch opening is partially shown in Figs. 1- 14 with three of the walls 40 forming the hatch opening. The frame 14 is mounted on one of the walls 40 in the shown embodiments, but could also be mounted on the hatch door.

The ladder 12 is constructed in the same manner as a conventional telescopic ladder, which is currently commercially available under the trademark Telesteps®. Whilst such a construction of the ladder is preferred, it is not fundamental to the present invention and it will not therefore be described in detail in the present context. For further details on the internal construction of the ladder 12, reference may be made to EP-B1-0 527 766.

The Telesteps® ladder is preferred because it collapses from the bottom upwards and not from the top downwards. In particular, the ladder has locking pins built into its rungs, which are spring biased to move laterally outwards into holes formed in the stiles in order to lock the sections of the stiles together when the ladder is in its extended position. As two rungs come together, the lower rung presses on two levers 26 (shown of the second lowermost rung of Fig. 13) which depend from the upper rung to cause the locking pins formed in the upper rung to be retracted from the stiles. This now allows the next higher section of the ladder to be collapsed and the process repeats until all the sections are collapsed from bottom upwards.

Each of the rungs of the ladder has two laterally projecting lugs 24, which engage in hooks 22 projecting from the carriage 14b. After the ladder has been fully collapsed, the lugs 24 of the second lowermost rung 33 can be lifted onto the hooks 22 and this prevents the ladder from extending under the action of its own weight.

The uppermost section of the ladder is pivoted relative to the mounting bracket 14a about pins 28 passing two limbs 20 that project from the mounting bracket 14a. Similarly, the carriage 14b is pivoted about pins 18 passing through two short ears 30 that project from the mounting bracket 14a.

The springs 16a and 16b are connected to bracket 14a and the carriage 14b in such a manner that as the carriage pivots downwards from the horizontal position shown in Fig. 1 to the vertical position shown in Fig. 2, it passes through an over-centre position in which the ends of the spring and the pivot pins 18 lie in a straight line. In this position, the length of the spring is maximized and a force has to be applied to the carriage to move the carriage towards this position, as the position is approached in either direction. In other words, the springs 16a and 16b have a toggle action forcing the carriage 14b away from the over-centre position. Thus, the carriage is stably held by the springs 16a and 16b in both the horizontal and the vertical positions.

In use, the ladder assembly is fixed by securing the mounting bracket 14a by bolts or screws to the ceiling joists surrounding and defining the hatch opening. When the hatch door 60 (only shown in Figs. 12-14) is opened by being hinged or removed, the loft ladder assembly will be found in the hatch opening in its configuration shown in Fig. 1. In this state, the springs apply a moment to the carriage 14b, which is slightly greater than the moment of the combined weights of the ladder 12 and the carriage 14b, so that the loft ladder assembly will remain in the hatch opening after the hatch door has been opened.

To deploy the ladder, the carriage 14b is pivoted downwards against the action of the springs 16a and 16b by pulling down on a strap 32 (shown in Figs. 3 and 4). This operation does not require much effort because of the leverage afforded by the carriage 14b. The carriage is pivoted past the over-centre position to the position shown in Figs. 3 and 4, from which it will be seen that the line of action of the springs 16a and 16b has moved to the opposite side of the pins 18 so that the carriage 14b will

now remain stable in its vertical position without assistance from the weight of the ladder 12.

When the ladder is stowed away, there remains a distance between its top two rungs. This allows the user to lift the entire ladder and thereby disengage the lugs 24 from the hooks 22. Once the weight of the ladder 12 is no longer supported by the hooks 22, it will extend naturally from the top downwards as can be seen in Fig. 4. This allows the user to pull the ladder 12 away from the carriage 14b and to extend until it reaches the ground and is inclined at a safe and comfortable angle.

To stow away the ladder, the above procedure is essentially reversed. First after using the levers 26 (partially shown in Figs. 1 and 4) to release the locking pins of the second lowermost rung 33 of the ladder, the lowermost section (comprising the rungs 33 and 35) of the ladder is raised. As the rung 33 reaches the next higher rung, it will automatically release the locking pins of the next higher ladder section to collapse that ladder section. The process is repeated until the entire ladder is collapsed.

With all the sections of the ladder 12 collapsed against one another, the lugs 24 of the second lowermost rung 33 can be raised onto the hooks 22 whereupon the weight of the ladder will be fully supported by the carriage 14b. While holding the strap 32 (only shown in Figs. 3 and 4), the carriage can now be pivoted towards its horizontal position and once it passes the over-centre position the strap 32 is used to restrain the ladder so that it can be returned gently to its stowage position of Fig. 1. The hatch door can then be replaced or closed.

In Figs. 5-7 a second embodiment of the loft ladder assembly 10 is shown, where the arrangement for holding the ladder 12 in the stowage position is formed by a hook section 122 provided on the lowermost rung 35. The hook

section receives in the stowage position (shown in Fig. 5) a vertical bar 50 of the carriage 14b, which extends between the horizontal bars 51 and 52 of the carriage 14b. Apart from the holding arrangement the loft ladder assembly according to the second embodiment is operated in the same manner as the loft ladder assembly according to the first embodiment.

In Figs. 8 -12 a third embodiment of the loft ladder assembly 10 is shown, which is intended to be used in hatch openings where the ladder cannot be accommodated in the hatch opening, but needs to be stored in the loft above the hatch opening. The loft ladder assembly shown in Figs. 8-12 has a similar arrangement for holding the ladder 12 in the stowage position as the loft ladder assembly shown in Figs. 5-7, i.e. a hook section 122 is provided on the lowermost rung 35 to receive the vertical bar 50 of the carriage 14b.

The loft ladder assembly of Fig. 8-12 is further provided with L-shaped beams 70, which are pivotably connected to brackets 14a in a first end 70 and having the ladder 12 pivotably connected in a second end 71. The beams 70 enable an upper part of the ladder 12 to extend over the hatch opening so that the ladder 12 can be stowed away even though the ladder 12 is longer than the hatch opening. This is shown in Figs. 8 and 9.

To deploy the ladder, the carriage 14b is pivoted downwards against the action of the springs 16a and 16b by pulling down on a strap. This operation does not require much effort because of the leverage afforded by the carriage 14b. The beams 70 and the carriage 14b are pivoted past the over-centre position (see Fig. 10) to the position shown in Fig. 11, from which it appears that the line of action of the springs 16a and 16b has moved to the opposite side of the pins 18 so that the carriage 14b will now remain stable in its vertical position without assistance from the weight of the ladder 12.

From this position the user lifts the entire ladder and thereby disengages the hooks 122 from the bar 50 and the beams 70 are pivoted further. Once the weight of the ladder 12 is no longer supported by the bar 50, it will extend naturally from the top downwards similar to what can be seen in Fig. 4. This allows the user to pull the ladder 12 away from the carriage 14b and to extend until it reaches the ground and is inclined at a safe and comfortable angle. The beams 70 will typically be pivoted to the position shown in Fig. 14.

To stow away the ladder, the above procedure is essentially reversed. First after using the levers on the second lowermost rung 33 of the ladder 12 to release the locking pins, the ladder is raised. As the rung 33 reaches the next higher rung, it will automatically release the locking pins of the next higher ladder section to collapse that ladder section. The process is repeated until the entire ladder is collapsed.

With all the sections of the ladder 12 collapsed against one another, the hook 122 of the lowermost rung 35 can be placed onto the bar 50 whereupon the weight of the ladder will be fully supported by the carriage 14b. While holding the strap, the beams and the carriage can now be pivoted towards its horizontal position and once it passes the over-centre position the strap is used to restrain the ladder so that it can be returned gently to its stowage position of Figs. 8 and 9. The hatch door 60 can then be replaced or closed.

In Figs. 13 and 14 a fourth embodiment of the loft ladder assembly 10 is shown, which is intended to be used in hatch openings where the ladder cannot be accommodated in the hatch opening, but needs to be stored in the loft above the hatch opening. The loft ladder assembly shown in Figs. 13 and 14 is similar to the third embodiment of the loft ladder assembly shown in Figs. 8-12, but without the

carriage and the springs. The arrangement for holding the ladder 12 in the stowage position is similar to that of the second and the third embodiment, but the hook 122 is provided on the second lowermost rung 33 and a vertical bar 90 is received. The vertical bar 90 is mounted on braces 114a of the frame 14. The beams 70 are pivotably mounted on the bar 90.

In the stowage position as shown in Fig. 13 the weight of the upper part of the ladder 12, i.e. the part of the ladder 12 which extend over the hatch opening, secures that the ladder will remain in the stowage position. When the hatch door 60 is opened the ladder 12 will remain in the stowage position. To deploy the ladder the user pulls a strap connected to the lowermost rung and the beams 70 and the ladder 12 are pivoted past the over centre position to a horizontal position.

From this position the user lifts the entire ladder and thereby disengages the hooks 122 from the bar 50 and the beams 70 are pivoted further. Once the weight of the ladder 12 is no longer supported by the bar 50, it will extend naturally from the top downwards similar to what can be seen in Fig. 4. This allows the user to pull the ladder 12 and to extend it until it reaches the ground and is inclined at a safe and comfortable angle. The beams 70 will typically be pivoted to the position shown in Fig. 14.

To stow away the ladder, the above procedure is essentially reversed. First after using the levers on the second lowermost rung 33 of the ladder 12 to release the locking pins, the ladder is collapsed. As the rung 33 reaches the next higher rung, it will automatically release the locking pins of the next higher section to collapse that ladder section. The process is repeated until the entire ladder is collapsed.

With all the sections of the ladder 12 collapsed against one another, the beams can now be pivoted towards

its horizontal position and once it passes the over-centre position the hook 122 of the lowermost rung can be placed onto the bar 50 whereupon the weight of the ladder will be fully supported by the frame 14. The strap is used to restrain the ladder so that it can be returned gently to its stowage position of Fig. 13. The hatch door 60 can then be replaced or closed.

The lower part of the ladder 12 can also be releasably connected to the hatch door 60 so that the ladder 12 will pivot as the hatch doors opens.

The person skilled in the art will appreciate that various modifications may be made to the described loft ladder assembly without departing from the scope of the invention as set out in the appended claims. For example, the carriage 14b may carry or be connected to the hatch door. Furthermore, in place of springs, one could use a catch to hold the carriage in its raised position.

CLAIMS

1. A loft ladder assembly for accessing a loft through a hatch opening, where the loft ladder assembly comprises a telescopically collapsible ladder having a locking arrangement being releasable on one rung to collapse the ladder and a frame for mounting the ladder within a hatch opening, the frame comprising a mounting bracket to be secured in use to the hatch opening, connecting arrangements to pivotably connect the ladder to the frame and holding arrangements to hold the ladder in relation to the frame when the ladder is in a collapsed position, and where the ladder is provided with corresponding holding arrangements, which interacts with the holding arrangements on the frame.

2. A loft ladder assembly according to claim 1, wherein the uppermost section of the ladder is pivotably connected to the bracket, and where a carriage is pivotably connected to the mounting bracket for supporting the weight of the ladder in its stowage position and preventing the ladder from extending unintentionally.

3. A loft ladder assembly according to claim 1, wherein beams are pivotably connected to the frame, and the uppermost section of the ladder is pivotably connected to the beams.

4. A loft ladder assembly according to claim 3, wherein a carriage is pivotably connected to the mounting bracket for supporting the weight of the ladder in its stowage position and preventing the ladder from extending unintentionally.

5. A loft ladder assembly according to any of the preceding claims, wherein, in order to prevent the ladder

from extending under the action of its own weight, the carriage is provided with means for releasably engaging the lowermost section of the ladder.

6. A loft ladder assembly according to claim 5, wherein the means for releasably engaging the lowermost section of the ladder comprises a pair of hooks for receiving lugs projecting laterally from the second lowermost rung of the ladder.

7. A loft ladder assembly according to any of claims 3-4, wherein, in order to prevent the ladder from extending under the action of its own weight, the ladder is provided with means for releasably engaging the frame.

8. A loft ladder assembly according to claim 7, wherein the means for releasably engaging the frame comprises a hook section on a second lowermost rung of the ladder for receiving a vertical bar extending between the brackets of the frame.

9. A loft ladder assembly according to any of claims 1-5, wherein, in order to prevent the ladder from extending under the action of its own weight, the ladder is provided with means for releasably engaging the carriage.

10. A loft ladder assembly according to claim 9, wherein the means for releasably engaging the carriage comprises a hook section on a lowermost rung of the ladder for receiving a vertical bar connecting horizontal bars of the carriage.

11. A loft ladder assembly according to any of claims 3-4, wherein the beams can be provided with a holding arrangement, e.g. a spring or hook, in order to

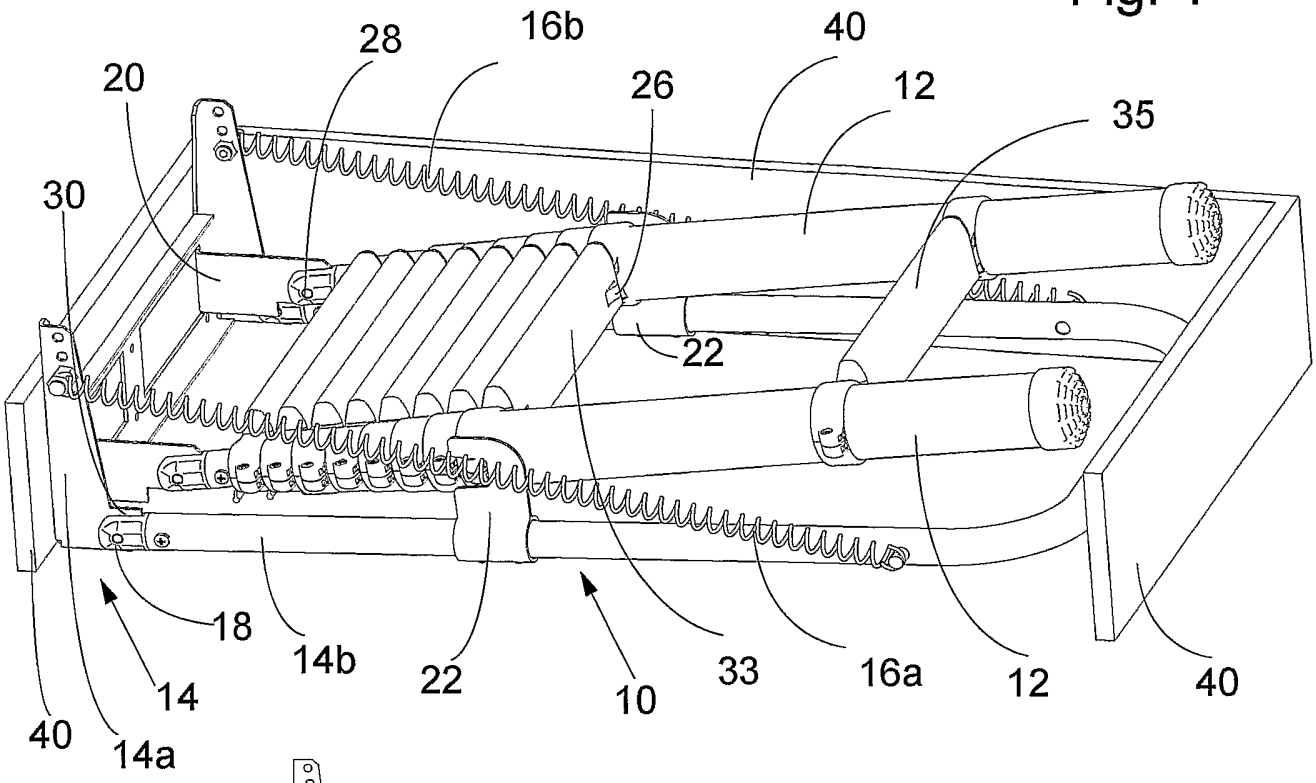
prevent the ladder from extending under the action of its own weight when being a stowage position.

12. A loft ladder assembly as claimed in any preceding claim, wherein the carriage is connected to the mounting bracket by means of at least one spring urging the carriage into the stowage position against the action of the weight of the ladder.

13. A loft ladder assembly as claimed in claim 12, wherein each spring is connected to the mounting bracket and to the carriage in such a manner as to act as an over-centre toggle spring, so as to urge the carriage away from the ladder when the latter is deployed.

14. A loft ladder assembly as claimed in any preceding claim, wherein the ladder has locking pins built into the rungs, which pins are spring biases to move laterally outwards into holes formed in the stiles in order to lock the sections of the ladder bars together when the ladder is in its extended position, the locking pins for the next higher section of the ladder being retracted as the rung carrying the locking pins approaches the rung beneath it.

Fig. 1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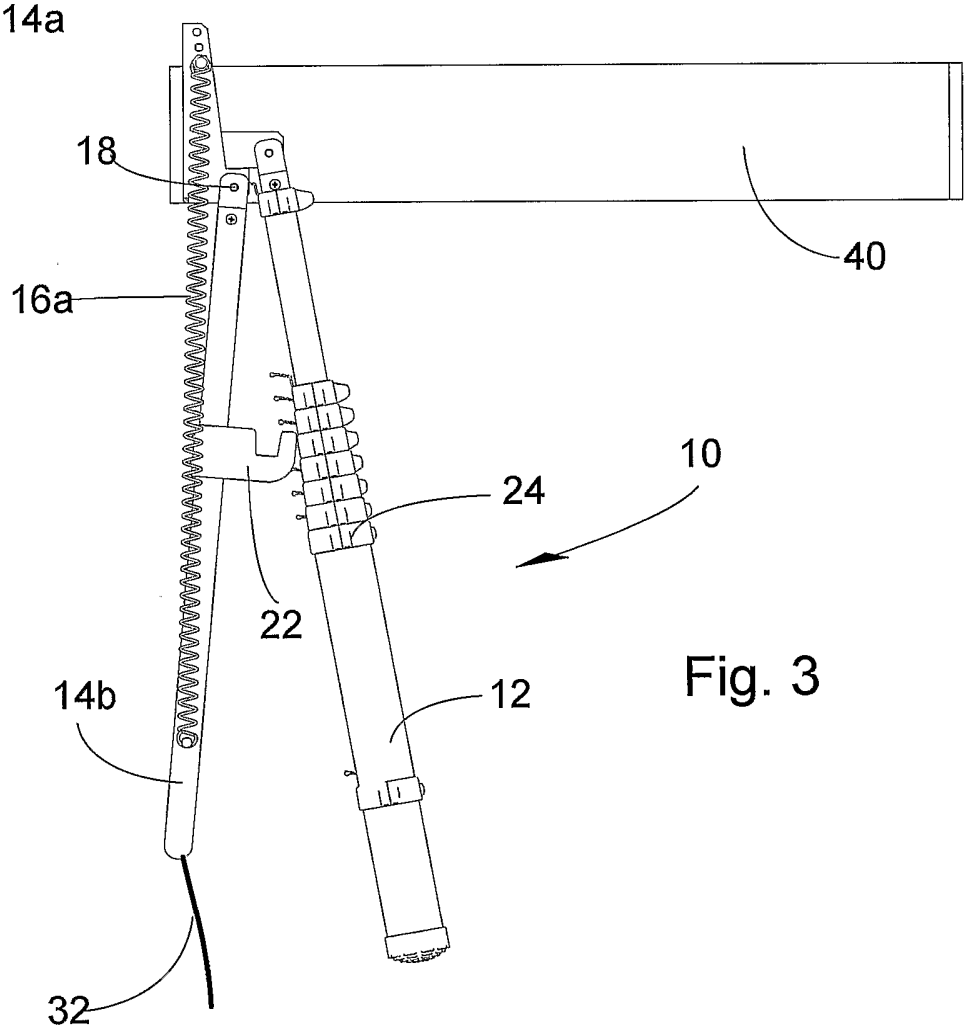
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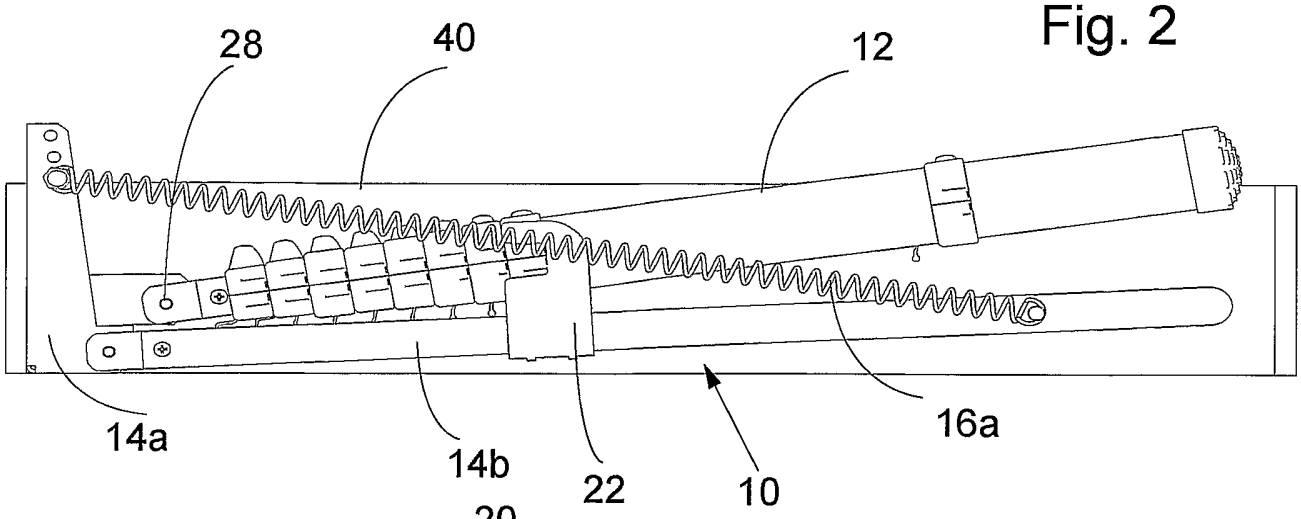
Fig. 3

Fig. 2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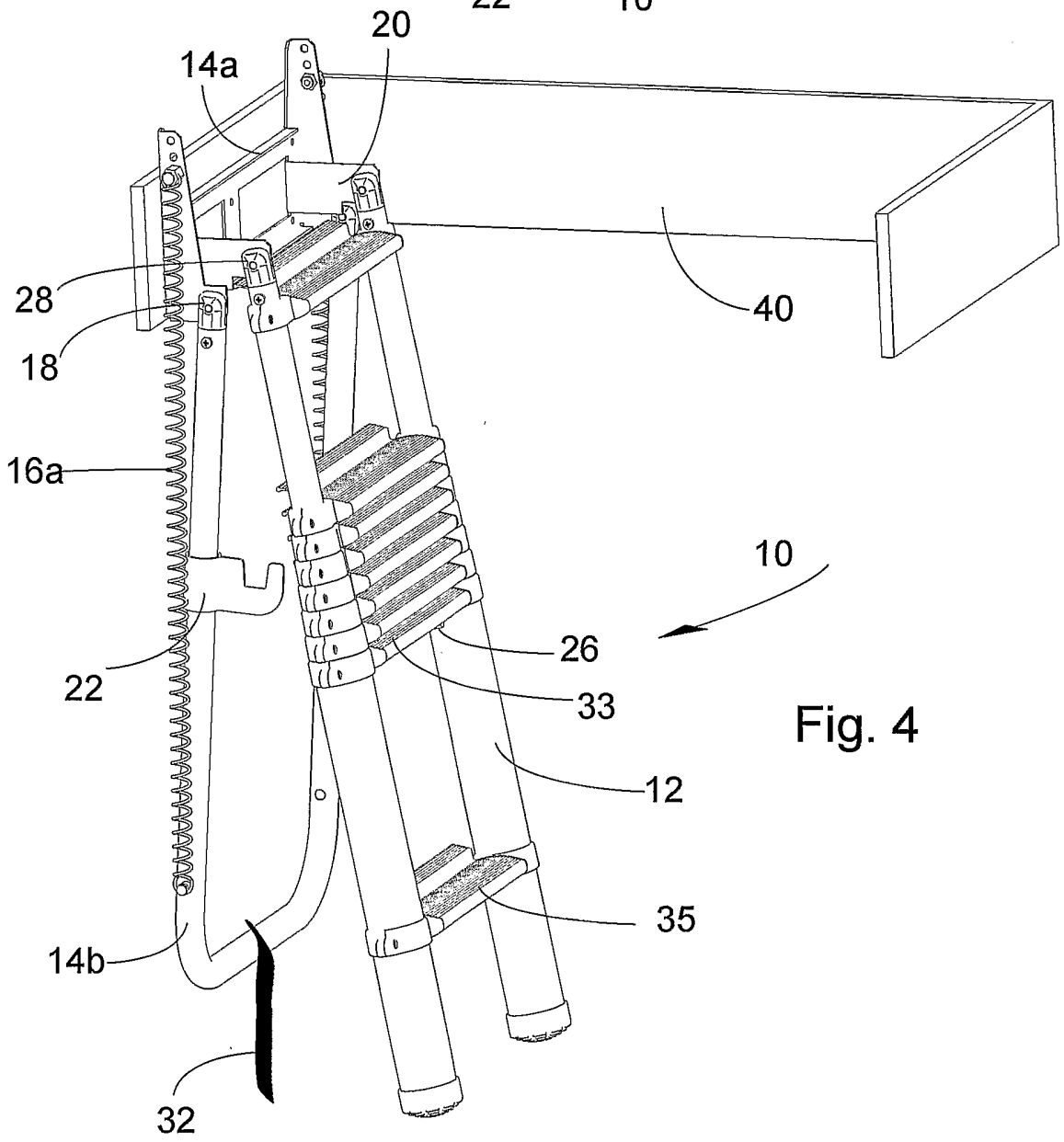
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Fig. 4

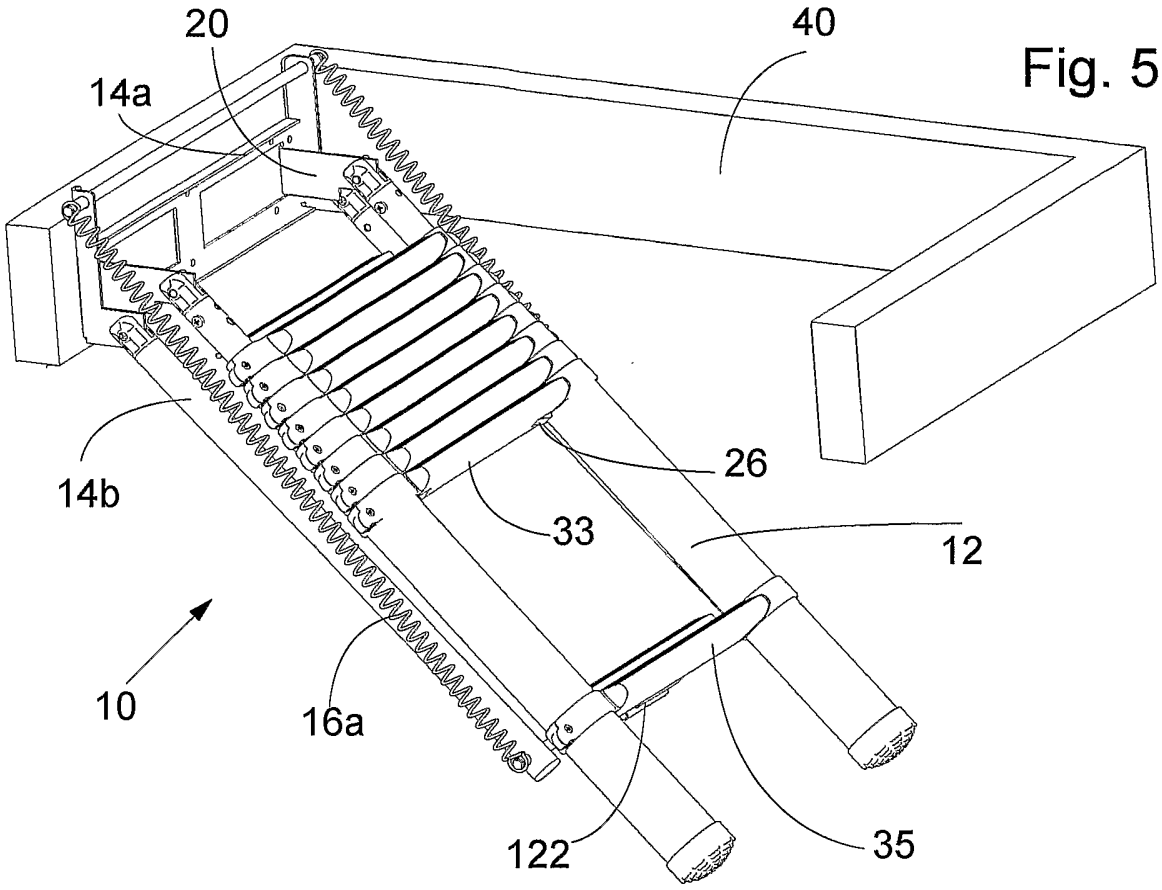
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Fig. 5

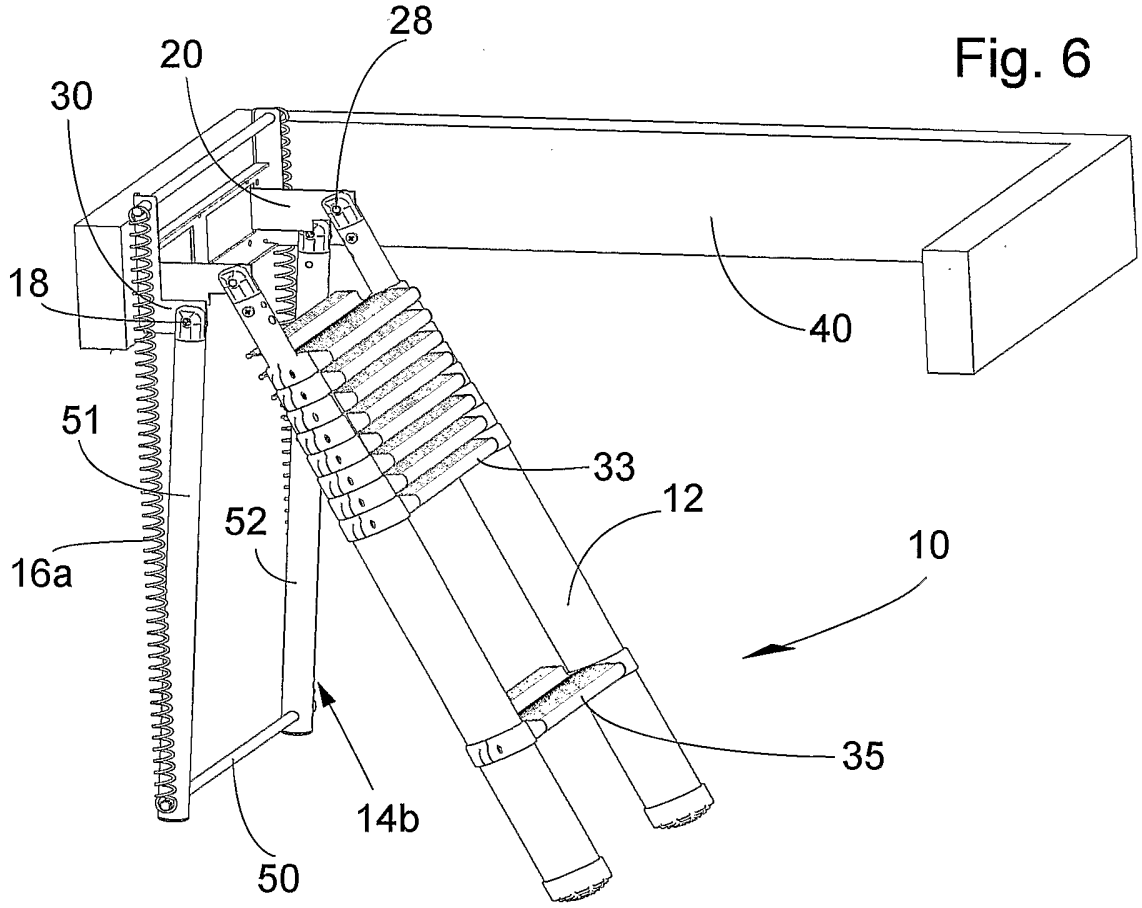
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Fig. 6

Fig. 7

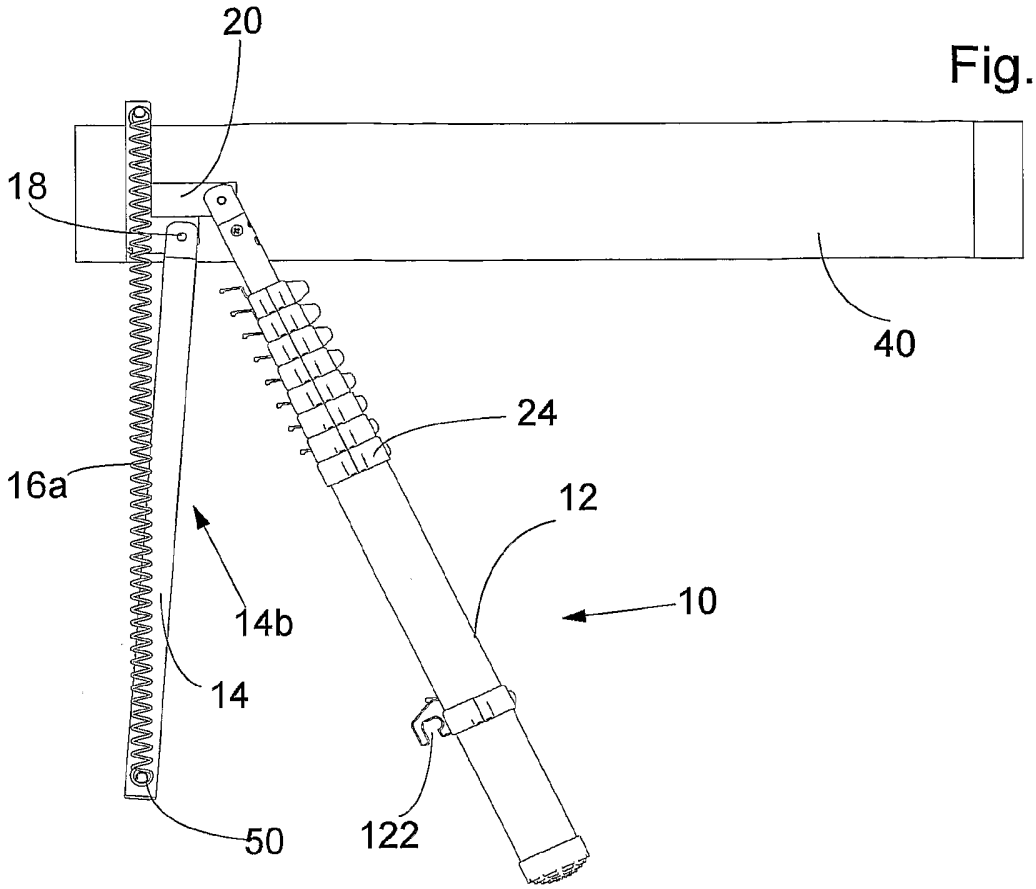
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Fig. 13

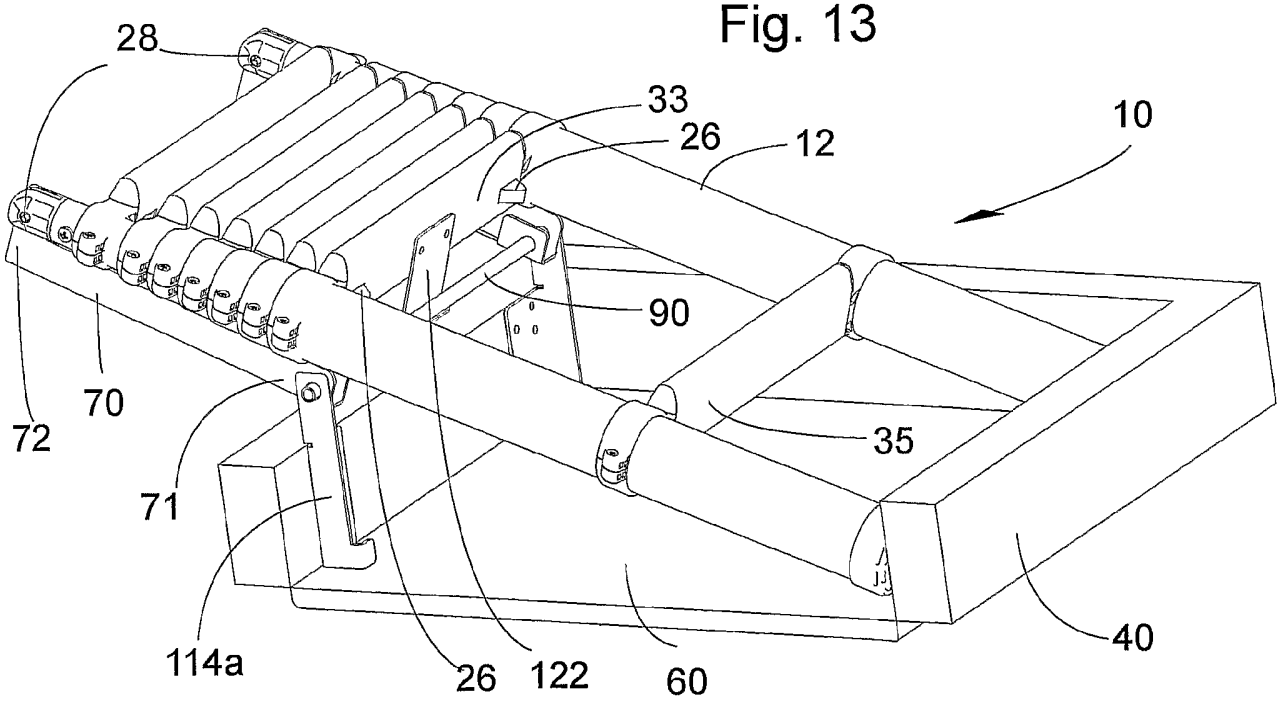
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Fig. 8

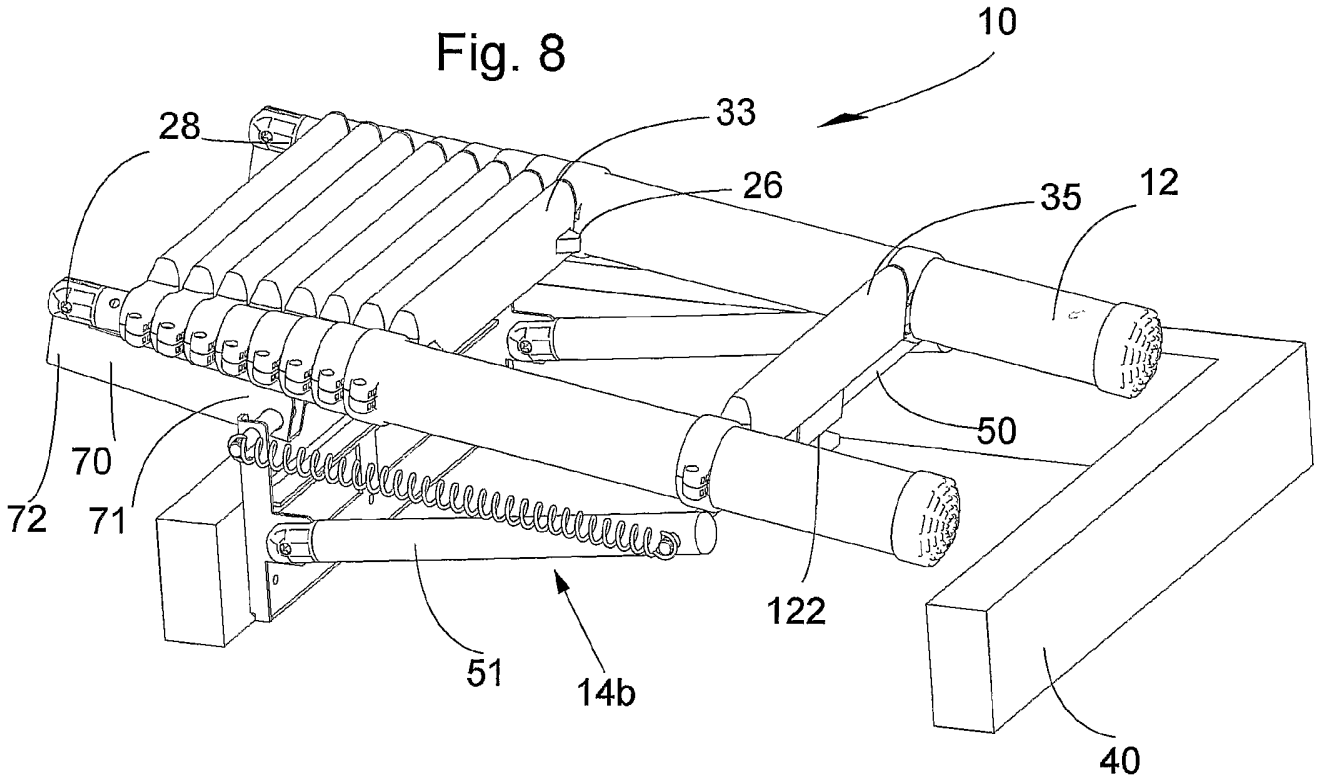
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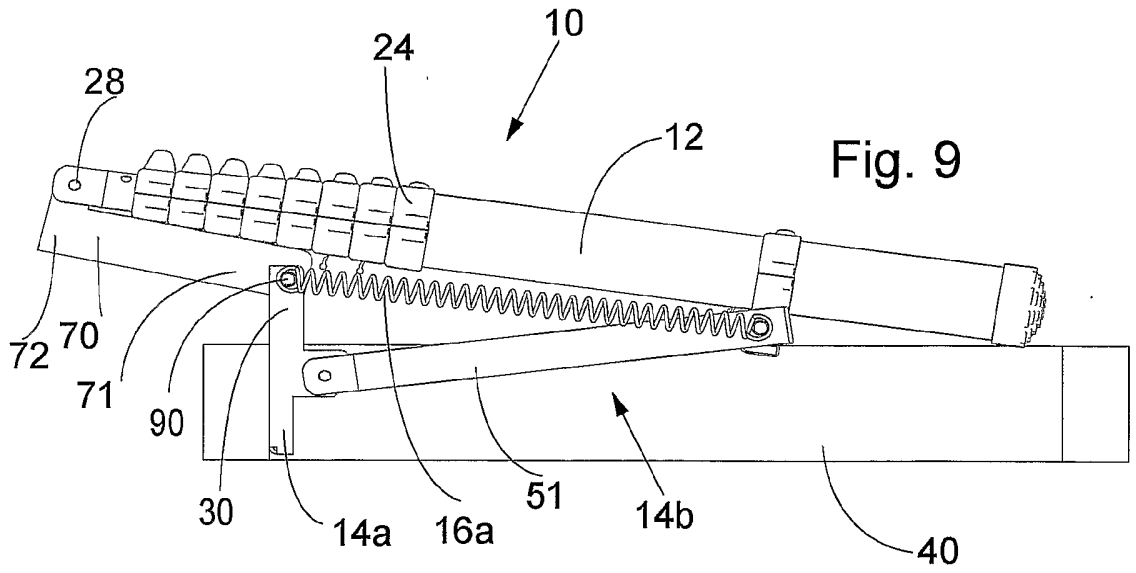
Fig. 9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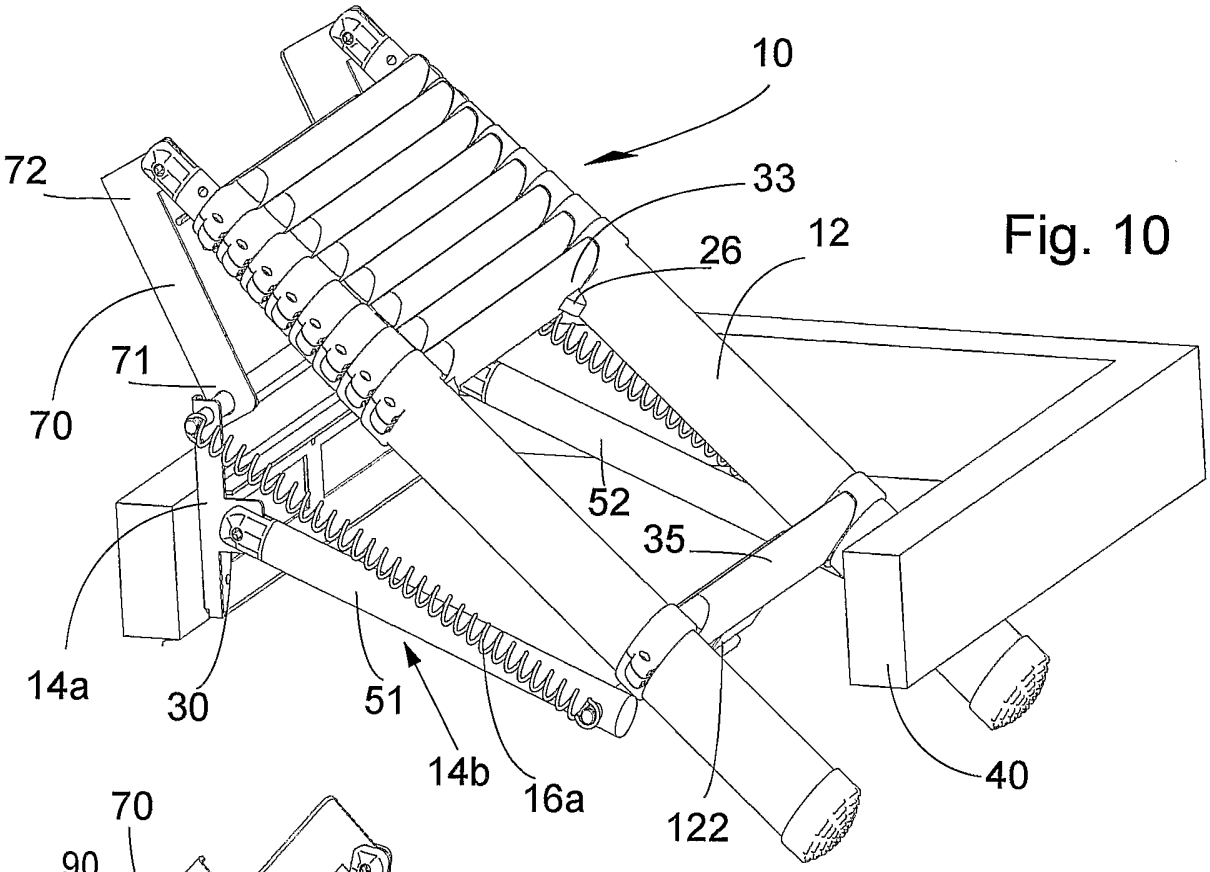
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Fig. 10

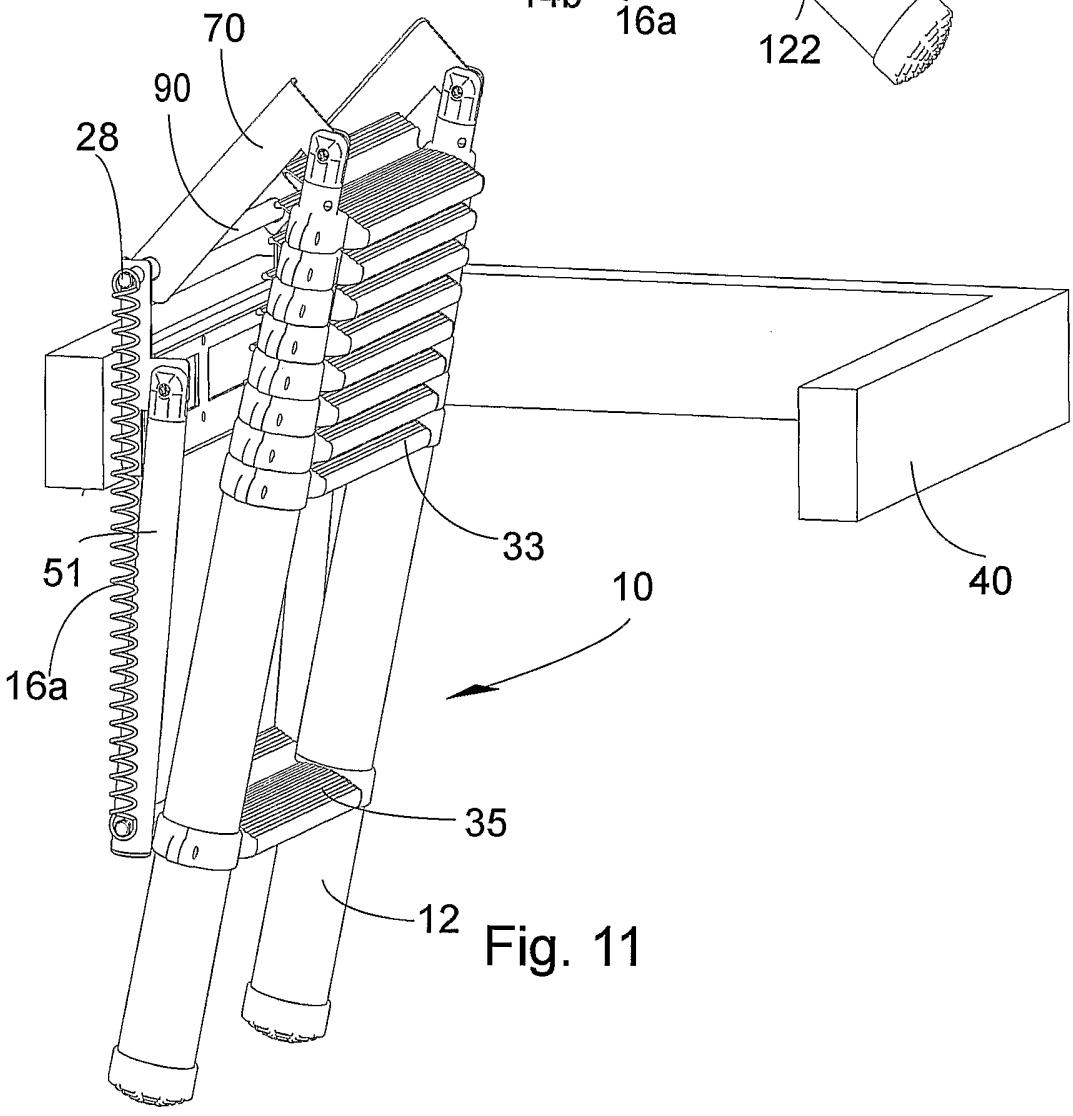
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Fig. 11

Fig. 12

Fig. 10

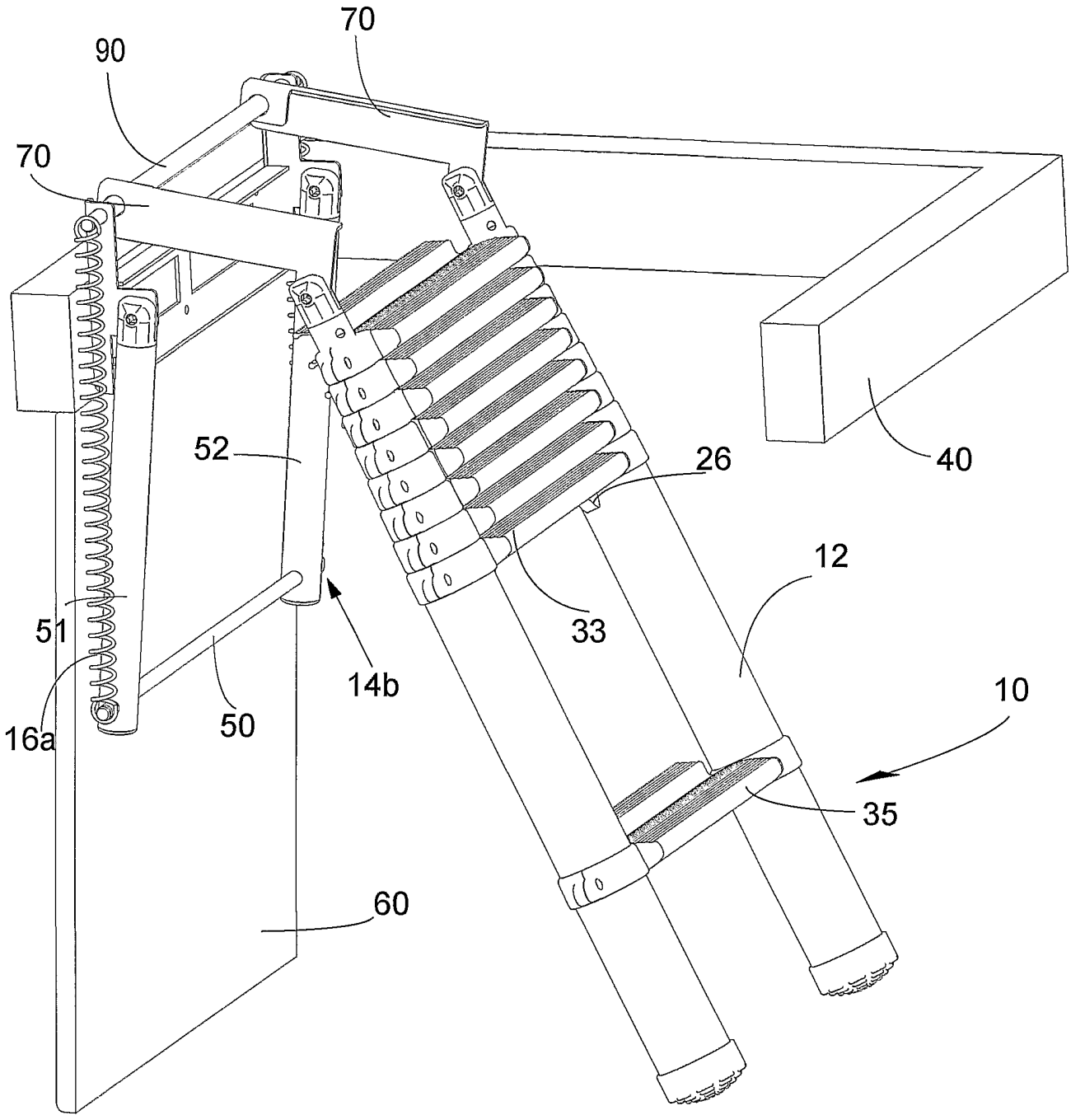
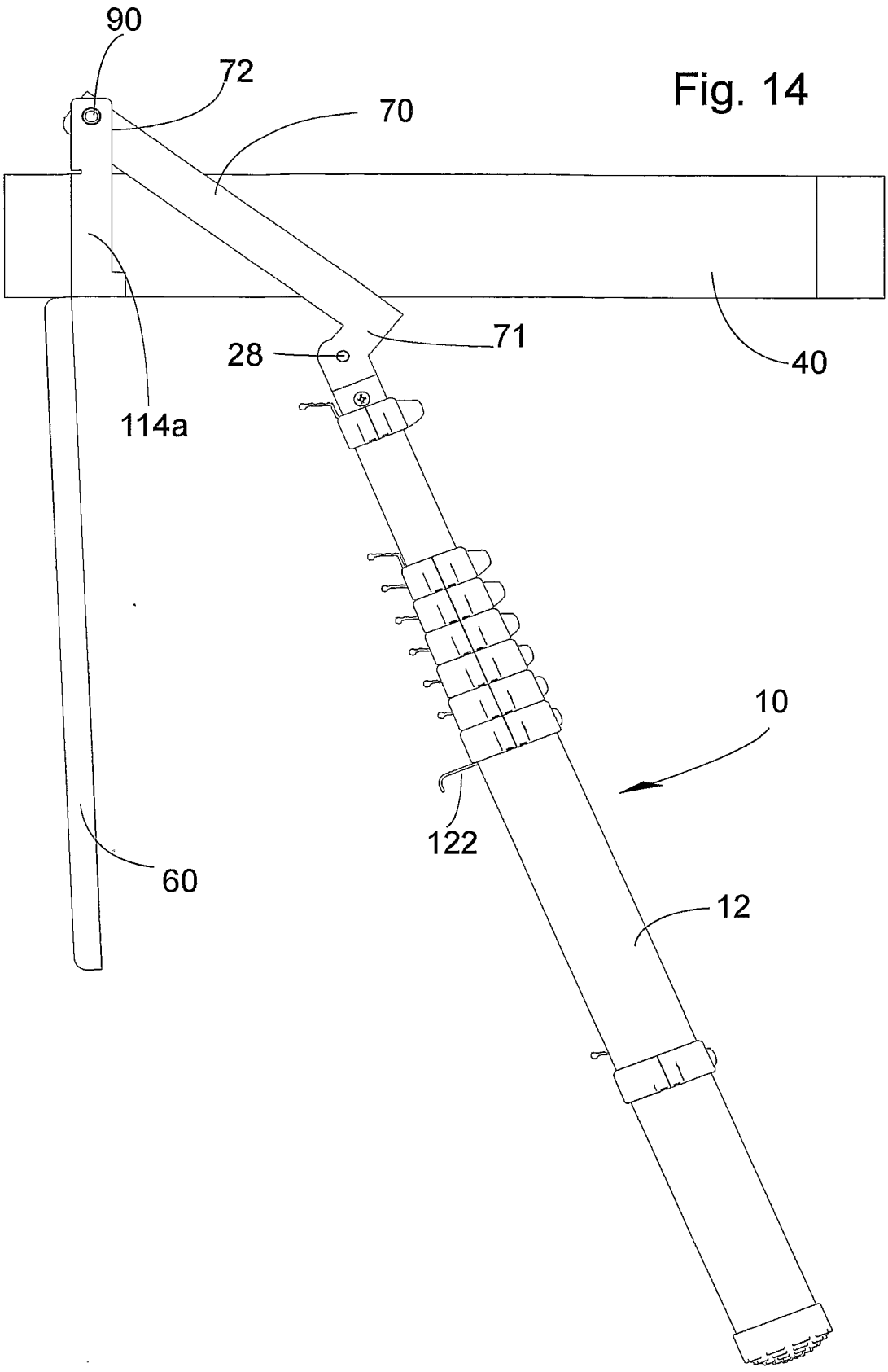


Fig. 14



INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 2005/000550

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: E04F 11/06
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)

IPC7: E04F, E06C

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

SE,DK,FI,NO classes as above

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

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2263932 A (TELESTEPS LIMITED), 11 August 1993 (11.08.1993), page 4, line 15 - line 19; page 6 - page 7, abstract	1,2,5,6,9, 10,12,13
Y		14
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Y	WO 9115651 A1 (SAFES-CAPE LIMITED), 17 October 1991 (17.10.1991), page 7, line 18 - page 9	14
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☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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"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
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 June 2005	27-06-2005
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Tommy Blomberg / MRo Telephone No. +46 8 782 25 00

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