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(54) **FALL PROTECTION DEVICE**

(57) The present invention relates to a fall protection device for safeguarding a worker during operations on a roof of a building, comprising:

- at least one elongate upright which extends upward in a position of use to a level higher than the roof, and to which a lifeline is to be arranged;
- a toppling prevention device which extends from the upright substantially transversely thereof; and

- wherein the toppling prevention device extending transversely from the upright is configured to engage around a corner of the building.

The toppling prevention device extending transversely from the upright preferably has at least one, and still more preferably at least two arms extending transversely from the upright.

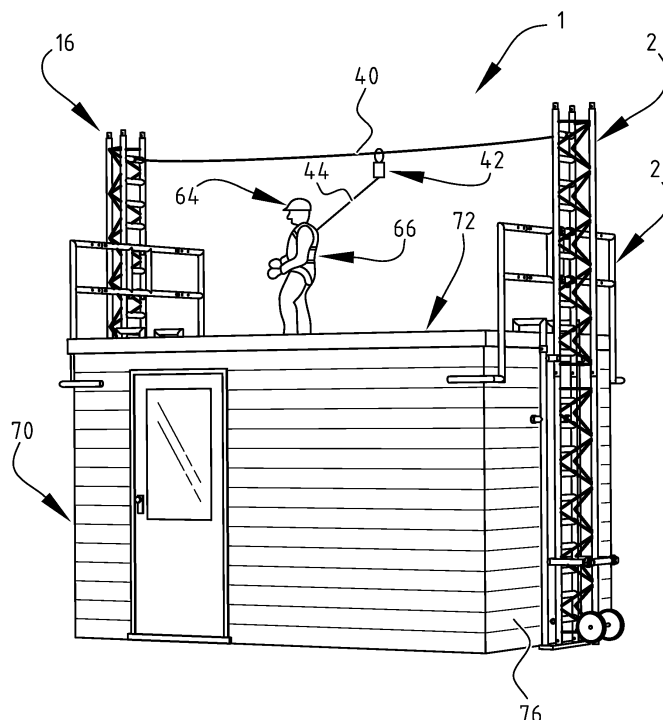


FIG. 1

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Description

[0001] The invention relates to a fall protection device, in particular a fall protection device for safeguarding a worker during operations on a roof of a building.

[0002] Safety of employees is of great importance, particularly in the construction industry. Although according to Dutch law a fall protection device is mandatory for operations at a height of 2.5 metres or more, provisions are often lacking in practice for actually arranging such a fall protection device. As a consequence hereof, and despite all the good intentions of employers and employees, operations are still regularly carried out wherein the desired fall protection device is inevitably dispensed with. Particularly in the case of operations on small roofs, such as a garage or a shed, which generally have dimensions of a maximum of 7 x 3 metres, it is often difficult to apply a fall protection device. Where on larger roofs safety rails can be arranged close to the roof edge, the space necessary therefor is lacking on such small roofs.

[0003] The application of a fall protection device on small roofs is made even more difficult when these small roofs comprise a roof of a detached building, which is precisely often the case with sheds and garages.

[0004] Because operations on small roofs are usually carried out by a single worker due to the limited space on the roof, it is advantageous that the fall protection device can be assembled and dismantled by one worker.

[0005] The fall protection device is preferably transportable on the roof of a car or in a trailer.

[0006] GB-A-2 413 821 discloses a safety apparatus with an overhead connection point arranged on a cable to which a worker can secure him/herself. Arranged on top of an upright is a rotating pulley over which a cable is guided. By providing excess cable on a winch, a fallen or injured worker can be safely lowered.

[0007] EP-A2-1 249 564 shows a safety device for protecting an individual working at height against falls in the construction industry. Use is made of uprights for stand-alone placing which rely only on laterally extending legs for protection against toppling.

[0008] DE-U1-20 2010 003968 discloses a releasable safety rail arrangeable close to a roof edge of a building. The safety rail is releasably attached to the outside wall of a building with a large number of anchor points to be arranged in the outside wall. A drawback is the large number of anchor points that must be arranged in the wall, which is not only labour-intensive but above all leaves holes in the wall after removal.

[0009] An object of the present invention is to provide a fall protection device for safeguarding a worker during operations on a roof of a building, wherein said drawbacks do not occur, or at least do so to lesser extent.

[0010] Said object is achieved according to the invention with a fall protection device for safeguarding a worker during operations on a roof of a building according to claim 1, comprising:

- at least one elongate upright which extends upward in a position of use to a level higher than the roof, and to which a lifeline is to be arranged;
- a toppling prevention device which extends from the upright substantially transversely thereof; and
- wherein the toppling prevention device extending transversely from the upright is configured to engage around a corner of the building.

[0011] The corner around which the upright is configured to engage is a corner between the wall along which the upright is disposed and an adjacent side wall. If the upright threatens to fall away from the corner around which it engages, the toppling prevention device is placed under strain of tension while it supports around the corner against the side wall adjacent thereto. For support in this load direction an anchoring to the wall or side wall is unnecessary. The toppling prevention device thus prevents the upright falling away from the engaged corner.

[0012] According to a preferred embodiment, the toppling prevention device has at least one arm extending transversely from the upright. This arm, which according to yet another embodiment is length-adjustable, bridges the distance to the corner of the building around which the toppling prevention device hooks or engages.

[0013] According to a further preferred embodiment, the arm extending transversely from the upright is configured to hook or engage in a position of use around a corner of the building.

[0014] In the case that an arm is provided on only one side of the upright, it will preferably not only hook around the corner of the building, but will preferably also be anchored to the building. Using a single arm a functioning toppling prevention device is in this way still provided in two directions parallel to the wall of the building wherein the upright is disposed. By anchoring the single arm to the building, the arm will also remain in contact with the building in the case the upright threatens to topple in the direction of the corner around which it engages, and will then be placed under strain of pressure. In the event the upright threatens to topple in the opposite direction, i.e. away from the corner around which the arm engages, the arm will be placed under strain of tension.

[0015] According to yet another preferred embodiment, the toppling prevention device extends on either side transversely from the upright, and is configured on both sides to engage around a corner of the building. Depending on the direction in which the toppling prevention device threatens to fall, the one or the other side of the toppling prevention device will be placed under strain of tension. Because a tension load can be absorbed better than a pressure load, which can result in buckling, a toppling prevention device configured to engage around a corner of the building on both sides can be given a lighter form. An important additional advantage is that anchoring of the toppling prevention device to the building has become unnecessary.

[0016] According to yet another preferred embodi-

ment, the toppling prevention device has at least two arms extending transversely from the upright which extend in opposite directions from the upright. The arms arranged on either side of the upright extend in an active state in opposite directions from the upright along a wall of the building in order to hook or engage around a corner of the building. Because two arms extending in opposite directions are applied, one of the arms is placed under strain of tension when there is a danger of toppling. Because tension load can be absorbed better than pressure load, the arms can be given a relatively lighter form.

[0017] According to yet another preferred embodiment, the arms extending in opposite directions from the upright lie substantially in a transverse plane extending transversely relative to the upright and the arms are configured to extend substantially parallel to a wall of the building.

[0018] Further preferred embodiments of the present invention form the subject-matter of the dependent claims.

[0019] Preferred embodiments of the present invention are further elucidated in the following description with reference to the drawing, in which:

Figure 1 is a perspective view of a building with a fall protection device for safeguarding a worker during operations on the roof thereof according to a preferred embodiment of the invention;

Figures 2-5 are perspective views of successive steps in arranging an upright of the fall protection device shown in figure 1.

Figure 6 is a side view of a building with a fall protection device according to figure 1.

[0020] Building 70 in figure 1 is a shed with a small roof 72. A worker 64 standing on roof 72 of building 70 wears a harness 66. Worker 64 is secured via a safety line 44 and an inertia reel 42 to a lifeline 40 of a fall protection device 1.

[0021] Fall protection device 1 for safeguarding worker 64 during his/her operations on roof 72 of building 70 comprises at least one elongate upright 2 which extends upward in a position of use to a level higher than roof 72. Lifeline 40 is arranged on upright 2.

[0022] A toppling prevention device 20 extends from upright 2 substantially transversely thereof and prevents upright 2 from toppling.

[0023] Fall protection device 1 shown in figures 1-6 comprises one further elongate upright 16 which likewise extends upward in a position of use to a level higher than roof 72. Lifeline 40 is arranged between elongate upright 2 and further elongate upright 16. It is noted that it is also possible, for instance if building 70 is not completely detached, to envisage attaching such a lifeline 40 to a wall (not shown) of an adjacent building (not shown) instead of to a further upright 16. A fall protection device with one elongate upright 2 will in that case suffice.

[0024] Further upright 16 is preferably identical to up-

right 2, and the description of further upright 16 is therefore dispensed with.

[0025] Successive steps in arranging a fall protection device 1 according to the invention are further elucidated with reference to figures 2-5, wherein the different measures of the individual components of fall protection device 1 will be discussed.

[0026] Although it is possible to envisage an upright 2 being disposed in stand-alone manner adjacently of or against a building 70, a higher measure of convenience of use is obtained if an upright support 50 is applied for this purpose (figure 2). Upright support 50 is configured to be connectable to building 70 during use and to thereby couple elongate upright 2 to building 70. Because upright support 50 can be given a smaller and lighter form than upright 2, convenience of use is thus enhanced. If desired, upright support 50 can be given a divisible form, so that it is transportable in parts.

[0027] Upright support 50 is preferably length-adjustable so that it is adaptable to different building heights.

[0028] In the shown embodiment upright support 50 is provided with a hook 52 which is configured to hook round a roof edge 74 of building 70 and/or to support on roof 72 of building 70 during use.

[0029] Hook 52 is preferably disconnectable from upright support 50 so that it can be removed temporarily during work operations, for instance if a roof covering has to be arranged or repaired at the location where hook 52 supports on roof 72 of building 70. Once upright 2 and further upright 16 have been arranged and connected to each other with a lifeline 40, hook 52 can safely be (temporarily) disconnected, as will be further elucidated with reference to figure 6.

[0030] Upright support 50 comprises in the shown embodiment two elongate tubes 51 connected to each other with a foot plate 53. At the end of tubes 51 opposite foot plate 53 upright support 50 is provided with two hooks 52. The two hooks 52 hook around roof edge 74 of building 70, and support on roof 72 thereof.

[0031] It is noted that embodiments can also be envisaged wherein upright support 50 comprises only one elongate tube 51 which extends between hooks 52 and foot plate 53. Hooks 52 can in that case be integrated into a combined part connectable to tube 51.

[0032] Upright support 50 rests with its foot plate 53 on the ground adjacently of building 70, and supports with supports 58 against a wall 76 of building 70.

[0033] Fall protection device 1 can be anchored with a safety eye bolt 80 arranged in wall 76 of building 70. In figure 6 upright 2 and further upright 16 are each anchored with a safety strap 82 to a safety eye bolt 80 arranged in wall 76 of building 70.

[0034] Foot plate 53 can alternatively be provided with an anchoring (not shown) with which foot plate 53 can be anchored to the ground. This anchoring (not shown) can for instance be a through-bore in foot plate 53 through which an anchor pin is arranged in the ground.

[0035] Provided on foot plate 53 of upright support 50

in the shown embodiment are two projections 56 on which upright 2 is arrangeable (figure 3). Upright 2 is placed between two guides 55 of upright support 50.

[0036] Upright support 50 is further provided with at least one lock 54 with which elongate upright 2 can be locked to upright support 50. Figure 4 shows the locked situation of lock 54.

[0037] In the shown embodiment upright 2 is given a divisible form and comprises a first upright part 4 and a second upright part 6. As a result of the divisible embodiment of upright 2 it can be transported in more compact dimensions, for instance in or on the roof of a van.

[0038] As can be clearly seen in figure 3, upright 2 is considerably longer than upright support 50. Because upright 2 is not only longer but also comprises much more material, upright 2 is moreover considerably heavier in assembled state than upright support 50. It will therefore be apparent that the application of an upright support 50 can considerably enhance the convenience of use for a worker 64 during erection of fall protection device 1. It is particularly user-friendly for upright 2 to be provided with travel wheels 12, so that it can be moved easily to upright support 50 by a worker 64.

[0039] In order to impart the desired strength to upright 2, upright 2 is preferably embodied as a truss structure 8. In the shown embodiment truss structure 8 has a triangular cross-section in longitudinal direction. One side of this triangular truss structure 8, i.e. the side configured to face toward wall 76 of building 70 in the position of use, is provided in the shown preferred embodiment with transverse bars 10 which extend substantially perpendicularly of the longitudinal direction of upright 2 and to which toppling prevention device 20 is connectable (figures 4 and 5).

[0040] Toppling prevention device 20 extending transversely from upright 2 is configured to engage on or around building 70. Although toppling prevention device 20 can in principle have for this purpose a flexible engagement in the form of for instance a tensioning strap, it is preferable that toppling prevention device 20 comprises at least one arm 22 extending transversely from the upright. In such an embodiment with a substantially rigid arm 22 the toppling prevention device 20 can also function as railing 26.

[0041] Toppling prevention device 20 is provided with suspension hooks 32 with which toppling prevention device 20 can be coupled to the transverse bars 10 of upright 2 extending substantially perpendicularly of the longitudinal direction of upright 2.

[0042] Toppling prevention device 20 prevents fall protection device 1 according to the invention from toppling in lateral direction, i.e. along the short side of building 70 in the figures, which will be elucidated still further with reference to figure 6.

[0043] Arm 22 extending transversely from upright 2 is configured to engage or hook around a corner of building 70 in a position of use. This corner of building 70 can be a roof edge 74 or a corner 78 between two walls 76

of building 70.

[0044] When the at least one arm 20 extending transversely from upright 2 is length-adjustable, i.e. provided with a length adjustment 24, toppling prevention device 20 can be adapted to the dimensions of building 70.

[0045] In the shown embodiment toppling prevention device 20 has an arm 22 extending transversely from upright 2 with a length adjustment 24. On the end remote from upright 2 arm 22 is provided with a railing upright 28 extending downward during use and provided on the underside with a hooking arm 30 with which toppling prevention device 20 can hook and support against a side wall 76 of building 70.

[0046] Toppling prevention device 20 is preferably connected to upright 2 at a level higher than roof 72 in a position of use. Upright 2 will after all, in the case it topples in lateral direction thereof, display a greater displacement on the upper side of upright 2 than on the underside of upright 2, i.e. close to the tipping point located on or close to the ground. Having the toppling prevention device 20 engage with upright 2 at a level higher than roof 72 has two effects: toppling prevention device 20 can on the one hand make use of a long moment arm, whereby toppling can be effectively prevented, and toppling prevention device 20 can on the other be embodied as railing 26.

[0047] Should fall protection device 1 threaten to fall in lateral direction, for instance if worker 64 shown in figures 1 and 6 were to be in danger of falling off the long side of the shown building 70, upright 2 will then displace in that direction. Upright 2 will here want to tilt round a tipping point on or close to the ground, wherein upright 2 will pull with it the toppling prevention device 20 coupled thereto. Toppling prevention device 20 engages however with hooking arm 30 on a side wall 76 of the building, more specifically the long side in figures 1 and 6 opposite the long side from which worker 64 is in danger of falling. As a consequence hereof the arm 22 of toppling prevention device 20 extending transversely from upright 2 is placed under strain of tension, and prevents upright 2 from toppling.

[0048] Figure 6 shows in a side view how hooking arm 30 of toppling prevention device 20 supports against side wall 76 on the long side of building 70 and thus prevents fall protection device 1 according to the invention from toppling in lateral direction, i.e. along the short side of building 70 in the figures.

[0049] It is noted that in figure 6 upright 2 and further upright 16 are anchored with safety straps 82 to safety eye bolts 80 which are arranged on either side in walls 76 on the short sides of building 70. Arranged between upright 2 and further upright 16 is a lifeline 40 which has a certain tension and thereby pulls the upper sides of upright 2 and further upright 16 toward each other. Roof edge 74 will hereby want to function as pivot point, and a tilting of upright 2 and further upright 16 around roof edge 74 is prevented by the anchoring of upright 2 and further upright 16 to walls 76 of building 70. For this reason hook 52 of upright support 50 can safely be (tempo-

rarily) removed, as already stated above.

[0050] Although it shows a preferred embodiment of the invention, the above described embodiment is intended only to illustrate the present invention and not to limit the specification of the invention in any way. When measures in the claims are followed by reference numerals, such reference numerals serve only to contribute toward the understanding of the claims, but are in no way limitative of the scope of protection. The described rights are defined by the following claims, within the scope of which many modifications can be envisaged.

Claims

1. Fall protection device for safeguarding a worker during operations on a roof of a building, comprising:
 - at least one elongate upright which extends upward in a position of use to a level higher than the roof, and to which a lifeline is to be arranged;
 - a toppling prevention device which extends from the upright substantially transversely thereof; and
 - wherein the toppling prevention device extending transversely from the upright is configured to engage around a corner of the building.
2. Fall protection device as claimed in claim 1, wherein the toppling prevention device has at least one arm extending transversely from the upright.
3. Fall protection device as claimed in claim 1 or 2, wherein the arm extending transversely from the upright is configured to hook or engage in a position of use around a corner of the building.
4. Fall protection device as claimed in any of the foregoing claims, wherein the toppling prevention device extends on either side transversely from the upright, and is configured on both sides to engage around a corner of the building.
5. Fall protection device as claimed in claim 4, wherein the toppling prevention device has at least two arms extending transversely from the upright which extend in opposite directions from the upright.
6. Fall protection device as claimed in claim 5, wherein the arms extending in opposite directions from the upright lie substantially in a transverse plane extending transversely relative to the upright and are configured to extend substantially parallel to a wall of the building.
7. Fall protection device as claimed in claims 2-6, wherein the at least one arm extending transversely from the upright is length-adjustable.
8. Fall protection device as claimed in any of the foregoing claims, wherein the toppling prevention device is connected in a position of use to the upright at a level higher than the roof.
9. Fall protection device as claimed in any of the foregoing claims, wherein the upright is divisible.
10. Fall protection device as claimed in any of the foregoing claims, wherein the upright is a truss structure, wherein the truss structure preferably has a triangular cross-section in longitudinal direction.
11. Fall protection device as claimed in claim 10, wherein at least one side of the triangular truss structure, wherein the side is configured to face toward a wall of the building in a position of use, is provided with transverse bars which extend substantially perpendicularly of the longitudinal direction of the upright and to which the toppling prevention device is connectable.
12. Fall protection device as claimed in any of the foregoing claims, further comprising an upright support configured to be connectable to the building during use and to thereby couple the elongate upright to the building.
13. Fall protection device as claimed in claim 12, wherein at least one lock is provided with which the elongate upright can be locked to the upright support.
14. Fall protection device as claimed in claim 12 or 13, wherein the upright support is provided with a hook configured to hook around a roof edge of the building and/or to support on the roof of the building during use, wherein the hook is preferably disconnectable from the upright support.
15. Fall protection device as claimed in any of the foregoing claims, comprising at least one further elongate upright which extends upward in a position of use to a level higher than the roof and to which the lifeline between the elongate upright and the further elongate upright is to be arranged.

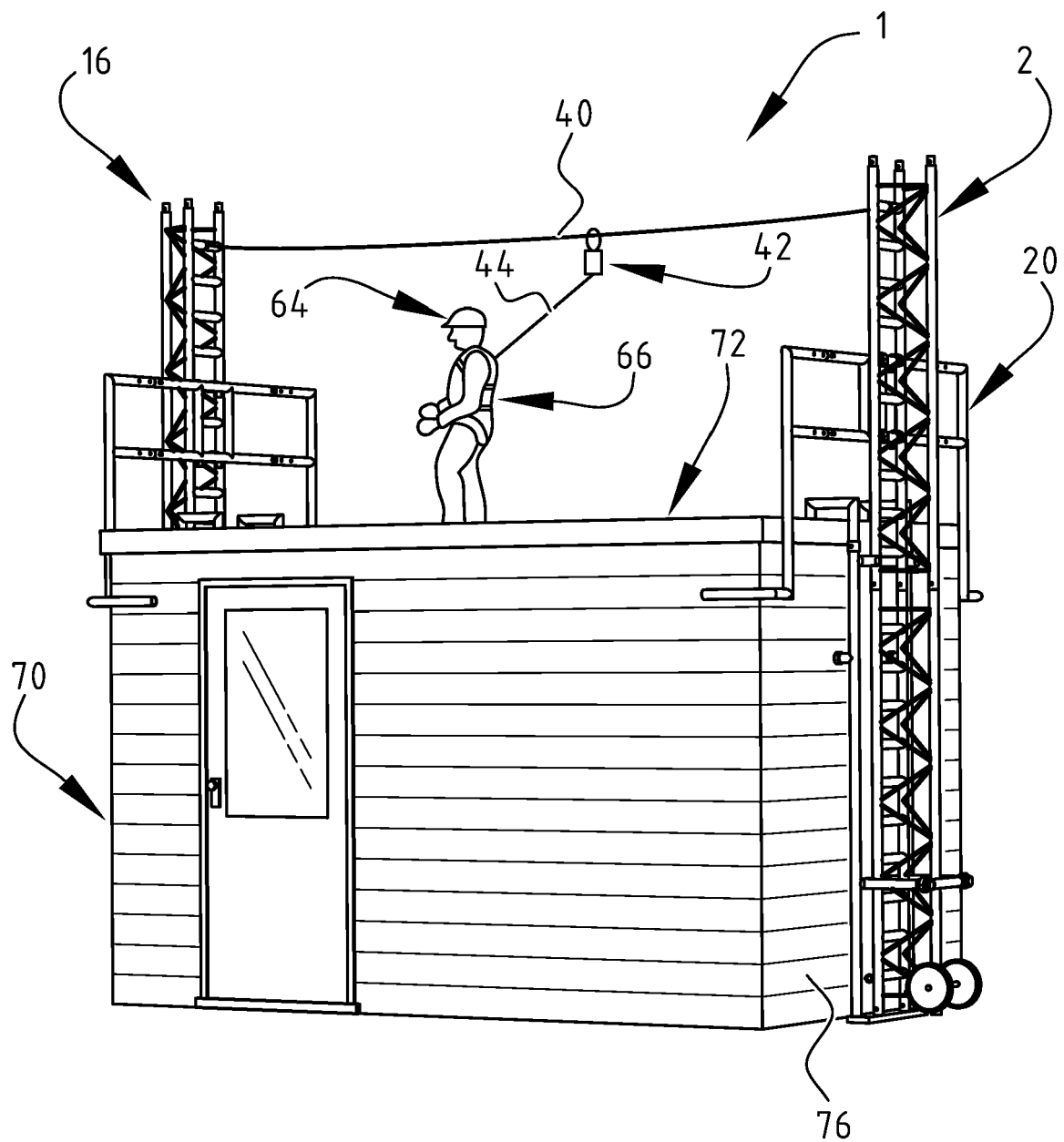


FIG. 1

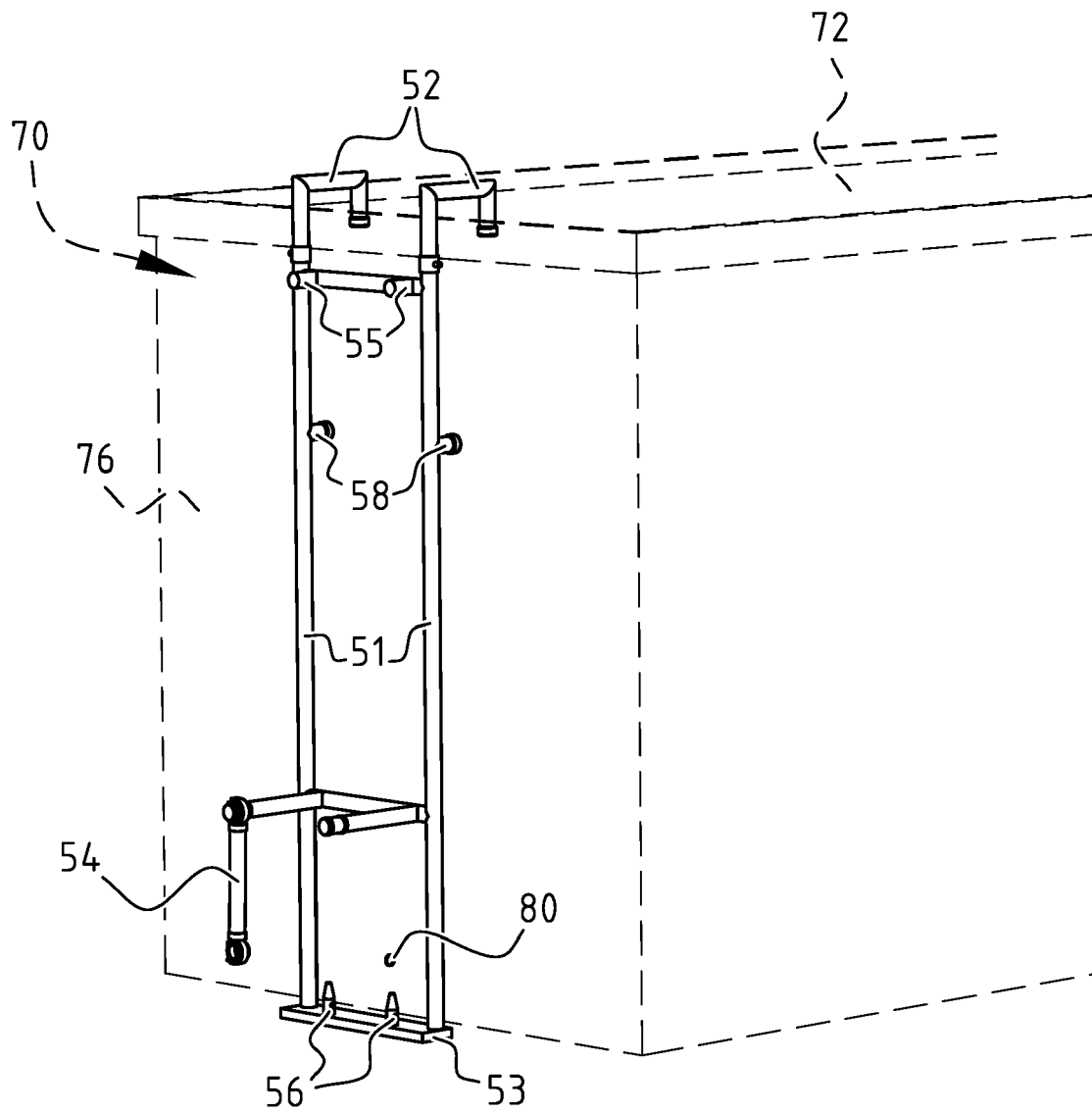


FIG. 2

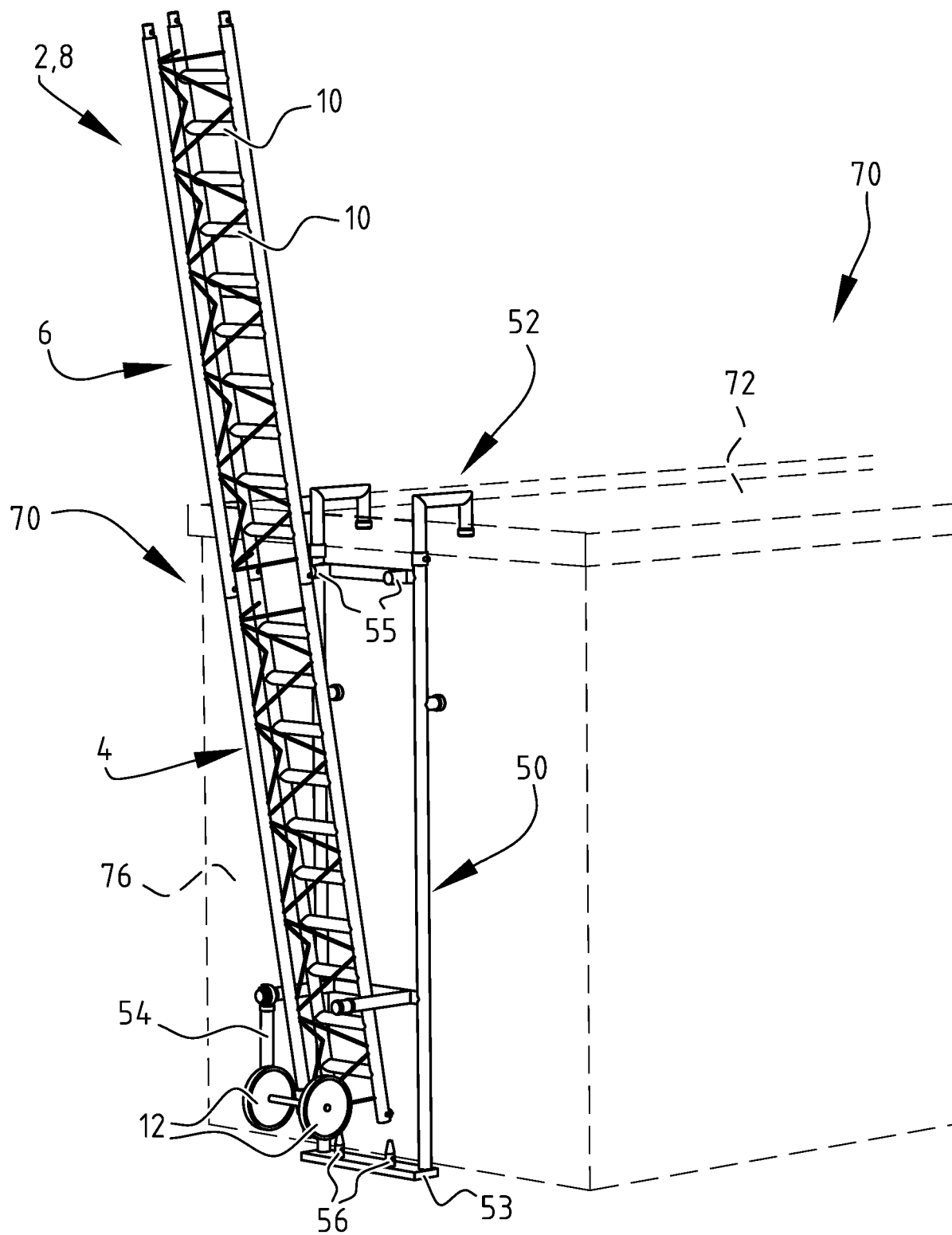


FIG. 3

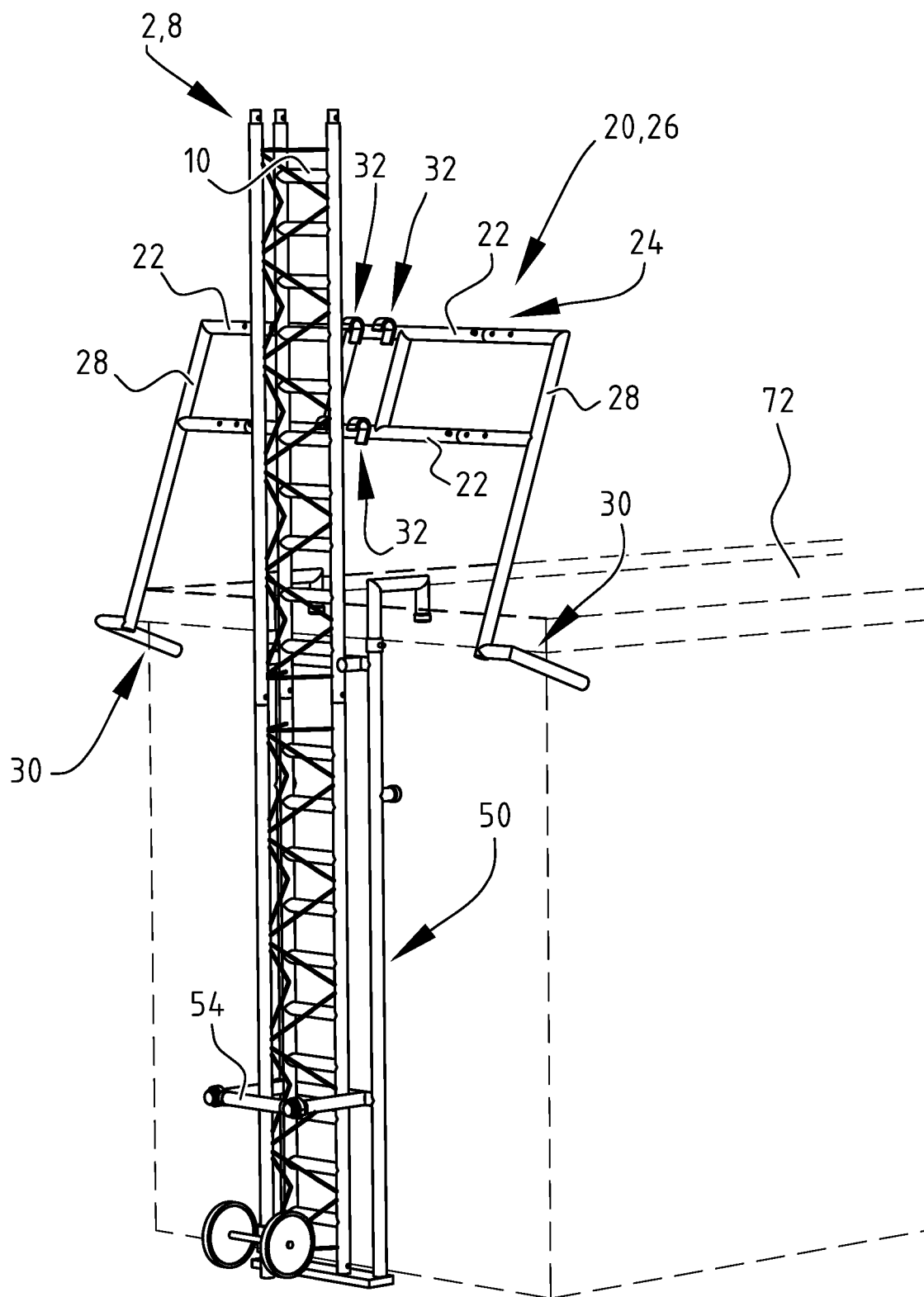


FIG. 4

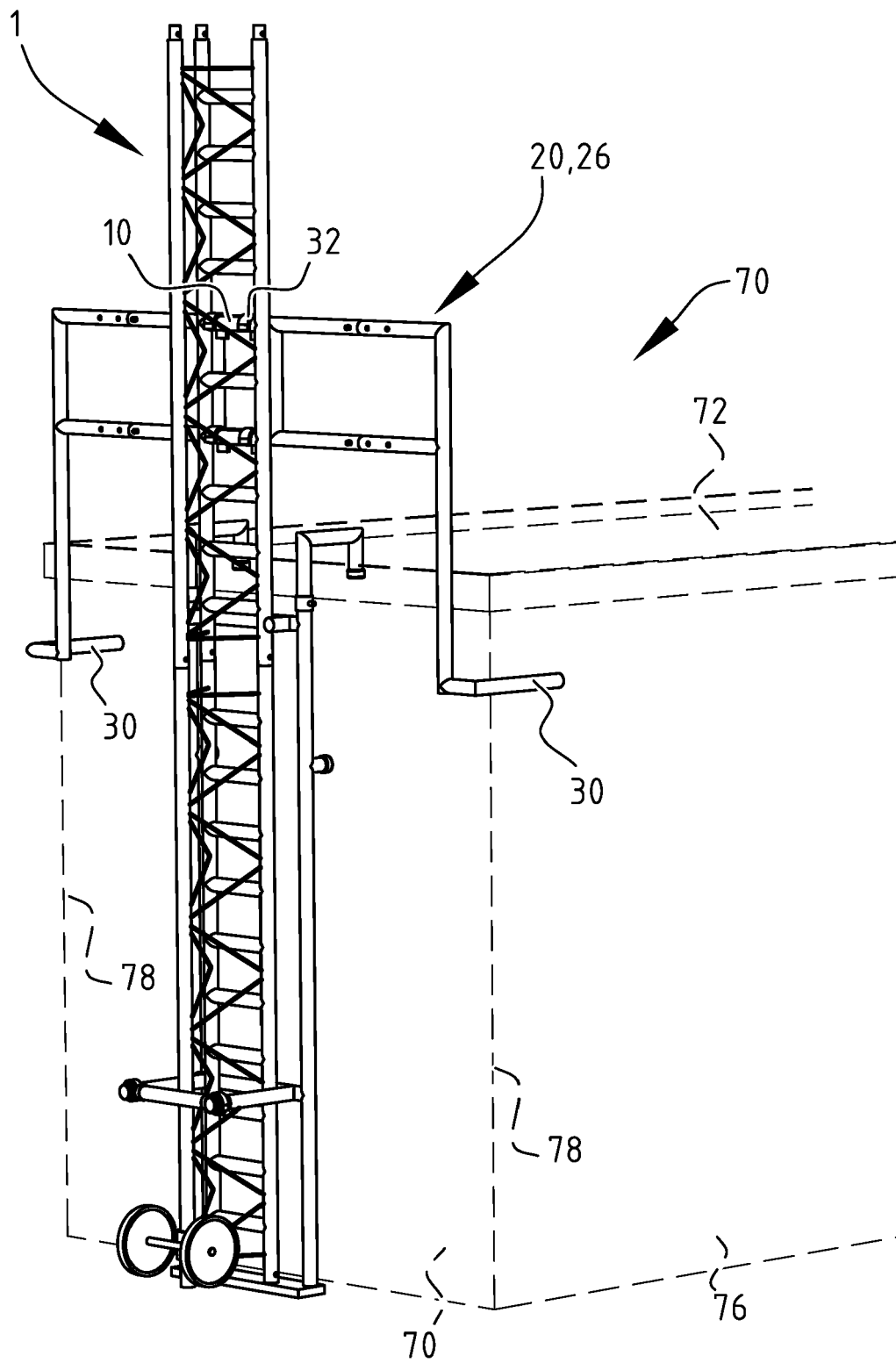
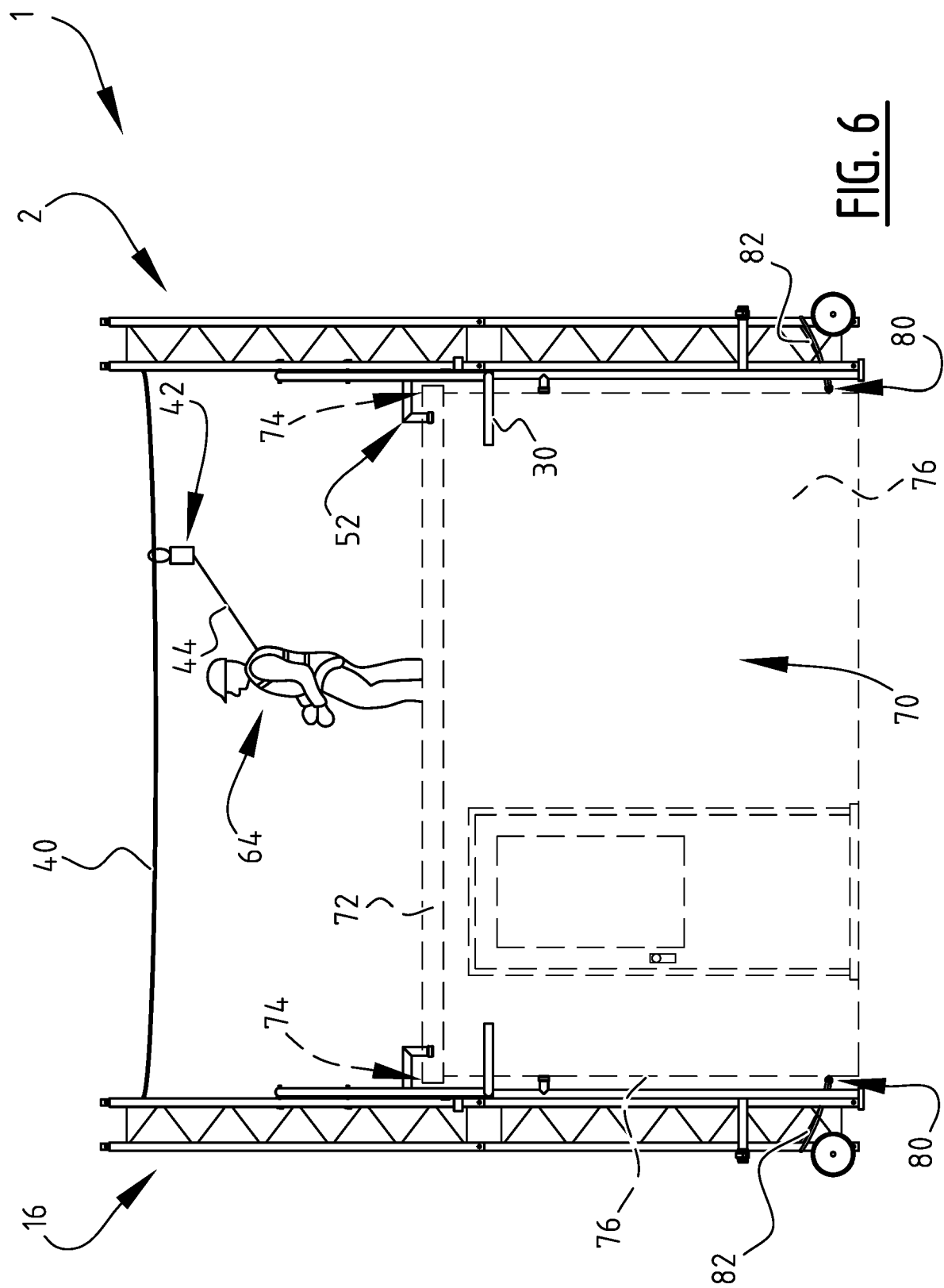


FIG. 5





EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC) E04G A62B E04C E06C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 13 September 2017	Examiner Baumgärtel, Tim
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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