



- (51) **International Patent Classification:**
E06C 7/42 (2006.01) *E06C 7/44* (2006.01)
- (21) **International Application Number:**
PCT/IB2015/059630
- (22) **International Filing Date:**
15 December 2015 (15.12.2015)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
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AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,
BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,
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HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR,
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TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) **Designated States** (*unless otherwise indicated, for every
kind of regional protection available*): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ,
TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU,
TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE,
DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,
LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, KM, ML, MR, NE, SN, TD, TG).

Published:

- (81) **Designated States** (*unless otherwise indicated, for every
kind of national protection available*): AE, AG, AL, AM, — with international search report (Art. 21(3))

(54) **Title:** LADDER STABILISER

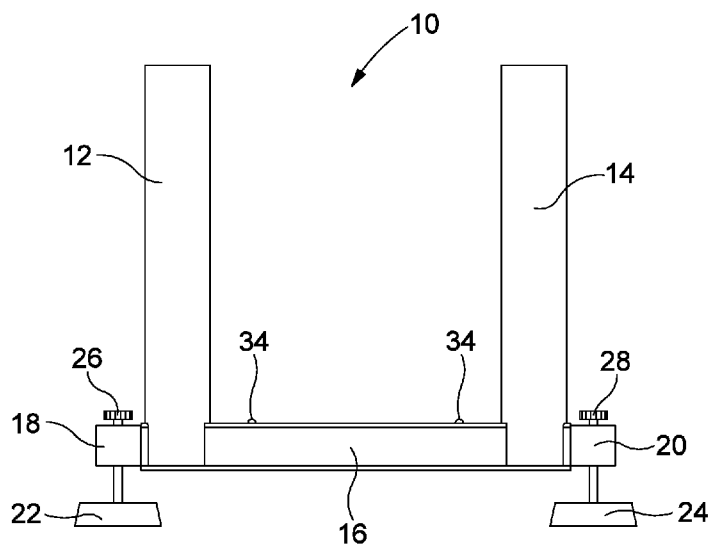


Fig. 1

(57) **Abstract:** A stabiliser for attachment to a base of a ladder, the stabiliser including a housing containing arms which slide between a retracted and deployed position wherein when deployed the arms extend laterally beyond the stiles of the ladder while being held firmly by the housing, characterised in that, when retracted, the arms lie adjacent one another within the housing in an at least partially overlapping relationship.

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Ladder Stabiliser

This invention relates to ladders and more specifically to increasing the stability of ladders and especially telescopic ladders when erected.

Collapsible ladders are utilised because of the convenience they provide. They may be transported easily, such as in the boot of a car, and may be carried and erected by one man. It is beneficial for such ladders to collapse to the smallest possible size, whilst still allowing them to be erected to a useful height.

Reducing the physical dimensions to produce the smallest collapsed size has the downside of reducing the width of the footprint when the ladder is erected. A narrower footprint reduces the stability of the ladder, the degree of instability is more noticeable the taller the ladder.

Previous solutions to this include the provision of removable feet located at the bottom of each stile which serve to widen the footprint of the ladder, but these are cumbersome to attach or remove each time the ladder is collapsed or erected for transport. One such solution is proposed by US 6,851,518 which describes overlapping extendable stabilisers to widen the footprint of the ladder.

With a view to mitigating the foregoing disadvantage, the present invention provides an extendable ladder as set forth in claim 1 of the appended claims.

Preferably the contact points of both feet lie substantially in a plane containing central axes of the stiles.

Additionally, when retracted, the arms may lie side by side in a substantially horizontal plane normal to the plane containing central axes of the stiles.

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Alternatively, when retracted, the arms may lie one above the other in a plane substantially parallel to the plane containing the stiles of the ladder.

Preferably when retracted, the arms may overlap one another over a
5 major proportion of their length.

Additionally, in cross section, the arms may be rectangular such that when adjacent one another their overall cross section is substantially square.

Preferably at least one arm is telescopic such that it may deploy
10 to an extended length that is greater than the distance between the stiles of the ladder.

At least one arm may be lockable in the retracted position.

Preferably, at least one arm may be locked in position by means of a locking mechanism arranged between at least one arm and the
15 housing, the mechanism comprising a resiliently biased locking pin releasably engaging within a hole.

Additionally the housing may include multiple holes allowing the arm to be locked at different degrees of extension between the fully retracted and fully deployed positions.

20 The stabiliser may further comprising a height adjustable foot extending from at least one arm for engaging an uneven or non-horizontal surface.

The offset may be provided by means of a bracket arranged between an arm and its respective foot.

25 Preferably at least one arm is resiliently urged towards the deployed position.

According to a second embodiment of the present invention, there is provided a ladder as set forth in claim 14 of the appended claims.

30 Preferably the ladder is telescopically extendable.

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

Figure 1 shows the base of a ladder incorporating a stabiliser according to the present invention, in the retracted position,

5 Figure 2 shows a similar view to that of Figure 1, except that the stabiliser is the deployed position,

Figure 3 shows a plan view of the embodiment of Figures 1 and 2, viewed through the hollow stiles of the ladder with the stabiliser in the retracted position,

10 Figure 4 shows an engineering diagram of the view of Figure 3 in the retracted position,

Figure 5 shows an engineering diagram of the view of Figure 3 in the deployed position,

15 Figure 6 shows a perspective view of a stabiliser housing wherein the stabiliser arms are themselves telescopically extendable,

Figure 7 shows a perspective view of an alternative stabiliser housing wherein the stabiliser arms are arranged one above the other when in the retracted position,

20 Figure 8 shows a similar view to that of Figure 2, but of the embodiment shown in Figure 7,

Figure 9 shows a perspective view of a further embodiment, similar to that of Figure 7, wherein the stabiliser arms are themselves telescopically extendable,

25 Figure 10 shows a similar view to that of Figure 8, but of the embodiment shown in Figure 9, and

Figure 11 shows a perspective view of a further embodiment, wherein a stabiliser housing is attached to the foot of a conventional ladder.

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The sole purpose of the stabiliser as described in the present invention is to provide a wider footprint for any kind of ladder to which the stabiliser is either attached or formed within. The wider the footprint the further apart the outer feet are about which it may pivot and therefore the more stable.

The main problem with providing this increased width is that the extra width created makes the ladder bulkier during transport. The present invention is intended to provide a convenient method of packaging a ladder stabiliser into the smallest possible space when not in use whilst still providing the greatest possible stability when required.

Turning now to Figure 1, we see the base of a ladder 10, having two stiles 12 and 14. The figure shows most of the ladder cut-away resulting in no rungs being visible in the diagram. A housing 16 is situated at the end lower most ends of stiles 12 and 14, perpendicular to axes of the stiles 12 and 14. It is similar in appearance to a rung in that it laterally spans the gap between the stiles. In the embodiment shown, channels are removed from the stiles 12 and 14 to receive the housing 16 which may be bonded, welded or bolted in place. It may equally be secured by any appropriate means. Additionally, it need not be located at the very base of the ladder but at any suitable height, preferably below the lower most rung (not shown).

In an alternative embodiment, shown in Figure 11, the stabiliser, including the housing 16 may be bolted underneath the foot of the ladder 10 such that it appears as a bottom most rung within the plane of the stiles and the rungs of the ladder. The ladder being secured by fastening it between flanges 36 extending from the upper service of the stabiliser housing.

The housing 16 in the preferred embodiment is square in cross-section though it may equally be rectangular, circular or ovular. The housing contains arms 18 and 20 which are preferably rectangular in cross-section and have their long axis parallel to the axis of the stiles 12 and 14. This is preferable as it results

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in greater to resistance to bending forces applied substantially in a direction parallel to the stiles 12 and 14. Arms having any cross sectional shape may be used, including square, triangular, circular or oval, so long as they are sufficiently capable of withstanding the bending stresses that may be applied during use.

The arms 18 and 20 are retained adjacent one another inside the housing 16 in a retracted or storage position such that they do not hinder movement of the ladder 10 when in transport. When required the arms 18 and 20, slide laterally from the housing 16 into an extended position as shown in Figure 2.

The housing 16 may contain two discreet parallel channels, each for receiving a respective arm such that a portion of each arm retained within the housing 16, even when fully extended, is held firmly by the housing. There is no requirement for discreet channels, their purpose is entirely to support the arms regardless of their position, this may be achieved by providing a channel or guide which may communicate with the shape of or slot within each arm to support it at all points along its travel.

The arms 18 and 20 each include a height adjustable foot, 22 and 24 respectively. In the drawings shown, all the figures display the feet, when the arms are in a retracted position, extending beyond the width of the stiles 12 and 14. While this makes for a more simple construction, in alternative embodiments the arms and feet of the ladder may, when in the retracted position, extend no further than the stiles 12 and 14.

The height of each foot, 22 and 24, is adjusted by means of a threaded shaft and nut, the combination of these two components is labelled 26 and 28 for the left and right hand side, respectively. The lowermost end of each shaft terminates in a ball and socket or other suitable joint that connects to the foot, 22 and 24. This enables the foot to be angled appropriately to accommodate inclined or uneven surfaces. In alternative embodiments, the feet may be hemispherical rather than circular as shown in the figures. The important point of the present invention is the orientation of

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the line joining the contact points between the feet and the ground, or the surface, upon which the ladder is resting when in use. It is essential that this line lies within the plane containing the major axes of stiles. This is so that as weight is transferred to the stabilising arms 18 and 20, the reaction force with the ground does not create a torque that would twist the ladder relative to a wall against which its stiles should be resting, and further destabilise the ladder.

The threaded shafts are engaged within bores extending vertically through arms 18 and 20. Preferably, though not essentially, the threaded shafts may be of a smaller diameter than that of the bores. This allows for the shafts to slip past the internally threaded bores to allow the feet to be pushed into place for most of their travel. Once resistance to further movement is met by the foot against the ground, the weight of the ladder and the movement of the ball and socket joint cause the threaded shaft to engage the threaded bore at a slight angle forcing the threads to bite. This allows the feet to be pushed most of the way into place and then tightened by the nut. Additionally, the nut may be capped with knob to allow it to be turned by the finger tips rather than a spanner.

Figure 3 shows a ladder according to the present invention, when viewed from above. The circles 12 and 14 represent the cut away hollow ladder stiles. An important point to note is that, as a result of the arms lying adjacent one another within the housing 16 when in the retracted position, without correction, a plane containing the central axes of the feet 22 and 24, would not be coplanar with the stiles of the ladder. This can be dangerous in that it results in instability as the weight of a user on the ladder can result in a twisting moment through the arms. One embodiment of the present invention solves this by providing an offset bracket 30 provided on at least one arm, in this case arm 18. The offset bracket 30 enables the foot 22 to be supported in a bore by means of threaded shaft/nut 26, such that the plane containing both shafts 26 and 28 is coplanar with the plane

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containing the stiles 12 and 14, resulting in no twisting moment. In alternative embodiments, the offset required to position the contact points within the plane of the major axes of the stiles can be provided by way of the design of the feet. Asymmetrical
5 feet, or feet provided with an eccentric threaded shaft 26 for engagement within the bore in each respective arm can serve to provide the adjustability required to ensure the contact patches of the feet are located to provide the greatest degree of stability. Any design of foot may be utilised for the purpose of
10 moving the contact point of the foot with the ground to within the plane containing the central axes of the stiles. This ensures greater stability of the ladder when weight is transferred to the feet.

The figures also show holes 32. These holes are intended to enable
15 the arms 18 and 20 to be releasably secured at a number of different positions between the fully retracted and fully deployed positions. These are secured relative to the holes 32 in the housing 16 by conventional resiliently biased metal pins 34 or any other suitable mechanism. This results in the user having more
20 control over the final width of the stabiliser. This may be important in spaces having limited floor space.

Figure 4 shows the stabiliser, again in plan view but in the form an engineering drawing which shows the components as if transparent. In Figure 4, the arms 18 and 20 are fully retracted
25 within the housing 16. Figure 5 shows a similar view, except that the arms have been partially deployed such that the metal pins 34 engage with the middle of the three available holes 32.

It is preferred though not essential that the arms are resiliently urged toward the deployed position, such that when released by
30 whatever means are retaining them in the deployed position, the arms automatically deploy. By biasing the arms in this way, the default operating method of the ladder is safer.

As mentioned above, the invention teaches either adding a stabiliser module to an existing ladder or integrally forming a

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stabiliser within the construction of the ladder. While this is equally applicable to fixed ladders, the inventor has recognised that there are advantages to employing the invention for use with a telescopic ladder. The specific advantage being that use of a telescopic ladder must be initiated by extending the ladder itself from a collapsed position to an extended position. It is therefore possible to utilise the first movement of opening up the ladder to effect release of a mechanism securing the arms 18 and 20 in the retracted position. It is noted that this mechanism is intended to be different from the resilient pins disposed within arms 18 and 20 for engaging with holes 32. The automatic release mechanism is already the subject of patent application WO2014/006568 which is incorporated herein by reference.

The inventor of the present invention has further recognised the advantage of providing telescopic arms which themselves extend in a similar way to the stiles of a telescopic ladder. By utilising telescopic overlapping arms, it is possible to provide a significant stabiliser width (providing a total width that is greater than three times the distance between the axes of the stiles) while still allowing the retracted and collapsed telescopic arms to reside substantially within the space between the stiles of the ladder. The stabiliser module of embodiments showing this can be seen in figures 6, 9 and 10.

The embodiments shown in figures 1 to 6 include stabiliser arms that when in the retracted position lie adjacent one another in the horizontal plane (side by side). It is of course equally possible for the stabiliser arms to lie adjacent one another in the vertical plane (over and under) and embodiments that show this are depicted in Figures 7 to 10. In these embodiments, the offset required to ensure the additional stability of the ladder results from having a longer foot on the upper of the two stabiliser arms to again ensure that the both feet contact the ground at points that lie within the plane containing the major axes of the stiles.

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Claims

1. A stabiliser for attachment to a base of a ladder having at two stiles and at least two rungs, to stabilise the ladder when resting on a surface, the stabiliser including a housing
5 containing elongate arms which are slidable along their respective central axes between a retracted and a deployed position, each arm having at one end, a foot for resting on the surface, wherein, the arms, when deployed, extend laterally beyond the stiles of the ladder while being held firmly by the housing, and when retracted,
10 the arms lie adjacent one another within the housing in an at least partially overlapping relationship,

characterised in that a surface contact point of at least one of the feet is offset from the central axis of its associated arm in the direction of the central axis of the other arm.

15 2. A stabiliser as claimed in claim 1, wherein the contact points of both feet lie substantially in a plane containing central axes of the stiles.

3. A stabiliser as claimed in claim 1 or 2, wherein when retracted, the arms lie side by side in a substantially horizontal
20 plane normal to the plane containing central axes of the stiles.

4. A stabiliser as claimed in claims 1 to 3, wherein when retracted, the arms lie one above the other in a plane substantially parallel to the plane containing the stiles of the ladder.

25 5. A stabiliser as claimed in claims 1 to 4, wherein when retracted, the arms overlap one another over a major proportion of their length.

6. A stabiliser as claimed in any preceding claim, wherein in cross section the arms are rectangular such that when adjacent one
30 another their overall cross section is substantially square.

7. A stabiliser as claimed in any preceding claim, wherein at least one arm is telescopic such that it may deploy to an extended

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length that is greater than the distance between the stiles of the ladder.

8. A stabiliser as claimed in any preceding claim, wherein at least one arm is lockable in the retracted position.

5 9. A stabiliser as claimed in claim 8, wherein at least one arm is locked in position by means of a locking mechanism arranged between at least one arm and the housing, the mechanism comprising a resiliently biased locking pin releasably engaging within a hole.

10 10. A stabiliser as claimed in claim 9, wherein the housing includes multiple holes allowing the arm to be locked at different degrees of extension between the fully retracted and fully deployed positions.

11. A stabiliser as claimed in any preceding claim further
15 comprising a height adjustable foot extending from at least one arm for engaging an uneven or non-horizontal surface.

12. A stabiliser as claimed in any preceding claim, wherein the offset is provided by means of a bracket arranged between an arm and its respective foot.

20 13. A stabiliser as claimed in any preceding claim wherein at least one arm is resiliently urged towards the deployed position.

14. A ladder including a stabiliser as claimed in any preceding claim.

15. A ladder as claimed in claim 14, which ladder is
25 telescopically extendable.

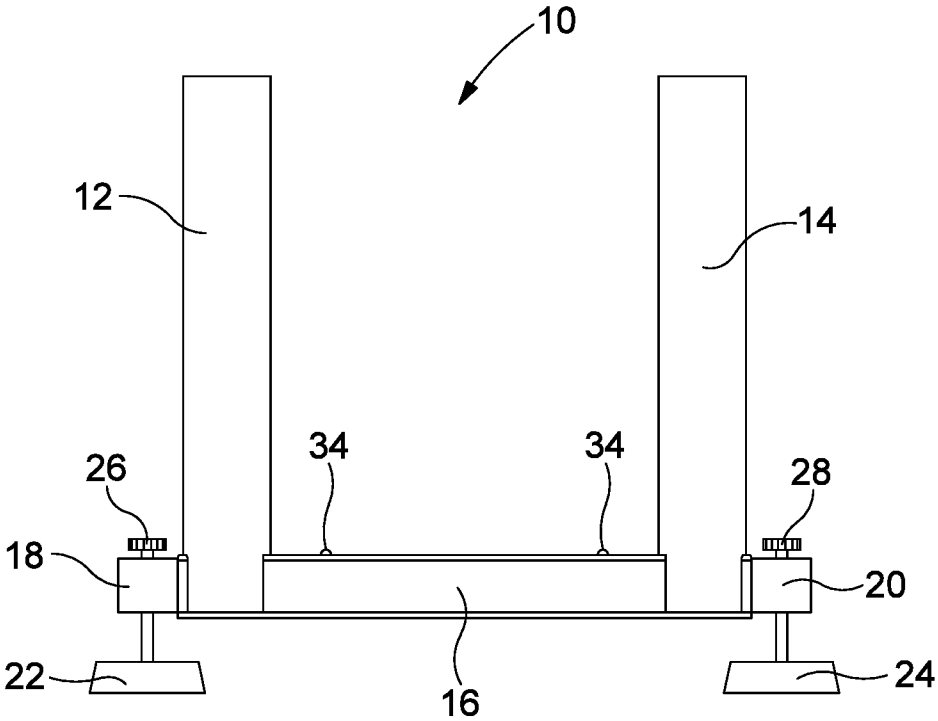


Fig. 1

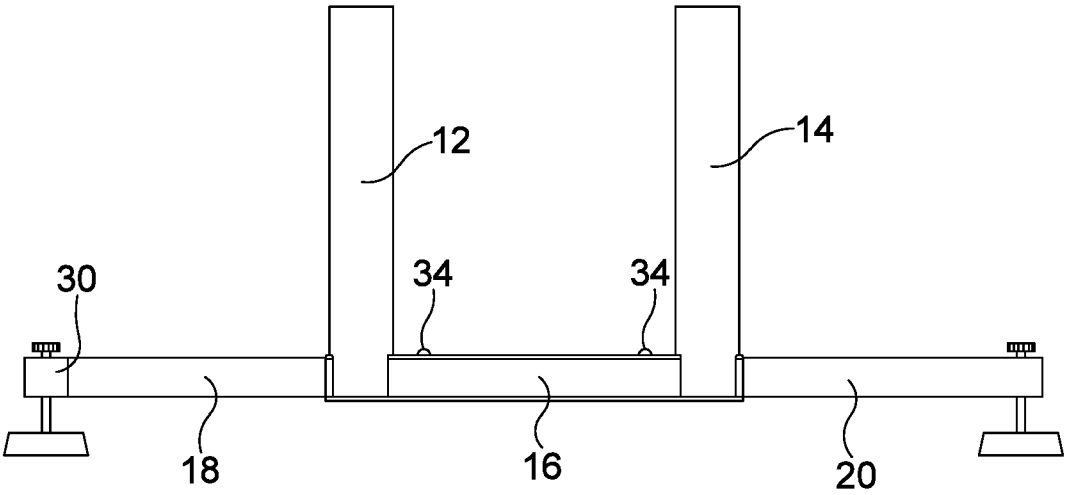


Fig. 2

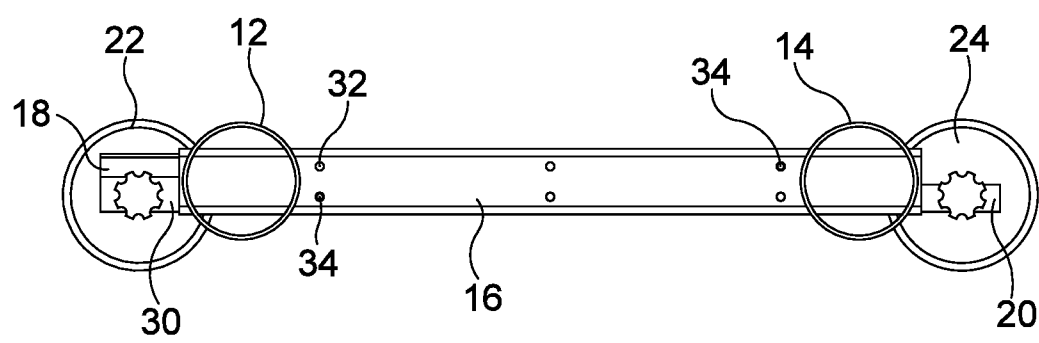


Fig. 3

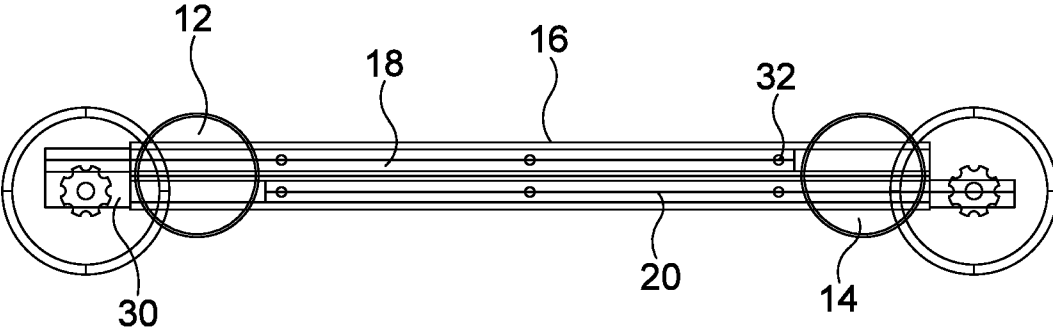


Fig. 4

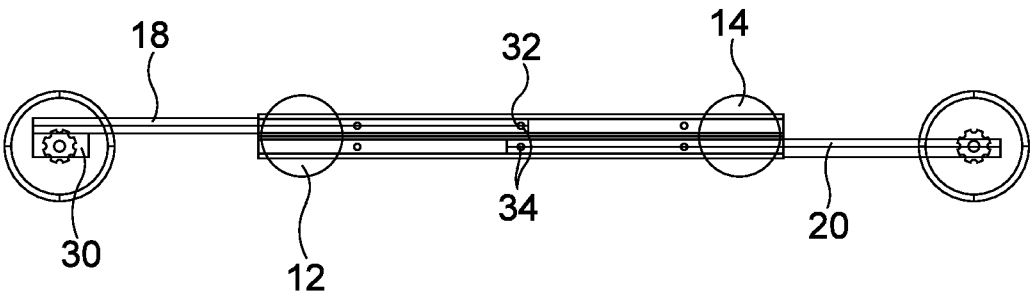


Fig. 5

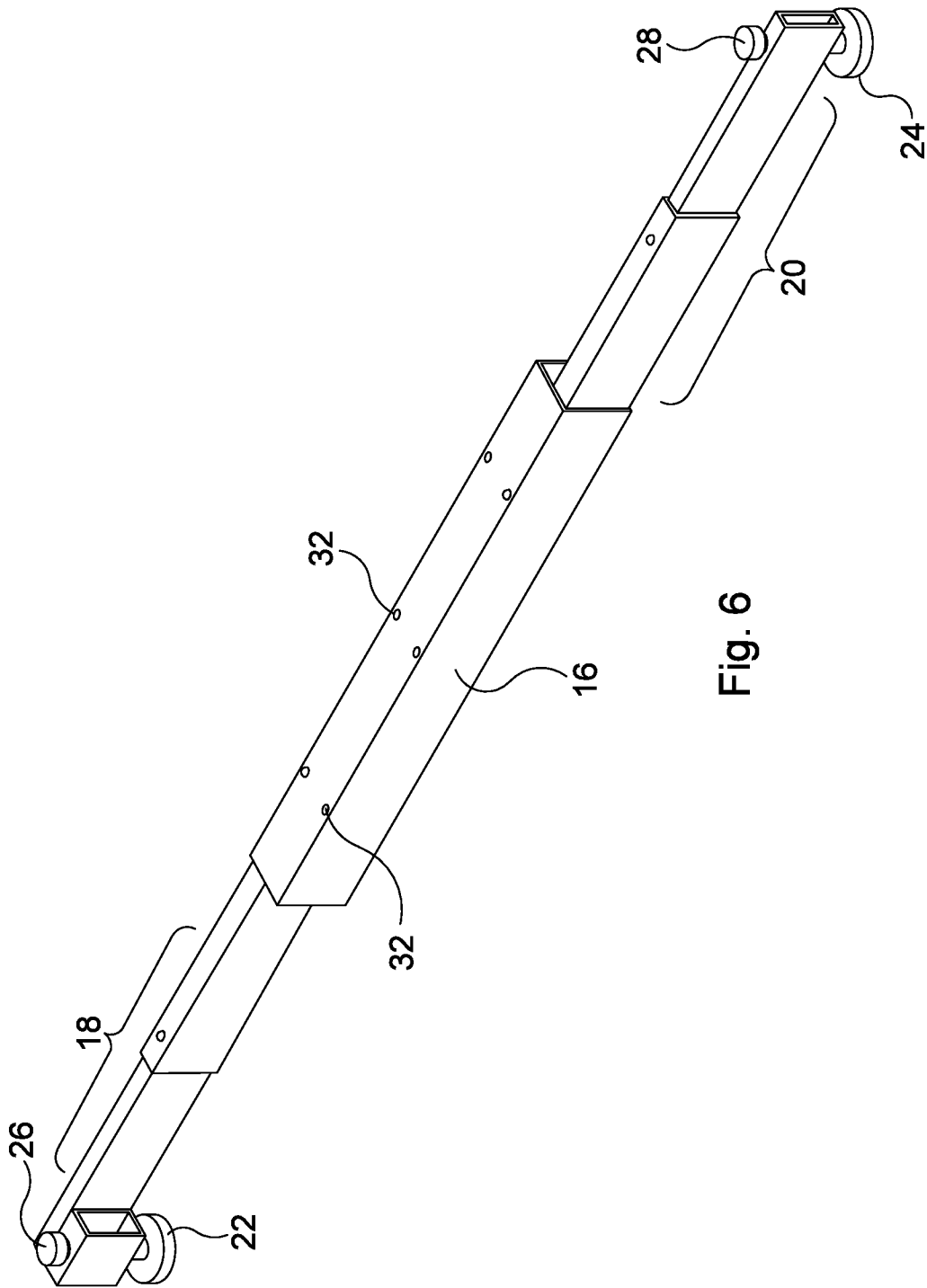


Fig. 6

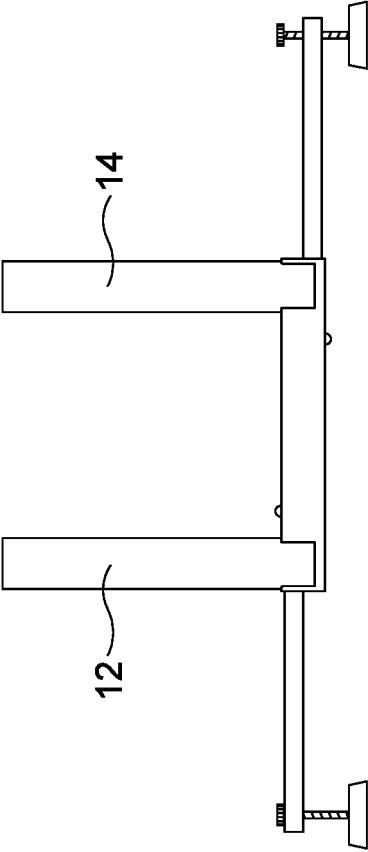


Fig. 8

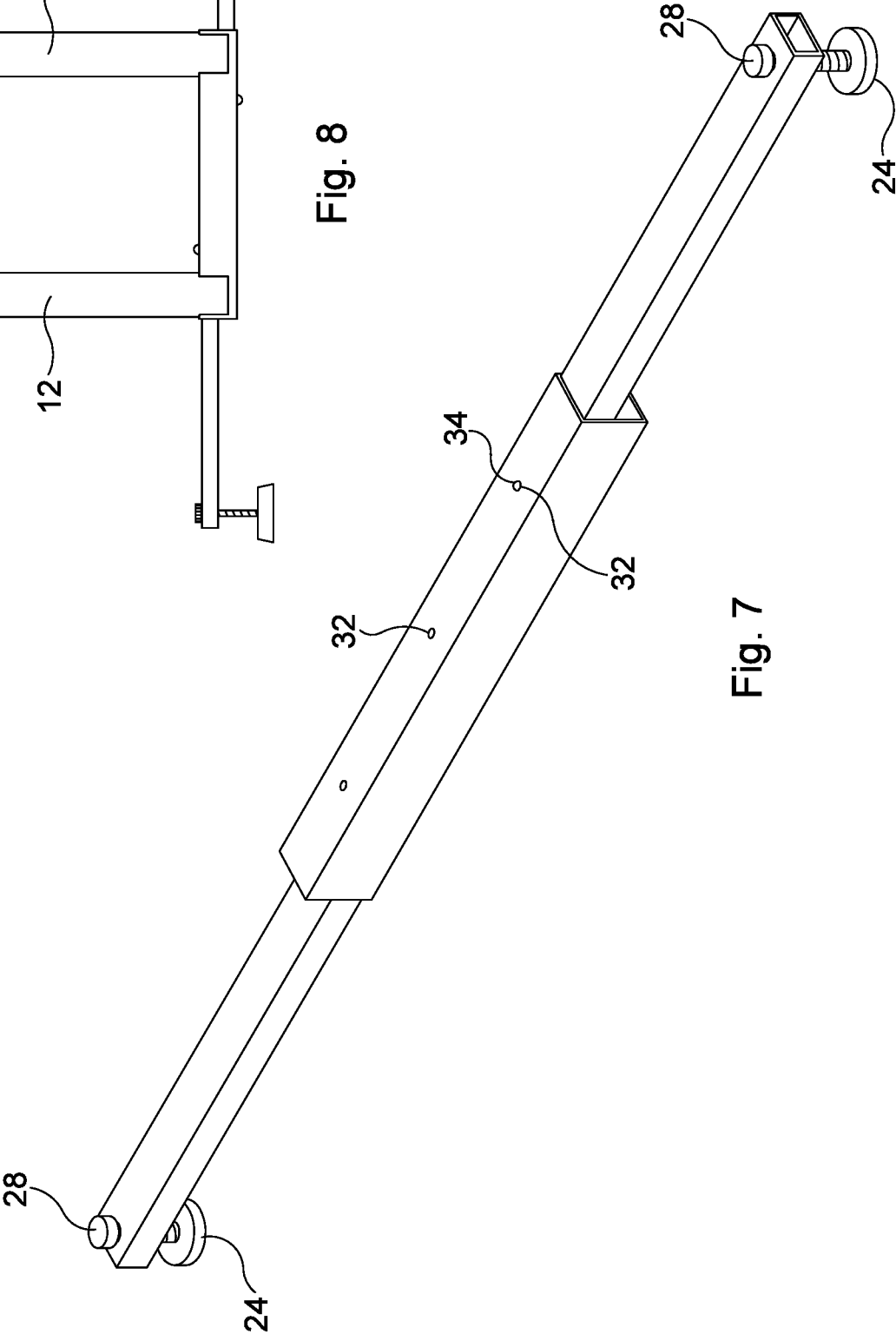
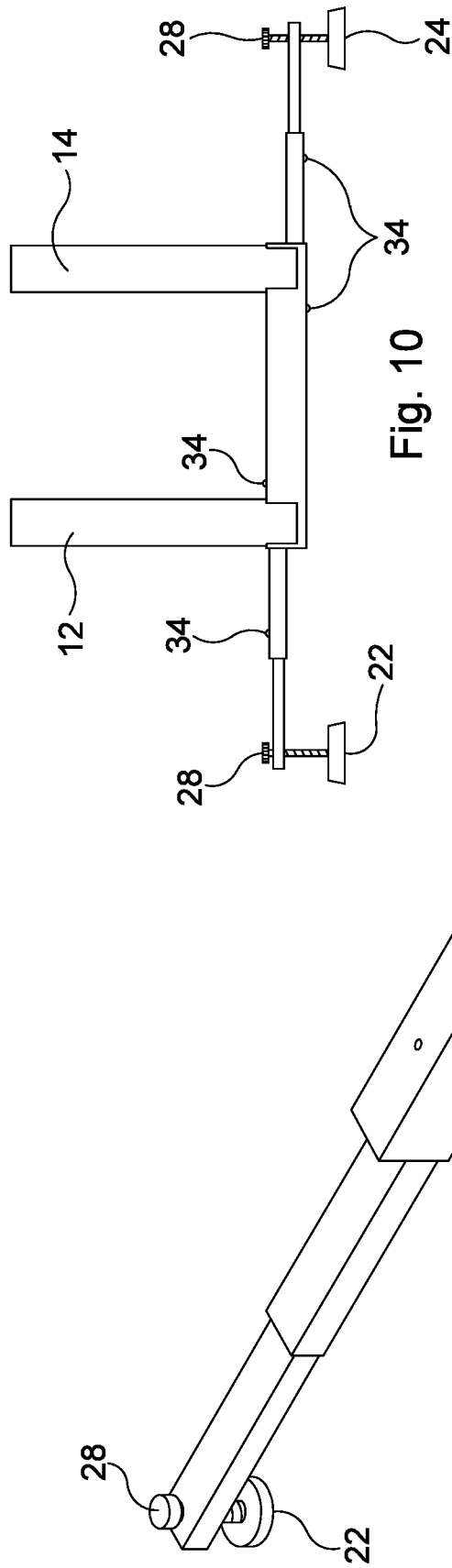


Fig. 7



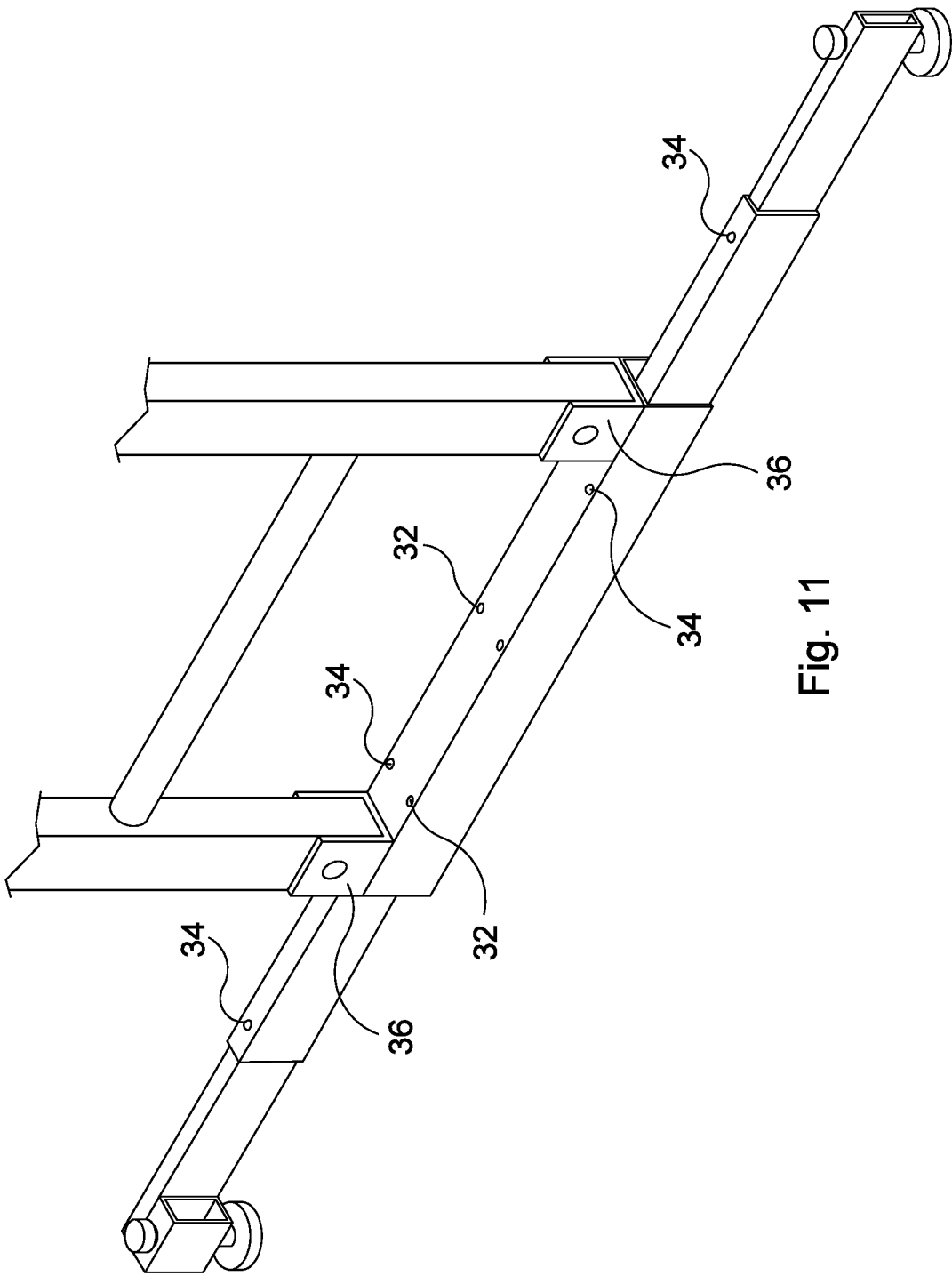


Fig. 11

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2015/059630

A. CLASSIFICATION OF SUBJECT MATTER
INV. E06C7/42 E06C7/44
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.
X	JP S64 19799 U ([JP]) 31 January 1989 (1989-01-31) the whole document -----	1-3, 5-10, 13-15
X	JP 2012 012893 A (YAMAZAKI NORIAKI) 19 January 2012 (2012-01-19) the whole document -----	1,2, 4-12,14, 15
A	WO 2014/006568 A1 (TELETOWER COM LTD [GB]) 9 January 2014 (2014-01-09) cited in the application the whole document -----	1-15

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

25 August 2016

Date of mailing of the international search report

01/09/2016

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2015/059630

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