Title: FAST ADJUSTING AND LOCKING SYSTEM FOR DIFFERENT LEG OPENING ANGLES IN A 3POD SYSTEM

Abstract: A fast adjusting tripod system (10) is provided for supporting the weight of a worker during entry to and exit from a manhole beneath the tripod system (10). The tripod system (10) includes a central frame (16); three support legs (18) extending from the frame (16), with each of the legs (18) being pivot mounted to the frame (16); a linkage mechanism (20) operatively connecting the legs (18) to pivot together relative to the frame (16); and a stop (22) configured to selectively lock the linkage mechanism (20) against movement relative to the frame (16) at a plurality of distinct, predetermined pivot angle positions of the legs (18) relative to the frame (16).
Published:

— with international search report (Art. 21(3))
FIELD

[0001] This disclosure relates to anchorage systems for raising and lowering a worker to and from a work site, and more particularly, to tripod devices that provide an anchor for raising and lowering a worker into and out of a manhole.

BACKGROUND

[0002] Tripod devices that create an anchor for raising and lowering a worker into a manhole are known. Conventionally, such tripods devices are designed for one maximum manhole size, with the three legs of tripod either being folded for transportation or extended to accommodate this one maximum manhole size with no variable position in-between. Accordingly, to adjust to other opening angles or sizes of manholes, such tripods have to adjust a webbing or chain connecting the feet of each of the legs to reduce the opening angle and therefore the diameter inscribed by the position of the three tripod legs. Because there is a possibility of encountering different sizes of manholes, there is a need for improvement.

SUMMARY

[0003] In accordance with one feature of this disclosure, a fast adjusting tripod system is provided for supporting the weight of a worker during entry to and exit from a worksite beneath the tripod system. The tripod system includes a central frame; three support legs extending from the frame, with each of the legs being pivot mounted to the frame; a linkage mechanism operably connecting the three support legs to pivot together relative to the frame; an anchor component supported by the frame and the legs and configured to anchor a worker during entry and exit from a manhole.
worksite beneath the tripod system; and a stop extending between the frame and the linkage mechanism. The stop is configured to selectively lock the linkage mechanism against movement relative to the frame at a plurality of distinct, predetermined pivot angle positions of the legs relative to the frame. Each of the predetermined pivot angle positions correspond to one of a plurality of stop surfaces on at least one of the linkage mechanism and the frame, with each of stop surfaces being engaged by the stop with the legs at a corresponding one of the predetermined pivot angle positions.

[0004] As one feature, the anchor component is mounted on the frame and extends downwardly from the frame with the tripod system positioned above a worksite.

[0005] In one feature, the stop surfaces are located on the linkage mechanism and the stop is mounted to translate relative to the frame between a free position where the stop is not engaged with any of the stop surfaces and a locked position where the stop is engaged with one of the stop surfaces.

[0006] According to one feature, the linkage mechanism includes a slide mounted to translate relative to the frame and three links, with each link pivot mounted to a corresponding one of the legs and to the slide.

[0007] As one feature, the frame comprises an elongate guide mounting the slide for translation relative to the frame.

[0008] In one feature, the elongate guide is a cylindrical rod and the slide has an elongate bore that receives the cylindrical rod for sliding, translational movement along an axis.

[0009] According to one feature, each of the links is pivot mounted to the corresponding leg at a location on the leg above where the corresponding leg is pivot mounted to the frame, with the tripod system positioned above a worksite.

[0010] As one feature, the stop surfaces are located on the slide.
[0011] In one feature, at least one of the stop surfaces is defined by a bore hole in the slide.

[0012] According to one feature, at least one of the stop surfaces is defined by an end surface of the slide.

[0013] As one feature, the slide has opposite end surfaces, one of the stop surfaces is defined by one of the end surfaces, another one of the stop surfaces is defined by the other end surface, and at least one more of the stop surfaces is defined by a bore hole in the slide.

[0014] In one feature, the stop comprises a pin mounted in the frame to translate relative to the frame between a free position where the stop is not engaged with any of the stop surfaces and a locked position where the stop is engaged with one of the stop surfaces.

[0015] According to one feature, the pin is a cylindrical pin that is spring biased toward the locked position.

[0016] As one feature, the slide is mounted to translate along a first axis and the pin is mounted to translate perpendicular to the first axis.

[0017] In one feature, the stop further comprises a knob configured for hand actuation of the stop by a user.

[0018] It should be understood that each of the features described above can be combined with any, or all of the other features described above.

[0019] Other features and advantages will become apparent from a review of the entire specification, including the appended claims and drawings.
BRIEF DESCRIPTION OF THE DRAWINGS

[0020] Fig. 1 is a view showing the upper portion of a tripod system according to this disclosure, with the lower portions of the three legs of the tripod not being shown;

[0021] Fig. 2 is a section view taken from line 2-2 in Fig. 1;

[0022] Fig. 3A is view of the tripod system of Figs. 1 and 2, with the legs opened at a first predetermined position/pivot angle and with portions of a central frame removed for purposes of illustration;

[0023] Fig. 3B is a view similar to Fig. 2, but showing the system with the legs at the first predetermined position/pivot angle;

[0024] Figs. 4A and 4B are views similar to Figs. 3A and 3B, respectively, but showing the tripod system at a second predetermined position/pivot angle that is larger than the first predetermined position/pivot angle; and

[0025] Figs. 5A and 5B are views similar to Figs. 3A, 4A and 3B, 4B, respectively, but shown the system with the legs at a third, predetermined position/pivot angle that is larger than the first and second predetermined positions/pivot angles.

DETAILED DESCRIPTION

[0026] With reference to Figs. 1-5B, an embodiment of a fast adjusting tripod system 10 according to this disclosure is shown for supporting the weight of a worker (shown schematically at 12 in Fig. 5A) during entry to and exit from a work site which will typically be defined by a manhole 14 located beneath the tripod system 10. As illustrated in Figs. 3A-5B, the tripod system 10 allows for quickly adjusting to different diameter sizes of manholes 14.
[0027] The tripod system 10 includes a central frame 16; three support legs 18 extending downwardly from the frame 16, with each of the legs 18 being pivot mounted to the frame; and a linkage mechanism, shown generally at 20. The linkage mechanism connects the three support legs 18 to pivot together relative to the frame, as best seen in Figs. 2, 3A, 4A and 5A, which show the legs in a stowed position in Fig. 2, in a minimum pivot angle position in Fig. 3A, in an intermediate pivot angle position in Fig. 4A, and in a maximum pivot angle position in Fig. 5A. The tripod system 10 further includes a stop, shown generally at 22, extending between the frame 16 and the linkage mechanism 20 and configured to selectively lock the linkage mechanism 20 against movement relative to the frame 16 at each of the distinct, predetermined pivot angle positions of the legs 18 relative to the frame 16 discussed above and again as illustrated by each of the positions shown in Figs. 2, 3A-3B, 4A-4B and 5A-5B, respectively. Each of the predetermined pivot angle positions corresponds to one of a plurality of stop surfaces 30. Each of the stop surfaces 30 can be selectively engaged by the stop 22 with the legs 18 at a corresponding one of the predetermined pivot angle positions. It should be appreciated that while the stop 22 is shown as being mounted by the frame 16 and the stop surfaces 30 as being on a component of the linkage mechanism 22, other configurations are possible, including configurations wherein the stop 22 is mounted in a component of the linkage mechanism 20 and the stop surfaces are located on the frame 16.

[0028] The tripod system 10 further includes an anchor component, shown in the illustrated embodiment at 32, that is supported by the frame 16 and the legs 18 and is configured to anchor a worker 12 during entry and exit from the work site 14 beneath the tripod system 10. In the illustrated embodiment, the anchor component 32 is mounted on the frame 16 and extends downwardly from the frame 16 with the tripod system 10 positioned above the work site 14. It should be appreciated that while the anchor component 32 is shown mounted on the frame 16 in the illustrated embodiment, other configurations are possible, including mounting the anchor component 32 on one or more of the legs 18 or additional anchor components that
are mounted on the frame 16 and/or the one or more of the legs 18, with the anchor components 32 possibly including a winch or other appropriate anchor component, such as the pulley 33 shown mounted to the leg 18 in Fig. 1.

[0029] In the illustrated embodiment, the stop 22 is mounted on the frame 16 to translate between a free position (illustrated in Fig. 2) where the stop 22 is not engaged with any of the stop surfaces 30 and a locked position (shown in Figs. 3B, 4B and 5B) where the stop 22 is selectively engaged with the stop surfaces 30. In this regard, the stop 22 includes a hardened pin 34, which in the illustrated embodiment is a cylindrical pin 34 that is slidably mounted in a bushing 36 fixed to the frame 16. In this regard, the bushing 36 is fixed to the frame 16 via a threaded fastener 37 that engages external threads on the bushing 36 to clamp a portion of the frame 16 between the bushing 36 and the threaded fastener 37, which is shown in the form of a threaded lock nut 37. A helical spring 38 biases the stop 22, including the pin 34, to the locked position via engagement with a shoulder on the pin 36 and an internal shoulder on the bushing 36. The stop 22 further includes a hand actuable knob 44 that is engageable by a user’s hand to actuate the stop 22 between the locked position and the free position.

[0030] In the illustrated embodiment, the linkage mechanism 20 includes a slide 48 mounted to translate relative to the frame 16, and three links 50, with each link 50 pivot mounted to a corresponding one of the legs 18 and to the slide 48. In this regard, it should be understood that while Figs. 2, 3B, 4B and 5B only show the relationship between one of the links 50, the corresponding leg 18 and the slide 48, the relationship between each of the other links 50, their corresponding leg 18 and the slide 48 is identical to that shown in Figs. 2, 3B, 4B and 5B. The frame 16 includes an elongate guide 52, which in the illustrated embodiment is a cylindrical rod 52 that is received in an elongate, cylindrical bore 54 of the slide 48 to guide the slide 48 in translation along a vertical axis 56. In the illustrated embodiment, each of the links 50 is pivot mounted to the corresponding leg 18 at a location on the leg 18 above where the leg 18 is pivot mounted to the frame 16. In this regard, each of the
legs 18 is pivot mounted to the frame 16 via a shoulder bolt 58 that is received in a
bushing 60 fixed in the leg 18, with the shoulder bolt 58 extending through a pair of
frame flange walls 61 located on opposite sides of the leg 18. Each of the links 50 is
pivot mounted to the corresponding leg 18 via a journal pin 62 received in a bore 64
at one end of the link 18, and pivot mounted to the slide 48 via a journal pin 68 fixed
in the slide 48 and extending through a bore 70 at an opposite end of the link 50. In
this regard, it should be appreciated that each of the pins 62 is supported by
opposite side walls 72 of the corresponding leg 18, and each of the pins 68 is
supported by opposite side walls 74 that define a channel 76 in the slide 48 that
 corresponds to the link 50 and the associated pin 68. In this regard, it should be
understood that while only one of the opposite side walls 74 of the channel 76 is
shown in Fig. 2 for purposes of illustration, the opposite side wall 74 is identical for
each of the channels 76 in the slide 48 of the illustrated embodiment. Each of the
links 50 extends through an elongate slot 78 formed in the corresponding leg 18 and
is received in the corresponding channel 76 formed in the slide 48.

[0031] As best seen in Fig. 2, the slide 48 includes a lower end surface 80 that
defines the stop surface 30 corresponding to the stowed position, with the slide 48
trapped between the stop 22 and an inner surface 81 of the frame 16. As best seen
in Fig. 3A, the slide 48 includes a bore hole 82 that defines the stop surface 30
corresponding to the minimum pivot angle position, with the slide 48 locked against
movement relative to the frame 16 by engagement of the pin 34 against the surface
30 of the bore hole 82. As best seen in Fig. 4B, the slide 48 includes a bore hole 84
that defines the stop surface 30 corresponding to the intermediate pivot angle
position, with the slide 48 locked against movement relative to the frame 16 by
engagement of the pin 34 against the surface 30 of the bore hole 84. As best seen
in Fig. 5A, the slide 48 includes an upper end surface 86 that defines the stop
surface 30 corresponding to the max pivot angle position, with the slide 48 being
trapped between the stop 22 and an inner surface 88 of the frame 16.
[0032] As best seen in Fig. 1, the frame 16 in the illustrated embodiment is formed from three pairs 90 of frame members 92 and 94, with each pair 90 defining a channel 96 that receives a corresponding one of the legs 18. Each of the pairs 90 is joined by threaded fasteners 98 that extend through cylindrical spacers 100. Each of the members 94 includes a radially inwardly directed pair of upper and lower flanges 100 and 102 that have openings 104 and 106, respectively, through which the rod 52 extends, with the rod 52 and frame members 92 and 94 all being clamped together by threaded fasteners 108 and 110 connected to opposite ends of the rod 52.

[0033] As best seen in Figs. 3A, 4A and 5A, in the illustrated embodiment, a foot 112 is pivot mounted at the lower end 14 of each leg 18, and each of the legs 18 can be a telescoping construction wherein a lower portion 116 of the leg 18 telescopes within an upper portion 118 of the leg 18 and can be locked in its extended position via a suitable pin 120.

[0034] It should be appreciated that while one embodiment of the tripod system 10 is shown in the figures, other alternate embodiments are contemplated within the scope of this disclosure. For example, while the illustrated embodiment is shown with a stowed position, a min pivot angle position, an intermediate pivot angle position and a max pivot angle position, it may be desirable in some applications for the tripod system 10 to include more pivot angle positions or fewer pivot angle positions than in the illustrated embodiment. By way of further example, while the slide 48 is shown as being guided by the rod 52, in some embodiments it may be desirable for the slide 48 to be guided via other structure in the frame 16. As yet a further example, while a particular configuration has been shown for the linkage mechanism 20, it may be desirable in some applications for other configurations of the linkage mechanism 20 to be provided that operably connect the legs 18 so that they pivot together relative to the frame 16. Accordingly, it should be understood that the scope of the disclosure is not limited to the specific embodiment shown.
CLAIMS

1. A fast adjusting tripod system (10) for supporting the weight of a worker (12) during entry to and exit from a worksite (14) beneath the tripod system (10), the tripod system (10) comprising:
   a central frame (16);
   three support legs (18) extending from the frame (16), each of the legs (18) being pivot mounted to the frame (16);
   a linkage mechanism (20) operably connecting the three support legs (18) to pivot together relative to the frame (16);
   an anchor component (32) supported by the frame (16) and the legs (18) and configured to anchor a worker during entry and exit from a worksite (14) beneath the tripod system (10);
   a stop (22) extending between the frame (16) and the linkage mechanism (20), the stop (22) configured to selectively lock the linkage mechanism (20) against movement relative to the frame (16) at a plurality of distinct, predetermined pivot angle positions of the legs (18) relative to the frame (16), each of the predetermined pivot angle positions corresponding to one of a plurality of stop surfaces (30) on at least one of the linkage mechanism (20) and the frame (16), each of stop surfaces (30) being engaged by the stop (22) with the legs (18) at a corresponding one of the predetermined pivot angle positions.

2. The tripod system (10) of claim 1 wherein the anchor component (32) is mounted on the frame (16) and extends downwardly from the frame (16) with the tripod system (10) positioned above a worksite (14).
3. The tripod system (10) of any preceding claim wherein the stop surfaces (30) are located on the linkage mechanism (20) and the stop (22) is mounted to translate relative to the frame (16) between a free position where the stop (22) is not engaged with any of the stop surfaces (30) and a locked position where the stop (22) is engaged with one of the stop surfaces (30).

4. The tripod system (10) of any preceding claim wherein the linkage mechanism (20) comprises:
   a slide (48) mounted to translate relative to the frame (16); and
   three links (50), each link (50) pivot mounted to a corresponding one of the legs (18) and to the slide (48).

5. The tripod system (10) of claim 4 wherein the frame (16) comprises an elongate guide (52) mounting the slide (48) for translation relative to the frame (16).

6. The tripod system (10) of claim 5 wherein the elongate guide (52) is a cylindrical rod (52) and the slide (48) has an elongate bore (54) that receives the cylindrical rod (52) for sliding, translational movement along an axis (56).

7. The tripod system (10) of any of claims 4, 5 or 6 wherein each of the links (50) is pivot mounted to the corresponding leg (18) at a location on the leg (18) above where the corresponding leg (18) is pivot mounted to the frame (16), with the tripod system (10) positioned above a worksite (14).

8. The tripod system (10) of any of claims 4, 5, 6 or 7 wherein the stop surfaces (30) are located on the slide (48).

9. The tripod system (10) of claim 8 wherein at least one of the stop surfaces (30) is defined by a bore hole (82,84) in the slide (48).
10. The tripod system (10) of claim 8 wherein at least one of the stop surfaces (30) is defined by an end surface (80,86) of the slide (48).

11. The tripod system (10) of claim 8 wherein the slide (48) has opposite end surfaces (80,86), one of the stop surfaces (30) is defined by one of the end surfaces (80,86), another one of the stop surfaces (30) is defined by the other end surface (80,86), and at least one more of the stop surfaces (30) is defined by a bore hole in the slide (48).

12. The tripod system (10) of any of claims 4-11 wherein the stop (22) comprises a pin (34) mounted in the frame (16) to translate relative to the frame (16) between a free position where the stop (22) is not engaged with any of the stop surfaces (30) and a locked position where the stop (22) is engaged with one of the stop surfaces (30).

13. The tripod system (10) of claim 12 wherein the pin (34) is a cylindrical pin (34) that is spring biased toward the locked position.

14. The tripod system (10) of either claim 12 or claim 13 wherein the slide (48) is mounted to translate along a first axis (56) and the pin (34) is mounted to translate perpendicular to the first axis (56).

15. The tripod system (10) of any of claims 12-14 wherein the stop (22) further comprises a knob (44) configured for hand actuation of the stop (22) by a user.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**
INV. F16M11/34 F16M11/16 E02D29/12

**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)
F16M E02D

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**

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>wo 98/19099 Al (OSTROBROD MEYER [US]) 7 May 1998 (1998-05-07) page 3 - page 5; figures 1-7</td>
<td>1-7</td>
</tr>
<tr>
<td>A</td>
<td>US 2 534 659 A (CARDONA CARLOS J) 19 December 1950 (1950-12-19) figures 1-5</td>
<td>1</td>
</tr>
<tr>
<td>A</td>
<td>JP 2007 328075 A (SATO KAORU) 20 December 2007 (2007-12-20) figures 1-6</td>
<td>1</td>
</tr>
</tbody>
</table>

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

* Special categories of cited documents:
  - "A" document defining the general state of the art which is not considered to be of particular relevance
  - "E" earlier application or patent but published on or after the international filing date
  - "L" document which may throw doubts on priority claim(s) one of which is cited to establish the publication date of another citation or other special reason (as specified).
  - "O" document referring to an oral disclosure, use, exhibition or other means
  - "P" document published prior to the international filing date but later than the priority date claimed

**Date of the actual completion of the international search**  
29 February 2016

**Date of mailing of the international search report**  
07/03/2016

**Name and mailing address of the ISA/Authorized officer**  
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016
Simens, Mark Phil
<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>CN 204 189 441 U (UNIV QIQIHAR)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>4 March 2015 (2015-03-04) figures 1,2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>18 February 2010 (2010-02-18) figures 1-13</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>WO 2010/130282 A1 (SECOBEL [BE]; OYEN EDMOND [BE]) 18 November 2010 (2010-11-18)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>figures 1-7</td>
<td></td>
</tr>
<tr>
<td>Patent document cited in search report</td>
<td>Publication date</td>
<td>Patent family member(s)</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 5975499 A</td>
</tr>
<tr>
<td>US 4660679 A</td>
<td>28-04-1987</td>
<td>NONE</td>
</tr>
<tr>
<td>US 2534659 A</td>
<td>19-12-1950</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP 2007328075 A</td>
</tr>
<tr>
<td>CN 204189441 U</td>
<td>04-03-2015</td>
<td>NONE</td>
</tr>
<tr>
<td>US 2010038498 A1</td>
<td>18-02-2010</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ES 2396945 T3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ES 2522640 T3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SI 2430263 T1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 2012112033 A1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 2012132780 A1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WO 2010130282 A1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WO 2010142506 A1</td>
</tr>
</tbody>
</table>