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Amended claims in accordance with Rule 137(2) EPC.

(54) MOBILE TRAY TABLE

(57) **Problem**

Patients physically impaired by disability or injury may be unable to transport household items. This challenge particularly affects those dependent on manually operated mobility aids such as crutches or walkers. Given a ruptured cruciate ligament, fractured metatarsal, or similar condition, even carrying a cup of coffee from kitchen to parlor may prove a major obstacle. In these and other cases, abandoning the handheld aid would aggravate the risk of additional irritation or re-injury.

Solution

The problem is solved by means of a mobile tray table (10) comprising

a tray (11) and a collapsible framework (39, 40) supporting the tray (11), a lower base frame (39) and an upper base frame (40) forming the framework (39, 40), the tray (11) being attached to the upper base frame (40),

a scissors mechanism (16-31) interconnecting the base frames (39, 40), and a deployable undercarriage (32-34) suspended by the scissors mechanism (16-31) betwixt the base frames (39, 40) such that the undercarriage (32-34) protrudes through the lower base frame (39) while the framework (39, 40) is collapsed and retracts through the lower base frame (39) when the framework (39, 40) is expanded.

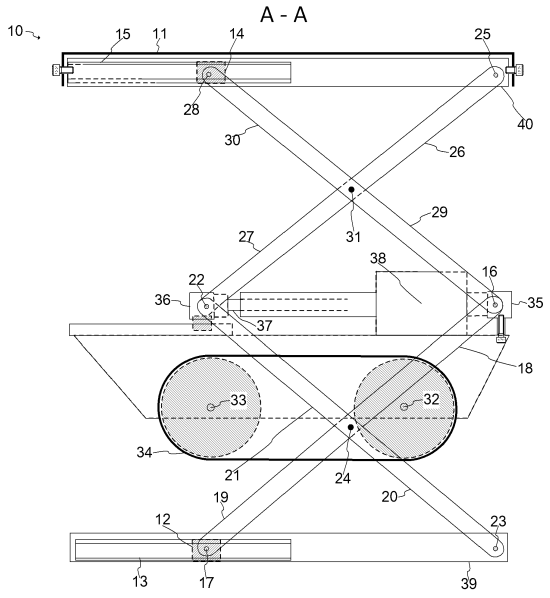

Fig. 3

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Description

Technical Field

[0001] The invention pertains to the field of home furnishings and equipment. Specifically, the invention pertains to the field of assistive domotics.

Background Art

[0002] US 3349727 A (HAMILTON COSCO INC) 31.10.1967 , upon which the preamble of Claim 1 is based, discloses a tray table comprising a first frame having a pair of legs interconnected at their upper ends by a transverse bight, a second frame having a pair of legs disposed laterally outwardly of the legs on said first frame and interconnected at their upper ends by a transverse bight, a tray removably mounted on the bights on said frames, means pivotally interconnecting the legs on said frames on a transverse axis, the distance between said means and the upper face of the bight on said first frame being less than the distance between said means and the lower face of the bight on said second frame, and the legs on said frames being curved in the same direction below said means.

Summary of invention

[0003] The present invention provides for an improved mobile tray table.

Technical Problem

[0004] Patients physically impaired by disability or injury may be unable to transport household items. This challenge particularly affects those dependent on manually operated mobility aids such as crutches or walkers. Given a ruptured cruciate ligament, fractured metatarsal, or similar condition, even carrying a cup of coffee from kitchen to parlor may prove a major obstacle. In these and other cases, abandoning the handheld aid would aggravate the risk of additional irritation or re-injury.

Solution to Problem

[0005] The problem is solved by means of the tray table according to Claim 1.

Advantageous effect of invention

[0006] The proposed tray table offers relief to the handicapped and convalescent by doubling as a remote-controlled transport vehicle for every-day items. Such apparatus may provide a tremendously increased quality of life for individuals otherwise reliant on caregivers or institutional care.

Brief description of drawings

[0007]

Figure 1 is a plan view of a mobile tray table according to the invention.
Figure 2 is a lateral view of the tray table with its framework collapsed.
Figure 3 is a lateral view of the tray table with its framework expanded.

Description of embodiments

[0008] Figure 1 illustrates a mobile tray table 10 whose framework 39, 40 is formed by a lower base frame 39 and an upper base frame 40 comprising bilateral linear motion bearings 12-15 each based on a linear slide 12, 14 guided by a sliding rail 13, 15. The tray table 10 is equipped with a camera (not depicted) and configured to establish a wireless local-area network for accessing the camera by means of a remote smartphone or tablet computer. On demand by the remote operator, a linear actuator 37, 38 serves to collapse the framework 39, 40 and deploy a remotely controlled undercarriage 32-34 (concealed in Figure 1). To this end, the linear actuator 37, 38 comprises a segmented spindle 37 and an electrical gear drive 38 for driving the spindle 37.

[0009] Figure 2 elucidates the collapsed framework 39, 40 in further detail. In this operational state, the undercarriage 32-34 protrudes through the lower base frame 39. A lower scissor linkage 16-24 and upper scissor linkage 16, 22, 25-31 connect the undercarriage 32-34 to the lower base frame 39 and upper base frame 40, respectively, thus forming a scissors mechanism 16-31 that interconnects the base frames 39, 40. Such mechanism, known in the art of kinematics as a pantograph, is described in SCHWAMB, Peter, et al. Elements of Mechanism. 2nd edition. New York: John Wiley , 1915. ISBN 1140218530. p.120-123.

[0010] A rear crossbeam 35 and a front crossbeam 36 paraxially interconnect the lower scissor linkage 16-24 and upper scissor linkage 16, 22, 25-31, the undercarriage 32-34 and aforementioned linear actuator 37, 38 being mounted between the crossbeams 35, 36. Specifically, the lower scissor linkage 16-24 comprises a first scissor link 16-19 and a second scissor link 20-23 mutually pivoted by a linkage fulcrum 24. Similarly, the upper scissor linkage 16, 22, 25-31 comprises a first scissor link 22, 25-27 and a second scissor link 16, 28-30 pivoted by a linkage fulcrum 31. The linkage fulcra 24, 31 effectively divide each scissor link into a passive lever arm 18, 20, 26, 29 and an active lever arm 19, 21, 27, 30, as will be explained hereinafter.

[0011] As to the lower scissor linkage 16-24, the first scissor link's active lever arm 19 ends in a sliding hinge joint 17 connecting the first scissor link 16-19 to the lower base frame 39. Opposite its linkage fulcrum 24, the first scissor link's passive lever arm 18 ends in a hinge joint

16 connecting the first scissor link 16-19 to the rear crossbeam 35. Conversely, the second scissor link's active lever arm 21 ends in a sliding hinge joint 22 connecting the second scissor link 20-23 to the front crossbeam 36 while, opposite its linkage fulcrum 24, the second scissor link's passive lever arm 20 ends in a hinge joint 23 connecting the second scissor link 20-23 to the lower base frame 39.

[0012] As to the upper scissor linkage 16, 22, 25-31, the first scissor link's active lever arm 27 also ends in the sliding hinge joint 22, which thus also connects the first scissor link 22, 25-27 to the front crossbeam 36. Opposite its linkage fulcrum 31, the first scissor link's passive lever arm 26 ends in a hinge joint 25 connecting the first scissor link 22, 25-27 to the upper base frame 40. Conversely, the second scissor link's active lever arm 30 ends in a sliding hinge joint 28 connecting the second scissor link 16, 28-30 to the upper base frame 40 while, opposite its linkage fulcrum 31, the second scissor link's passive lever arm 29 also ends in the hinge joint 16, which thus also connects the second scissor link 16, 28-30 to the rear crossbeam 35. Hence, the central joints 16, 22 are effectively shared among the lower scissor linkage 16-24 and upper scissor linkage 16, 22, 25-31 while each scissor linkage is connected to the corresponding base frame 39, 40 by dedicated peripheral joints 17, 23, 25, and 28.

[0013] The undercarriage 32-34 comprises bilateral rear axles 32 facing toward the rear crossbeam 35 and front axles 33 facing toward the front crossbeam 36, the rear axles 32 and front axles 33 being aligned paraxially. On each side of the undercarriage 32-34, the axles 32, 33 are interconnected by belts or chains 34.

[0014] The corresponding view of Figure 3 shows the framework 39, 40 in its expanded state. Here, the undercarriage 32-34 has retracted through the lower base frame 39, the scissors mechanism 16-31 thus suspending it betwixt the base frames 39, 40. With the tray table 10 now resting steadily upon its lower base frame 39, a detachable tray 11 attached to the upper base frame 40 may be safely extracted from the latter, accommodating a convenient dining height of approximately 75 cm above ground level. A plissé or other pleat clamped between the base frames 39, 40 covers the scissors mechanism 16-31, thus mitigating any risk of crushing or squeezing when the tray table 10 eventually returns to its collapsed state.

[0015] In an advanced embodiment, the tray table 10 may be equipped with a gyrostabilizer to compensate for the motion necessarily caused by the undercarriage 32-34. Such stabilizer would include an angular reference device such as an optical gyroscope and a servomechanism acting on the tray 11. Similar stabilizers have been employed in other continuous tracked vehicles such as for gun stabilization in tanks, as is outlined in SANDERS, Gold V. Why Our Tanks Can Score Hits on the Run. Pop. sci.. September 1944, vol.145, no.3, p.82-85.

Industrial applicability

[0016] The invention is applicable, inter alia, throughout the catering, furniture, appliance, hardware, automotive, health, leisure, and care industries.

Reference signs list

[0017] Similar reference signs denote corresponding features consistently throughout the attached drawings.

10 Tray table

11 Tray

12 Linear slide (lower base frame)

13 Sliding rail (lower base frame)

14 Linear slide (upper base frame)

15 Sliding rail (upper base frame)

16 Central joint (lower scissor linkage, first scissor link and upper scissor linkage, second scissor link)

17 Peripheral joint (lower scissor linkage, first scissor link)

18 Passive lever arm (lower scissor linkage, first scissor link)

19 Active lever arm (lower scissor linkage, first scissor link)

20 Passive lever arm (lower scissor linkage, second scissor link)

21 Active lever arm (lower scissor linkage, second scissor link)

22 Central joint (lower scissor linkage, second scissor link and upper scissor linkage, first scissor link)

23 Peripheral joint (lower scissor linkage, second scissor link)

24 Linkage fulcrum (lower scissor linkage)

25 Peripheral joint (upper scissor linkage, first scissor link)

26 Passive lever arm (upper scissor linkage, first scissor link)

27 Active lever arm (upper scissor linkage, first scissor link)

28 Peripheral joint (upper scissor linkage, second scissor link)

29 Passive lever arm (upper scissor linkage, second scissor link)

30 Active lever arm (upper scissor linkage, second scissor link)

31 Linkage fulcrum (upper scissor linkage)

32 Rear axle

33 Front axle

34 Belt or chain

35 Rear crossbeam

36 Front crossbeam

37 Segmented spindle

38 Electrical gear drive

39 Lower base frame

40 Upper base frame

Citation list

[0018] The following literature is cited throughout this document.

Patent literature

[0019] US 3349727 A (HAMILTON COSCO INC) 31.10.1967

Non-patent literature

[0020] SCHWAMB, Peter, et al. Elements of Mechanism. 2nd edition. New York: John Wiley , 1915. ISBN 1140218530. p.120-123.

[0021] SANDERS, Gold V. Why Our Tanks Can Score Hits on the Run. Pop. sci.. September 1944, vol.145, no.3, p.82-85.

Claims

1. Mobile tray table (10) comprising
a tray (11) and
a collapsible framework (39, 40) supporting the tray (11),
characterized in
a lower base frame (39) and an upper base frame (40) forming the framework (39, 40), the tray (11) being attached to the upper base frame (40), a scissors mechanism (16-31) interconnecting the base frames (39, 40), and a deployable undercarriage (32-34) suspended by the scissors mechanism (16-31) betwixt the base frames (39, 40) such that the undercarriage (32-34) protrudes through the lower base frame (39) while the framework (39, 40) is collapsed and retracts through the lower base frame (39) when the framework (39, 40) is expanded.

2. Mobile tray table (10) according to Claim 1, **characterized in that**
the scissors mechanism (16-31) comprises a lower scissor linkage (16-24) between the lower base frame (39) and the undercarriage (32-34) and an upper scissor linkage (16, 22, 25-31) between the upper base frame (40) and the undercarriage (32-34).

3. Mobile tray table (10) according to Claim 2, **characterized in**
a rear crossbeam (35) and a front crossbeam (36) paraxially interconnecting the scissor linkages (16-24; 16, 22, 25-31), the undercarriage (32-34) being mounted between the crossbeams (35, 36).

4. Mobile tray table (10) according to Claim 3, **characterized in that**
each scissor linkage comprises a first scissor link (16-19, 22, 25-27), a second scissor link (16, 20-23, 28-30), and a linkage fulcrum (24, 31) mutually pivoting the scissor links (16-19, 22, 25-27; 16, 20-23, 28-30), each scissor link comprising a central joint (16, 22) connecting the scissor link to one of the crossbeams (35, 36) and a peripheral joint (17, 23, 25, 28) connecting the scissor link to one of the base frames (39, 40).

5. Mobile tray table (10) according to Claim 4, **characterized in that**
each scissor link comprises a passive lever arm (18, 20, 26, 29) and an active lever arm (19, 21, 27, 30) separated by the linkage fulcrum (24, 31) and each bearing one of the joints (16, 17, 22, 23, 25, 28), the joint (16, 23, 25) of the passive lever arm (18, 20, 26, 29) being a hinge joint and the joint (17, 22, 28) of the active lever arm (19, 21, 27, 30) being a sliding hinge joint.

6. Mobile tray table (10) according to Claim 5, **characterized in that**
the passive lever arms (18, 20, 26, 29) connect to the rear crossbeam (35) and the active lever arms (19, 21, 27, 30) connect to the front crossbeam (36).

7. Mobile tray table (10) according to Claim 5 or Claim 6, **characterized in that**
each base frame (39, 40) comprises a linear-motion bearing (12, 13; 14, 15) bearing the sliding hinge

joint (19, 21, 27, 30) connecting to that base frame (39, 40).

8. Mobile tray table (10) according to Claim 7, **characterized in that** each linear-motion bearing (12, 13; 14, 15) comprises a linear slide (12, 14) and a sliding rail (13, 15) guiding the linear slide (12, 14).

9. Mobile tray table (10) according to any of Claim 3 to Claim 8, **characterized in** a linear actuator (37, 38) mounted between the crossbeams (35, 36) for collapsing the framework (39, 40) and deploying the undercarriage (32-34).

10. Mobile tray table (10) according to Claim 9, **characterized in that** the linear actuator (37, 38) comprises a segmented spindle (37) and an electrical gear drive (38) for driving the spindle (37).

11. Mobile tray table (10) according to any of the preceding claims, **characterized in that** the undercarriage (32-34) comprises bilateral rear axles (32) facing toward the rear crossbeam (35) and bilateral front axles (33) facing toward the front crossbeam (36), the rear axles (32) and the front axles (33) being aligned paraxially.

12. Mobile tray table (10) according to Claim 11, **characterized in that** the undercarriage (32-34) further comprises belts or chains (34), each belt or chain (34) interconnecting one of the rear axles (32) and the same-sided front axle (33).

13. Mobile tray table (10) according to any of the preceding claims, **characterized in** a camera, the tray table (10) being configured to establish a wireless local-area network for accessing the camera and controlling the undercarriage (32-34) by means of a remote smartphone or tablet computer.

14. Mobile tray table (10) according to any of the preceding claims, **characterized in that** the tray (11) is detachable and extractable from the upper base frame (40) at a dining height of approximately 75 cm above ground level.

15. Mobile tray table (10) according to any of the preceding claims, **characterized in** a pleat, preferably a plissé pleat, clamped between the base frames (39, 40) for covering the scissors mechanism (16-31).

Amended claims in accordance with Rule 137(2) EPC.

1. Mobile tray table (10) comprising
a tray (11),
a collapsible framework (39, 40) supporting the tray (11),
a lower base frame (39) and an upper base frame (40) forming the framework (39, 40), the tray (11) being attached to the upper base frame (40), a scissors mechanism (16-31) interconnecting the base frames (39, 40), and a deployable undercarriage (32-34) suspended by the scissors mechanism (16-31),
characterized in that
the undercarriage (32-34) is suspended betwixt the base frames (39, 40) such that the undercarriage (32-34) protrudes through the lower base frame (39) while the framework (39, 40) is collapsed and retracts through the
lower base frame (39) when the framework (39, 40) is expanded.

2. Mobile tray table (10) according to Claim 1, **characterized in that** the scissors mechanism (16-31) comprises a lower scissor linkage (16-24) between the lower base frame (39) and the undercarriage (32-34) and an upper scissor linkage (16, 22, 25-31) between the upper base frame (40) and the undercarriage (32-34).

3. Mobile tray table (10) according to Claim 2, **characterized in** a rear crossbeam (35) and a front crossbeam (36) paraxially interconnecting the scissor linkages (16-24; 16, 22, 25-31), the undercarriage (32-34) being mounted between the crossbeams (35, 36).

4. Mobile tray table (10) according to Claim 3, **characterized in that** each scissor linkage comprises a first scissor link (16-19, 22, 25-27), a second scissor link (16, 20-23, 28-30), and a linkage fulcrum (24, 31) mutually pivoting the scissor links (16-19, 22, 25-27; 16, 20-23, 28-30), each scissor link comprising a central joint (16, 22) connecting the scissor link to one of the crossbeams (35, 36) and a peripheral joint (17, 23, 25, 28) connecting the scissor link to one of the base frames (39, 40).

5. Mobile tray table (10) according to Claim 4, **characterized in that** each scissor link comprises a passive lever arm (18, 20, 26, 29) and an active lever arm (19, 21, 27, 30)

separated by the linkage fulcrum (24, 31) and each bearing one of the joints (16, 17, 22, 23, 25, 28), the joint (16, 23, 25) of the passive lever arm (18, 20, 26, 29) being a hinge joint and the joint (17, 22, 28) of the active lever arm (19, 21, 27, 30) being a sliding hinge joint.

6. Mobile tray table (10) according to Claim 5, **characterized in that** the passive lever arms (18, 20, 26, 29) connect to the rear crossbeam (35) and the active lever arms (19, 21, 27, 30) connect to the front crossbeam (36).

7. Mobile tray table (10) according to Claim 5 or Claim 6, **characterized in that** each base frame (39, 40) comprises a linear-motion bearing (12, 13; 14, 15) bearing the sliding hinge joint (19, 21, 27, 30) connecting to that base frame (39, 40).

8. Mobile tray table (10) according to Claim 7, **characterized in that** each linear-motion bearing (12, 13; 14, 15) comprises a linear slide (12, 14) and a sliding rail (13, 15) guiding the linear slide (12, 14).

9. Mobile tray table (10) according to any of Claim 3 to Claim 8, **characterized in** a linear actuator (37, 38) mounted between the crossbeams (35, 36) for collapsing the framework (39, 40) and deploying the undercarriage (32-34).

10. Mobile tray table (10) according to Claim 9, **characterized in that** the linear actuator (37, 38) comprises a segmented spindle (37) and an electrical gear drive (38) for driving the spindle (37).

11. Mobile tray table (10) according to any of the preceding claims, **characterized in that** the undercarriage (32-34) comprises bilateral rear axles (32) facing toward the rear crossbeam (35) and bilateral front axles (33) facing toward the front crossbeam (36), the rear axles (32) and the front axles (33) being aligned paraxially.

12. Mobile tray table (10) according to Claim 11, **characterized in that** the undercarriage (32-34) further comprises belts or chains (34), each belt or chain (34) interconnecting one of the rear axles (32) and the same-sided front axle (33).

13. Mobile tray table (10) according to any of the preceding claims, **characterized in** a camera, the tray table (10) being configured to establish a wireless local-area network for accessing the camera and controlling the undercarriage (32-34) by means of a remote smartphone or tablet computer.

14. Mobile tray table (10) according to any of the preceding claims, **characterized in that** the tray (11) is detachable and extractable from the upper base frame (40) at a dining height of approximately 75 cm above ground level.

15. Mobile tray table (10) according to any of the preceding claims, **characterized in** a pleat, preferably a plissé pleat, clamped between the base frames (39, 40) for covering the scissors mechanism (16-31).

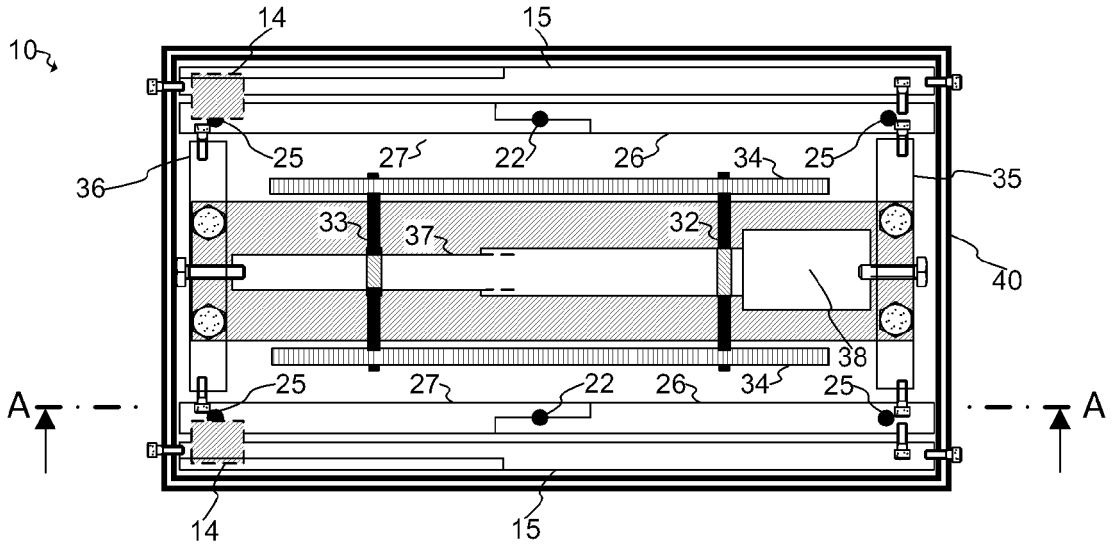
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Fig. 1

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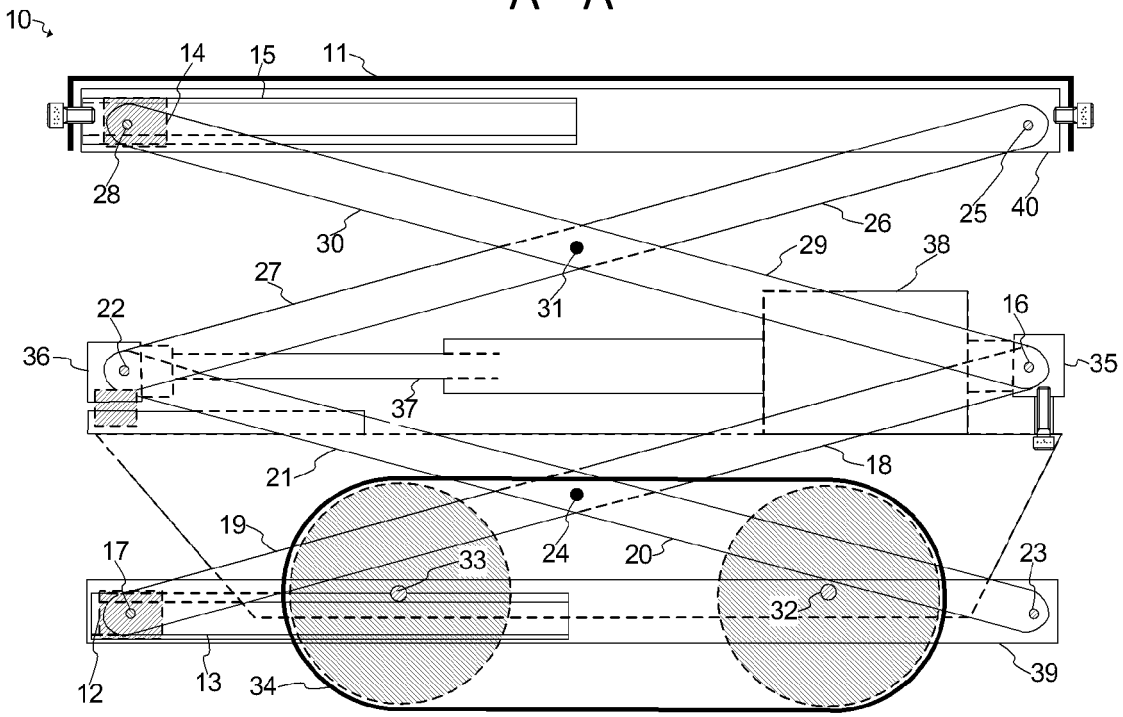
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Fig. 2

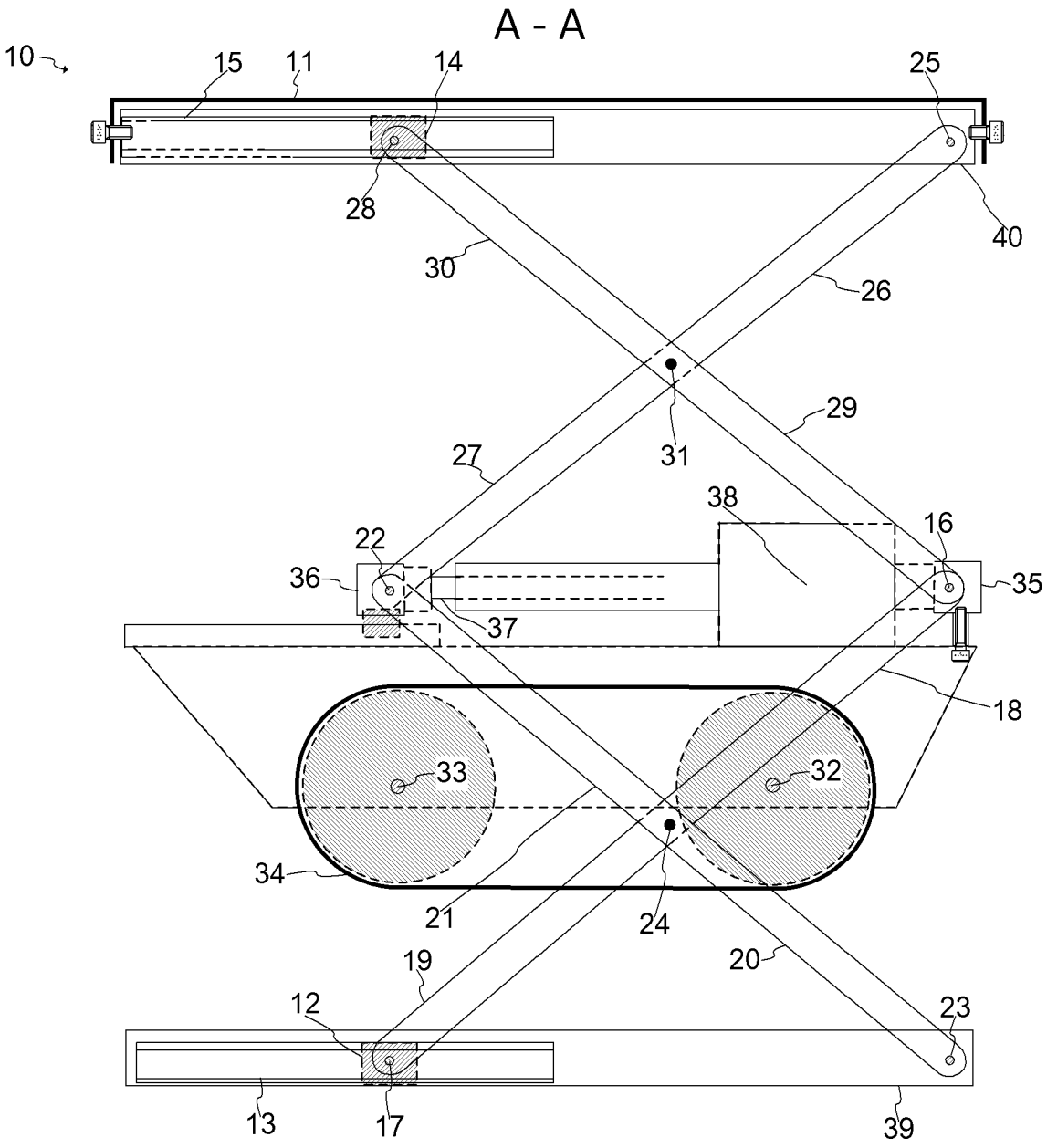
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Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 15 16 7399

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	EP 1 281 659 A1 (BOLZONI SPA [IT]) 5 February 2003 (2003-02-05) * Double scissor, linear spindle drive; the whole document *	1-11, 13-15 12	INV. A47B9/16 B66F7/06
A	US 6 431 319 B1 (MYERS DEAN EVERETT [US] ET AL) 13 August 2002 (2002-08-13) * detachable table; the whole document *	14	
A	DE 203 16 058 U1 (LANGGUTH & CO GMBH [DE]) 8 April 2004 (2004-04-08) * the whole document *	2-10	
A	DE 10 2005 042630 A1 (HERRMANN SIEGFRIED [DE]) 15 March 2007 (2007-03-15) * (28) Faltenbalg; paragraph [0031]; figure 2 *	15	

TECHNICAL FIELDS SEARCHED (IPC)

A47B
B66F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	20 October 2015	Ottesen, Rune

CATEGORY OF CITED DOCUMENTS

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20-10-2015

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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- **SCHWAMB, PETER et al.** Elements of Mechanism. John Wiley, 1915, 120-123 **[0009]**
- **SANDERS, GOLD V.** Why Our Tanks Can Score Hits on the Run. *Pop. sci.,* September 1944, vol. 145 (3), 82-85 **[0015] [0021]**
- Elements of Mechanism. **SCHWAMB, PETER et al.** Elements of Mechanism. John Wiley, 1915, 120-123 **[0020]**