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(54) **LOADING DEVICE FOR AN EXERCISE MACHINE**

(57) An exercise machine is provided with a loading device. The loading device includes a lever, a coupler, a cylinder unit and a driving unit. The lever includes two ends. The first end of the lever is connected to the exercise machine. The coupler is movable along the lever between the first and second ends. The cylinder unit includes an end connected to the exercise machine and another end connected to the coupler. The driving unit includes a threaded sleeve, a threaded rod and a motor. The threaded sleeve is connected to the coupler. The threaded rod is engaged with the threaded sleeve. The motor rotates the threaded rod relative to the threaded sleeve so that the threaded rod moves the coupler via the threaded sleeve.

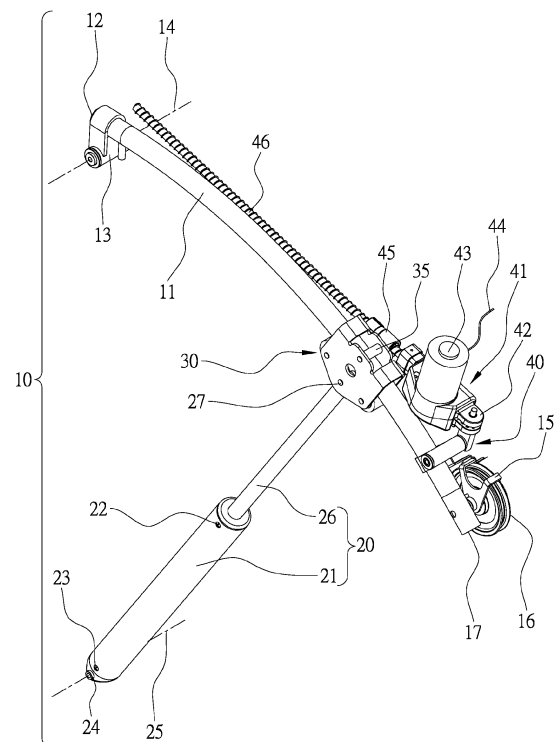


FIG. 1

Description

BACKGROUND OF INVENTION

1. FIELD OF INVENTION

[0001] The present invention relates to an exercise machine and, more particularly, to a loading device for use on an exercise machine.

2. RELATED PRIOR ART

[0002] An exercise machine includes a loading device operable to control a load or resistance against a person who exercises with the exercise machine. The loading device can include a spring, a set of weights or a system of levers.

[0003] Where a loading device includes a spring, it is impossible for a user to adjust the load provided by the spring because the load provided by the spring gets heavier as extension of the spring gets longer.

[0004] Where a loading device includes a set of weights, a user is allowed to adjust the load by using different combinations of the weights. However, the adjustment of the load is not delicate for two reasons. Firstly, each of the weights is made with a considerable weight. Secondly, the number of the combinations is limited.

[0005] As disclosed in US Patent No. 7758479 for example, an exercise machine is provided with a left loading device and a right loading device. The left and right loading devices are identical to each other in structure and are mirror images to each other in position. For the brevity of the description, only the left loading device will be described. The left loading device includes a lever 30, two pulleys 34 and 70, a pneumatic cylinder 36, a cable 40 and a coupling device 50. The lever 30 includes multiple holes 42 arranged along the lever 30. A pivot 32 is used to connect an end of the lever 30 to an upright member 14 of the exercise machine. The pulley 34 is supported on the lever 30, near another end of the lever 30. The pulley 70 is attached to a lower support member 16 of the exercise machine. The cable 40 is wound on the pulleys 34 and 70. An end of the cable 40 is tied to a lower support member 16 of the exercise machine. Another end of the cable 40 is tied to a handle 44 to be held by a user. The coupling device 50 includes a body 52 and a handle 54. The body 52 is supported on the lever 30. The handle 54 is formed with a pin 54a and a flange 54d. A spring 54b is compressed between the flange 54d and an internal portion of the body 52. An upper end of the pneumatic cylinder 36 is pivotally connected to the body 52. A pivot 38 is used to connect a lower end of the pneumatic cylinder 36 to the lower support member 16. The distance between the pivot 32 and the upper end of the pneumatic cylinder 36 sets a first moment arm while the distance between the pivot 32 and a center of the rollers 34 sets a moment arm. The body 52 is movable on the lever 30 so that the first moment arm is adjustable. In

use, the pin 54a is inserted in a selected one of the holes 42 to keep the upper connected end of the pneumatic cylinder 36 in a selected one of multiple positions relative to the pivot 32, i.e., keep the first moment arm in a selected one of multiple values. The spring 54b keeps the while pin 54a in the selected hole 42 and retains two contact portions 53 of the body 52 against the lever 30.

[0006] The use of the loading devices is not without any problem. The sliding of the body 52 on the lever 30 and the insertion of the pin 54a in one of the holes 42 are manual. Hence, the use of the loading devices is not convenient. Moreover, the use of the handle 54 to keep the upper end of the pneumatic cylinder 36 in position relative to the pivot 32 is not firm.

[0007] The present invention is therefore intended to obviate or at least alleviate the problems encountered in the prior art.

SUMMARY OF INVENTION

[0008] It is the primary objective of the present invention to provide an exercise machine with a delicately adjustable loading device.

[0009] To achieve the foregoing objective, the loading device includes a lever, a coupler, a cylinder unit and a driving unit. The lever includes two ends. The first end of the lever is connected to the exercise machine. The coupler is movable along the lever between the first and second ends. The cylinder unit includes an end connected to the exercise machine and another end connected to the coupler. The driving unit includes a threaded sleeve, a threaded rod and a motor. The threaded sleeve is connected to the coupler. The threaded rod is engaged with the threaded sleeve. The motor rotates the threaded rod relative to the threaded sleeve so that the threaded rod moves the coupler via the threaded sleeve.

[0010] Other objectives, advantages and features of the present invention will be apparent from the following description referring to the attached drawings.

BRIEF DESCRIPTION OF DRAWINGS

[0011] The present invention will be described via detailed illustration of two embodiments referring to the drawings wherein:

FIG. 1 is a perspective view of a loading device according to the first embodiment of the present invention;

FIG. 2 is a top view of the loading device shown in FIG. 1;

FIG. 3 is a front view of the loading device shown in FIG. 2;

FIG. 4 is a top view of the loading device in another position than shown in FIG. 2;

FIG. 5 is a front view of the loading device shown in FIG. 4;

FIG. 6 is an enlarged, partial and cross-sectional

view of the loading device shown in FIG. 3;
 FIG. 7 is an enlarged, partial and cross-sectional view of the loading device shown in FIG. 2;
 FIG. 8 is a perspective view of a loading device according to the second embodiment of the present invention;
 FIG. 9 is a perspective view of an exercise machine equipped with the loading device shown in FIG. 1; and
 FIG. 10 is a perspective view of another exercise machine equipped with the loading device shown in FIG. 1.

DETAILED DESCRIPTION OF EMBODIMENTS

[0012] Referring to FIG. 1, a loading device 10 includes a lever 11, a cylinder unit 20, a coupler 30 and a driving unit 41 according to a first embodiment of the present invention. The loading device 10 can be used with an exercise machine 50 shown in FIG. 9 or another exercise machine 60 shown in FIG. 10.

[0013] The lever 11 is an arched element formed with two ends 12 and 17. A pivot 13 is used to connect the end 12 of the lever 11 to a portion of the exercise machine 50 or 60 so that the lever 11 is allowed to pivot about an axis 14 along which the pivot 13 extends. A supporting element 15 and a positioner 40 are connected to the lever 11, near the end 17. The supporting element 15 supports a stationary pulley 16. A cable 57 (FIG. 9) or another cable 65 (FIG. 10) is wound on the stationary pulley 16 so that the stationary pulley 16 is subjected to a force *F* exerted by the cable 57 or 65. The positioner 40 includes two portions extending perpendicular to each other. The portions of the positioner 40 are pivotally connected to each other. The first portion of the positioner 40 is connected to the lever 11. Preferably, the first portion of the positioner 40 is a ferrule extending around the lever 11. Alternatively, the first portion of the positioner 40 is connected to the lever 11 by welding. The second portion of the positioner 40 is connected to the driving unit 41. The driving unit 41 is located behind the lever 11.

[0014] The driving unit 41 includes a shell 41a (FIG. 7), a motor 43, a threaded sleeve 45 and a threaded rod 46. The shell 41a is pivotally connected to the second portion of the positioner 40. The motor 43 is supported on the shell 41a. The motor 43 is electrically connected to a power supply (not shown) through a wire 44. The motor 43 includes a mandrel 43a (FIG. 7). The power supply is used to energize the motor 43 to rotate the mandrel 43a. The threaded rod 46 is operatively connected to the mandrel 43a so that the threaded rod 46 is rotated by the mandrel 43a. The threaded sleeve 45 is engaged with the threaded rod 46 so that the threaded sleeve 45 moves on and along the threaded rod 46 when the threaded rod 46 rotates.

[0015] Referring to FIG. 2, the shell 41a is formed with a connective portion 42 pivotally connected to the second portion of the positioner 40 so that the driving unit 41 is

pivotally connected to the lever 11, in the vicinity of the supporting element 15. The threaded sleeve 45 is connected to the coupler 30 by a pivot 45a. The coupler 30 is movable on and along the lever 11 between the end 12 of the lever 11 and the end 17 of the lever 11 (or the positioner 40). The threaded sleeve 45 is prevented from rotation about an axis of the threaded rod 46 but allowed to move along the axis of the threaded rod 46 due to the pivot 45a, which is connected to the coupler 30.

[0016] Referring to FIG. 7, a toothed wheel 41c is located in and connected to the shell 41a. The toothed wheel 41c is coaxially connected to the mandrel 43a. The toothed wheel 41c is engaged with the threaded rod 46 so that the toothed wheel 41c rotates the threaded rod 46. A supporting element 41b is located in and connected to the shell 41a. The supporting element 41b is in the form of a collar or sleeve extending around the threaded rod 46 so that the supporting element 41b keeps the threaded rod 46 engaged with the toothed wheel 41c.

[0017] The motor 43 can be energized to rotate the mandrel 43a. The mandrel 43a rotates the toothed wheel 41c. The toothed wheel 41c rotates the threaded rod 46. The threaded rod 46 moves the threaded sleeve 45. The coupler 30 moves with the threaded sleeve 45. Thus, the coupler 30 can be located in the vicinity of the end 17 of the lever 11 (FIG. 2) or moved toward the end 12 of the lever 11 (FIG. 4).

[0018] Referring to FIG. 1 again, the cylinder unit 20 can be a pneumatic or hydraulic cylinder unit that includes a cylinder 21 and a plunger 26. The cylinder 21 is formed with a lug 24 at an end. The plunger 26 includes a first end movable in the cylinder 21 and a second end movable in the exterior of the cylinder 21. Gas or liquid can be admitted into the cylinder 21 through an aperture 22 to move the second end of the plunger 26 toward the cylinder 21. Gas or liquid can be admitted into the cylinder via another aperture 23 to move the second end of the plunger 26 from the cylinder 21. The second end of the plunger 26 is formed with a lug 28 (FIG. 6) connected to the coupler 30 by a fastener 27 such as a rivet and a combination of a threaded bolt with a nut. The cylinder unit 20 pivots about an axis 25 extending through the lug 24 when the coupler 30 moves along the lever 11.

[0019] Referring to FIG. 6, the coupler 30 includes two arched portions 32 formed between two planar portions 31. The second end of the plunger 26 is located between the planar portions 31 of the coupler 30 before the former is connected to the latter via the fastener. Two rollers 34 and a roller 35 are located between the planar portions 31 of the coupler 30 before the former are connected to the planar portions 31 of the coupler 30 by fasteners 33. The rollers 34 are located further from the arched portions 32 of the coupler 30 than the roller 35 is. The second end of the plunger 26 is located between the rollers 34. The lever 11 is located between the planar portions 31 of the coupler 30. The lever 11 is not in contact with the plunger 26. The rollers 34 are in contact with a side of the lever 11 while the roller 35 is in contact with another side of

the lever 11. The rollers 34 and 35 allow the coupler 30 to move smoothly on and along the lever 11.

[0020] Referring to FIGS. 2 through 5, a first moment arm is determined by the distance between the axis 14 and an axis (not numbered) of the pulley 16. The first moment arm is constant because the pulley 16 is not movable in relation to the lever 11. A second moment arm is determined by the distance between the axis 14 and an axis (not numbered) of the fastener 27. The second moment arm is adjustable because the coupler 30 is movable along the lever 11. For example, the second moment arm shown in FIGS. 2 and 3 is longer than the second moment arm shown in FIGS. 4 and 5. Hence, a user of the exercise machine 50 or 60 encounters a larger resistance when the second moment arm is as shown in FIGS. 2 and 3 than as shown in FIGS. 4 and 5.

[0021] Referring to FIG. 8, there is a loading device 10 according to a second embodiment of the present invention. The second embodiment is like the first embodiment except for that the driving unit 41 is located in the vicinity of the end 12 of the lever 11. Accordingly, the driving unit 41 is located in front the lever 11.

[0022] Referring to FIG. 9, the exercise machine 50 is equipped with the loading device 10. The exercise machine 50 further includes a frame 51, a bench 54, a pivotal element 55, a pulley set 56 and a cable 57. The frame 51 includes two vertical bars 52 connected to two horizontal bars 53. The bench 54 is located before and connected to the frame 51. The pivotal element 55 is located below and pivotally connected to the bench 54. The pulley set 56 is located in and connected to the frame 51.

[0023] The loading device 10 is located in the frame 51, behind the bench 54. The end 12 of the lever 11 is connected to a left one of the vertical bars 52 via the pivot 13, in the vicinity of an upper end. The lug 24 of the cylinder 21 is connected to the left vertical bar 52 by a pivot (not numbered), in the vicinity of a lower end.

[0024] The cable 57 is wound on the pulley set 56 and the pulley 16. An end of the cable 57 is tied to a rear face of the pivotal element 55. Another end of the cable 57 is tied to a lower one of the horizontal bars 53.

[0025] A user of the exercise machine 50 sits on the bench 54. The user bends his or her legs before hooking the pivotal element 55 with the legs. Then, the user stretches the legs and pivots the pivotal element 55 from the bench 54 as indicated by an arrow head e. Hence, the user encounters a resistance from the loading device 10 via the cable 57 as indicated by arrow heads a, b, c and d.

[0026] Referring to FIG. 10, the exercise machine 60 is equipped with the loading device 10. The exercise machine 60 further includes a primary frame 61, a pulley set 64, a cable 65, a secondary frame 66 and a handle 67. The primary frame 61 includes two vertical bars 62 connected to two horizontal bars 63. The primary frame 61 is located on a supporting surface 58 such as a floor. The pulley set 64 is located in and connected to the primary frame 61. The secondary frame 66 is connected to an

upper one of the horizontal bars 63.

[0027] The loading device 10 is located in the frame 51. The end 12 of the lever 11 is connected to a left one of the vertical bars 62 via the pivot 13, in the vicinity of an upper end. The lug 24 of the cylinder 21 is connected to the left vertical bar 52 by a pivot (not numbered) extending along the axis 25, in the vicinity of a lower end.

[0028] The cable 65 is wound on the pulley set 64 and the pulley 16. An end of the cable 65 is tied to a middle portion of the handle 67. Another end of the cable 65 is tied to a lower one of the horizontal bars 63.

[0029] A user of the exercise machine 60 stands in front of the primary frame 61. The user stretches his or her arms before holding the handle 67 with his or her hands. Then, the user bends the arms and pulls the handle 67 from the secondary frame 66 as indicated by an arrow head f. Hence, the user encounters a resistance from the loading device 10 via the cable 65 as indicated by arrow heads a, b and c.

[0030] The present invention has been described via the illustration of the embodiments. Those skilled in the art can derive variations from the embodiments without departing from the scope of the present invention. Therefore, the embodiments shall not limit the scope of the present invention defined in the claims.

Claims

1. A loading device for use in an exercise machine (50, 60), wherein the loading device comprises:

a lever (11) comprising a first end (12) and a second end (17), wherein the first end (12) of the lever (11) is connected to the exercise machine (50, 60);

a coupler (30) movable along the lever (11) between the first and second ends (12, 17);

a cylinder unit (20) comprising an end connected to the exercise machine (50, 60) and another end connected to the coupler (30); and

a driving unit (41) comprising:

a threaded sleeve (45) connected to the coupler (30);

a threaded rod (46) engaged with the threaded sleeve (45); and

a motor (43) for rotating the threaded rod (46) relative to the threaded sleeve (45) so that the threaded rod (46) moves the coupler (30) via the threaded sleeve (45).

2. The exercise machine loading device according to claim 1, wherein the driving unit (41) further comprises:

a shell (41a);

a toothed wheel (41c) located in the shell (41a)

and driven by the motor (43); and
 a supporting element (41b) located in the shell
 (41a), wherein the supporting element (41b)
 keeps the threaded rod (46) engaged with the
 toothed wheel (41c).

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3. The exercise machine loading device according to
 claim 2, wherein the motor (43) comprises a mandrel
 (43a) coaxially connected to the toothed wheel (41c).

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4. The exercise machine loading device according to
 claim 2, wherein the shell (41a) comprises a connec-
 tive portion (42), wherein the lever (11) comprises a
 positioner (40) pivotally connected to the connective
 portion (42) of the shell (41a).

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5. The exercise machine loading device according to
 claim 1, wherein the lever (11) is an arched element.

6. The exercise machine loading device according to
 claim 1, further comprising a stationary pulley (16)
 connected to the lever (11), in the vicinity of the sec-
 ond end (17).

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7. The exercise machine loading device according to
 claim 1, wherein the cylinder unit (20) includes a cyl-
 inder (21) and a plunger (26) extending from the cyl-
 inder (21), wherein the cylinder (21) comprises a lug
 (24) connected to an exercise machine (50, 60),
 wherein the plunger (26) comprises a lug (28) con-
 nected to the coupler (30).

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8. The exercise machine loading device according to
 claim 1, wherein the coupler (30) comprises two low-
 er rollers (34) in contact with a lower side of the lever
 (11) and an upper roller (35) in contact with an upper
 side of the lever (11), wherein the lower and upper
 rollers (34, 35) are located between the planar por-
 tions (31) of the coupler (30).

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9. The exercise machine loading device according to
 claim 8, wherein the planar and arched portions (31,
 32) of the coupler (30) are formed in one piece,
 wherein the planar portions (31) of the coupler (30)
 extend on two opposite sides of the arched portions
 (32).

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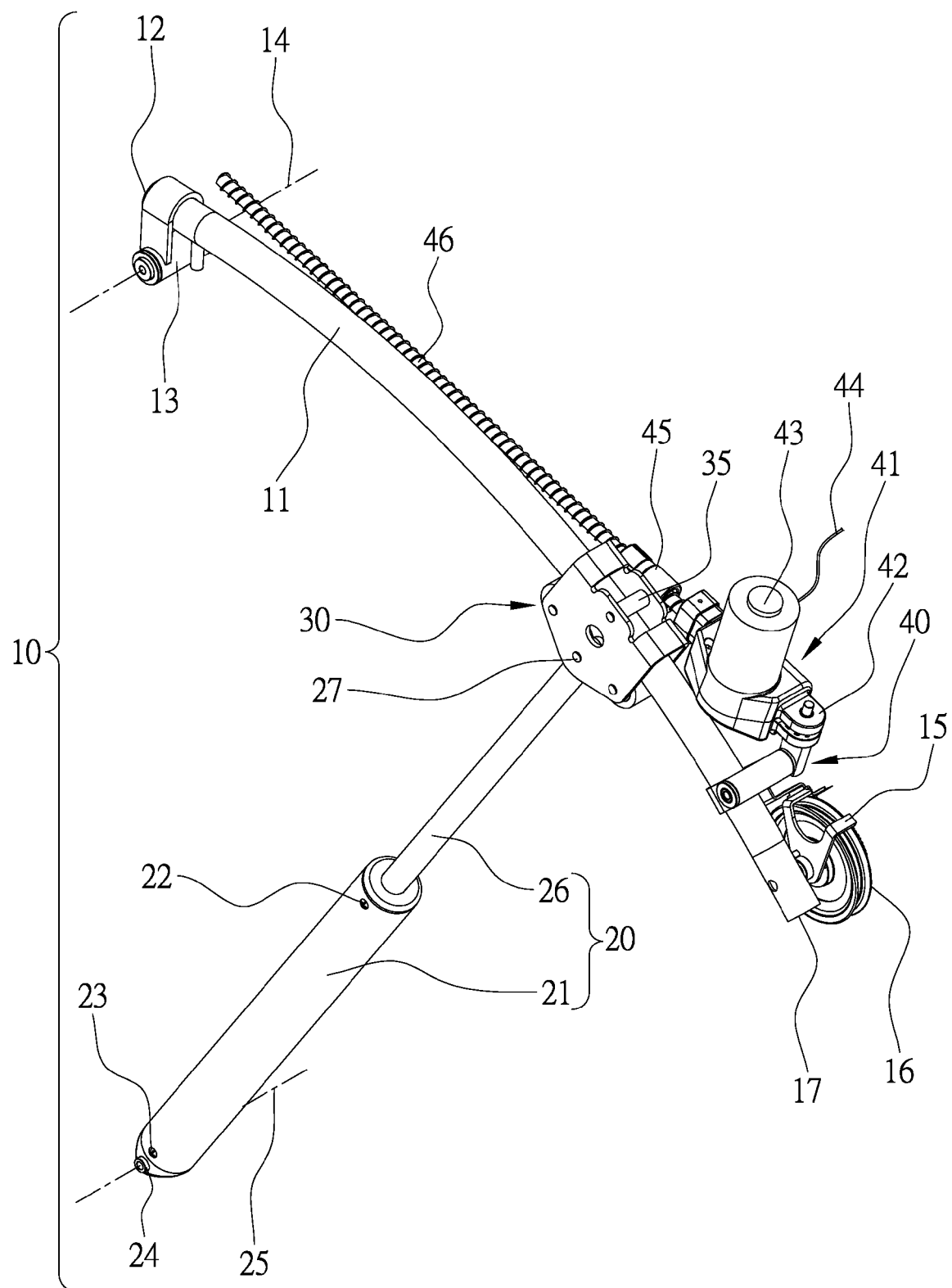
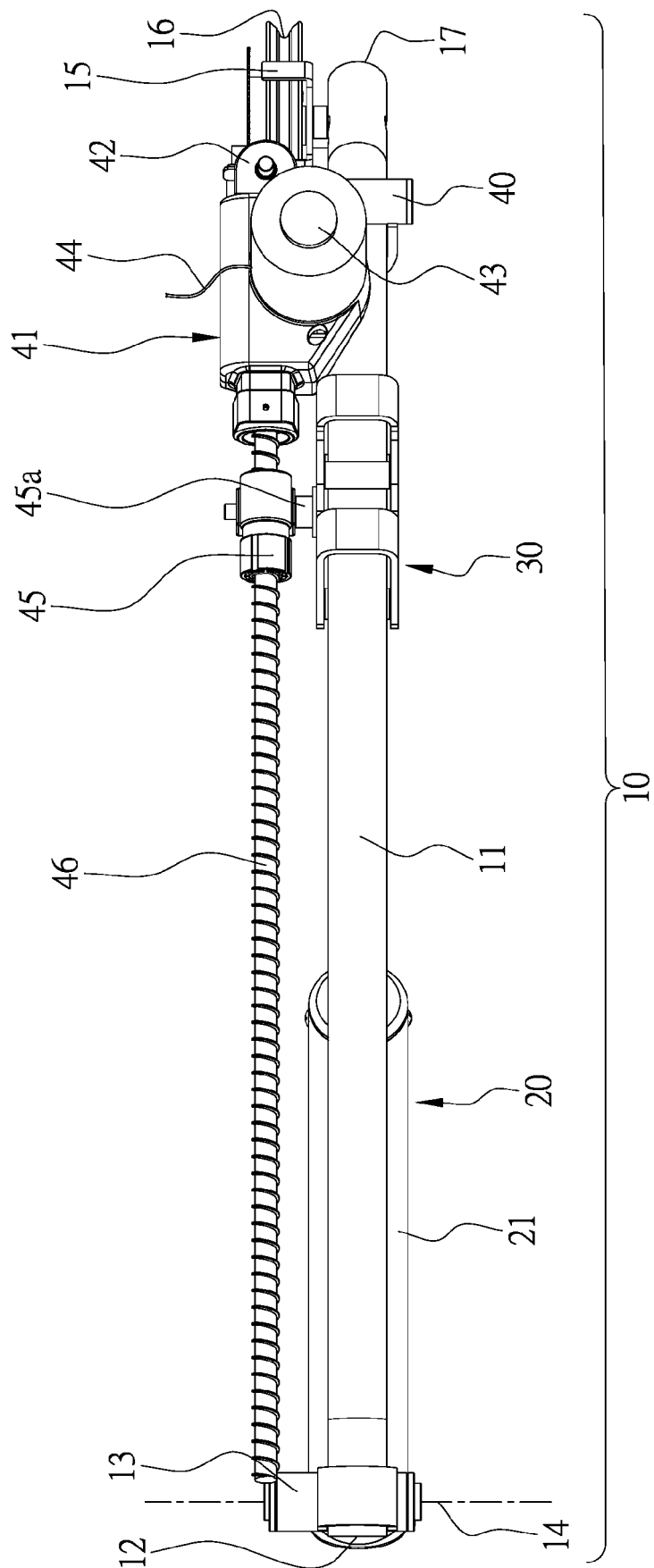


FIG. 1



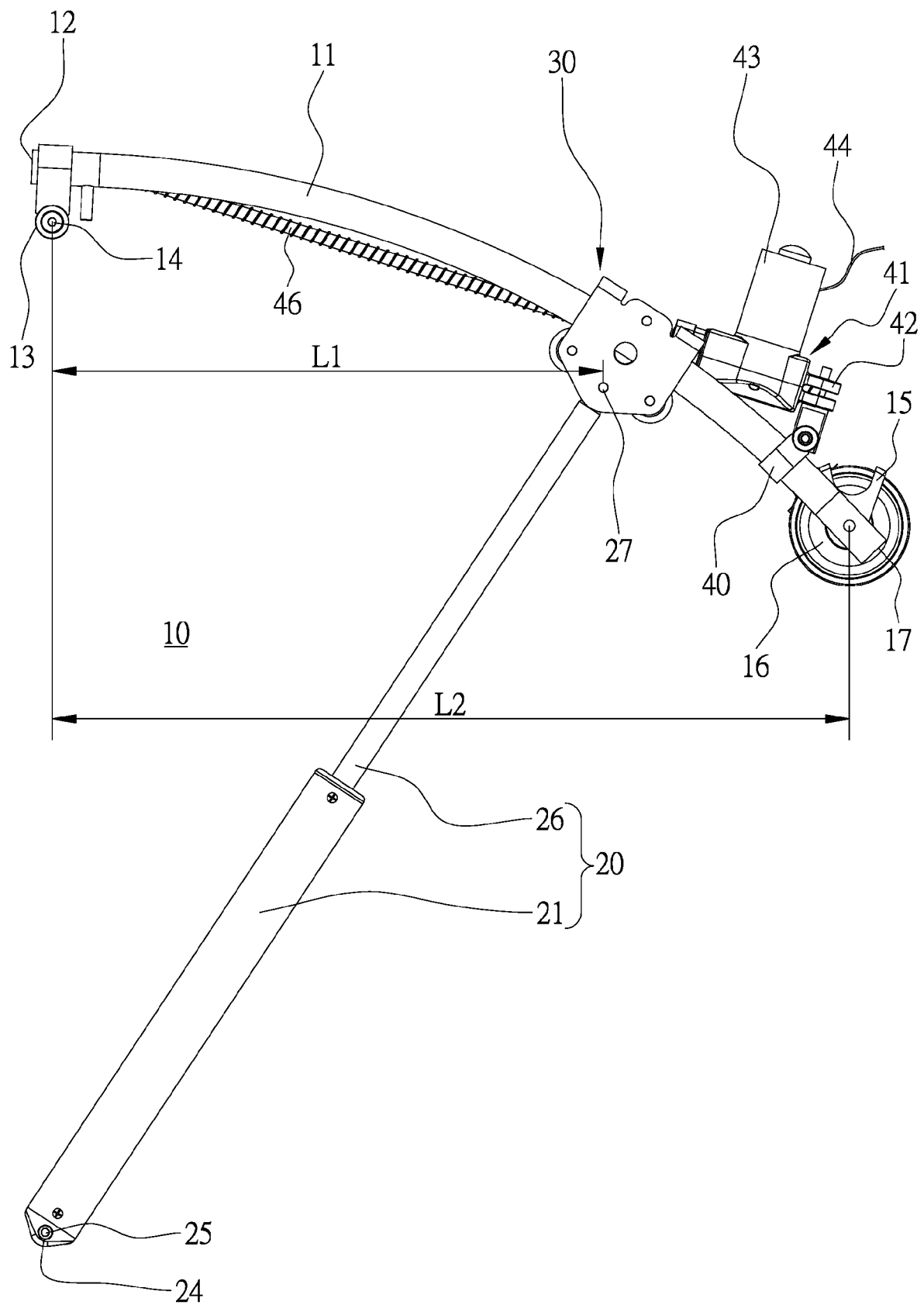


FIG. 3

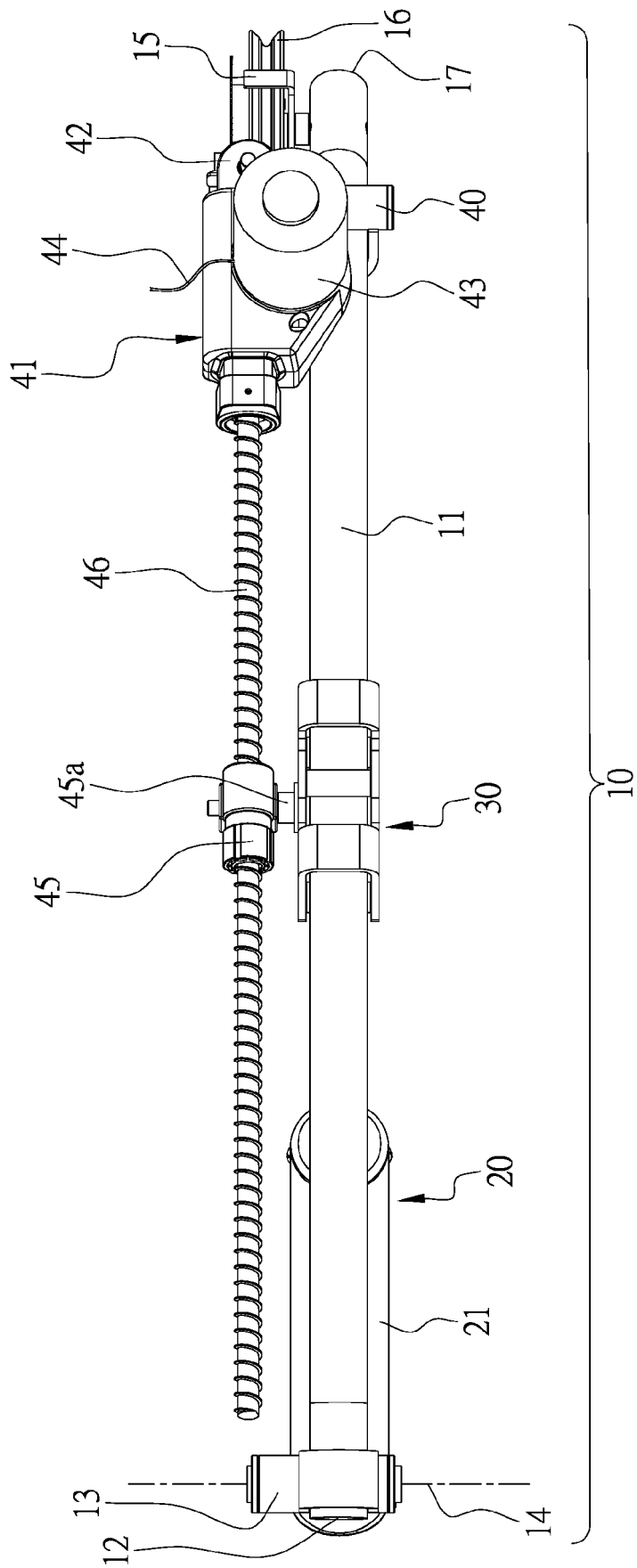


FIG. 4

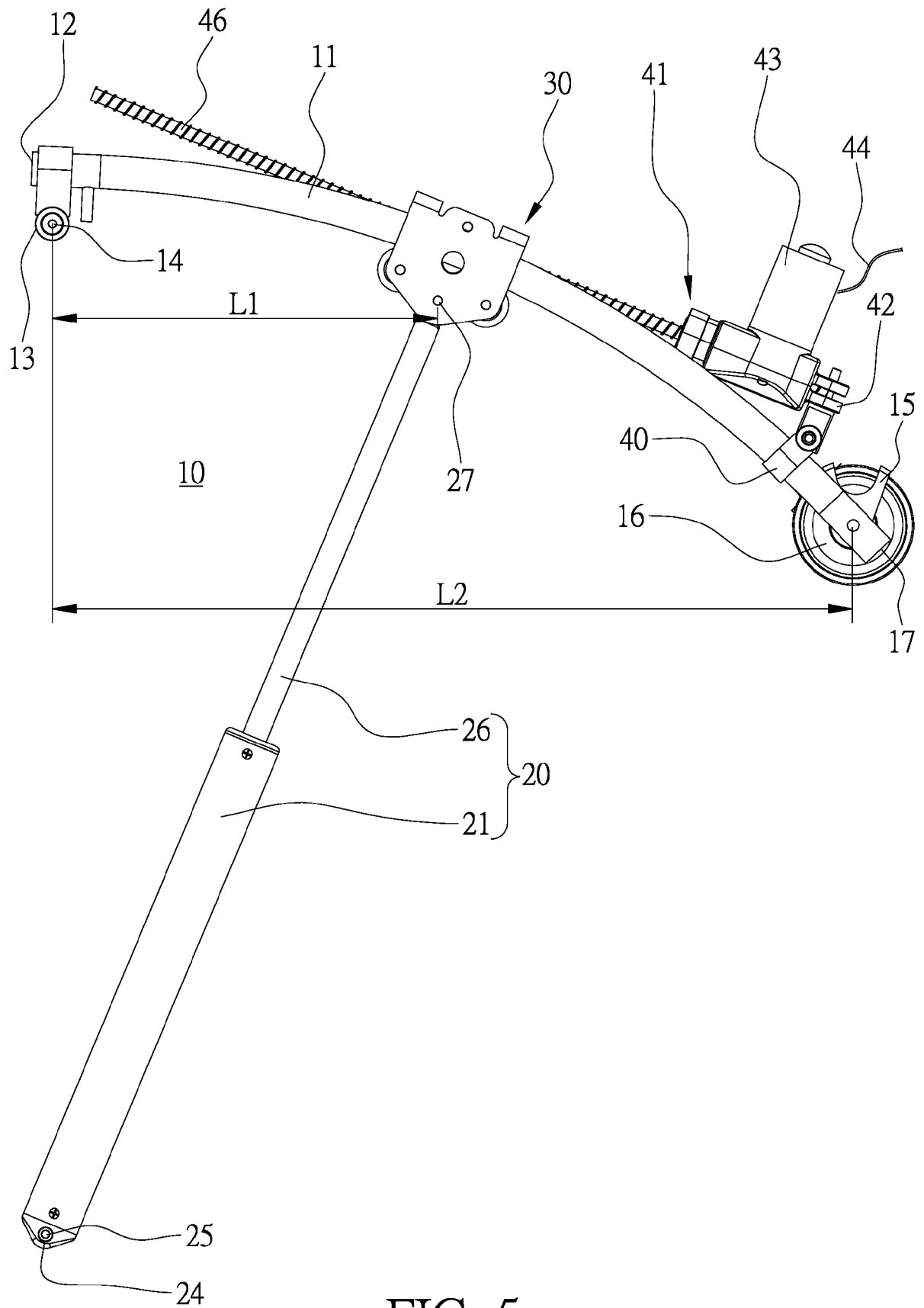


FIG. 5

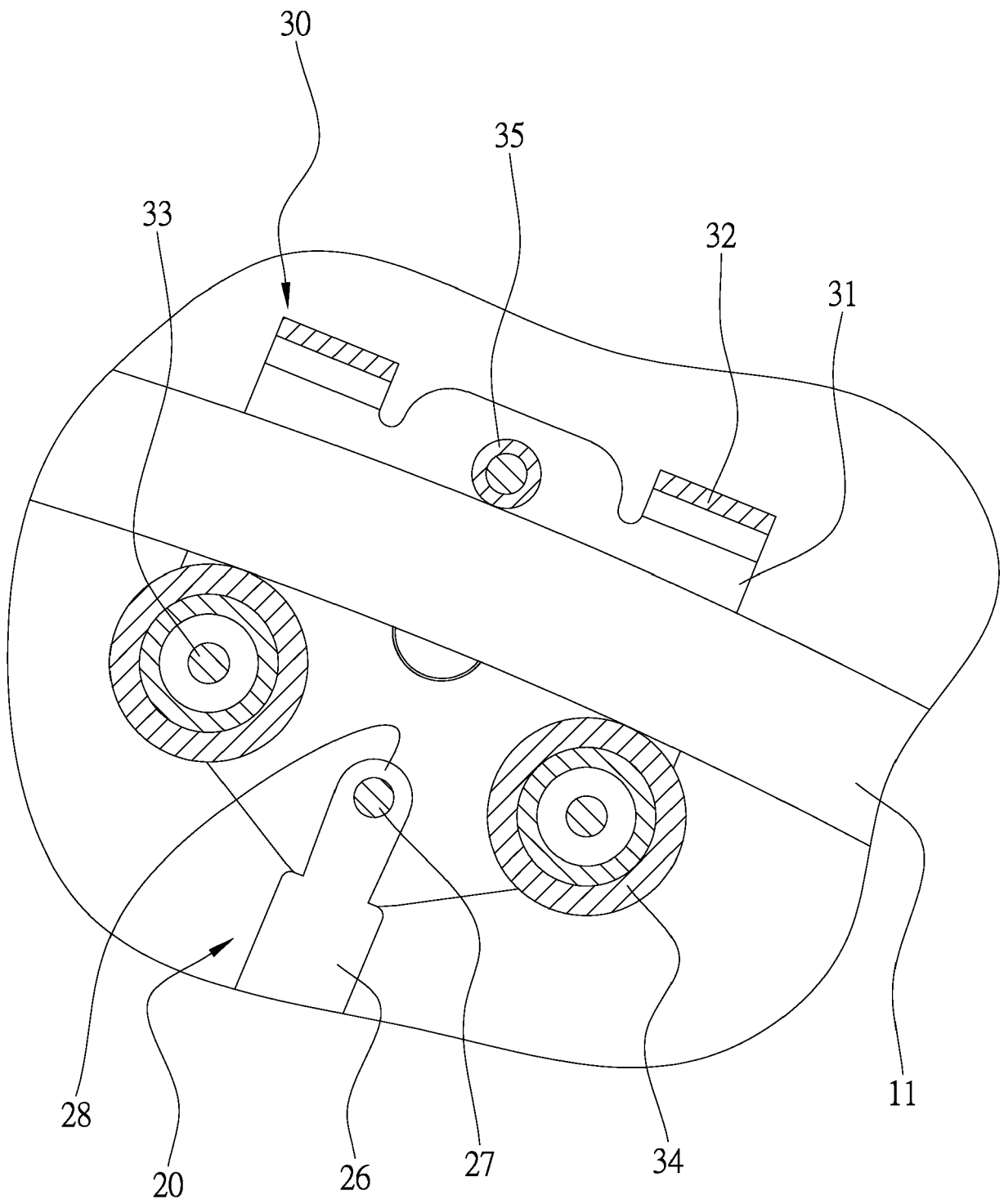


FIG. 6

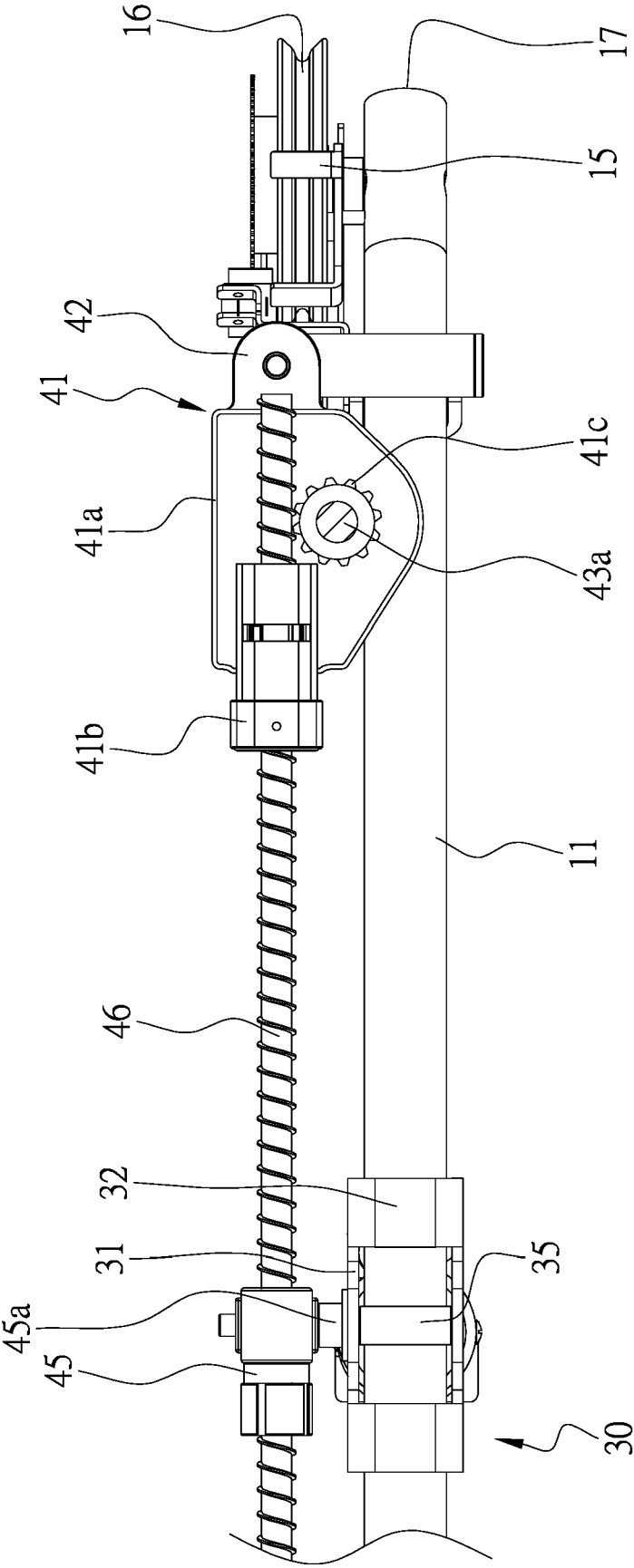


FIG. 7

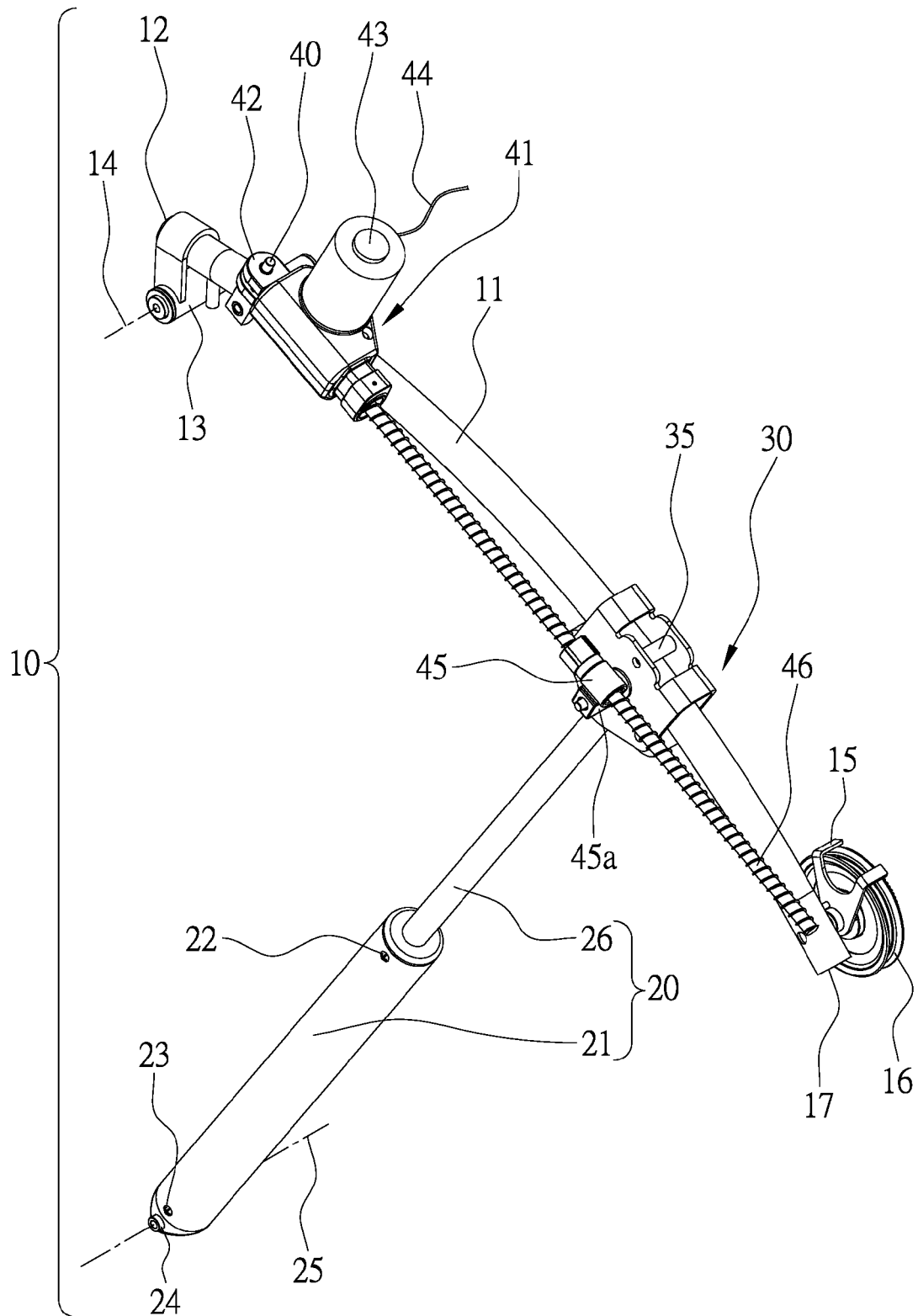


FIG. 8

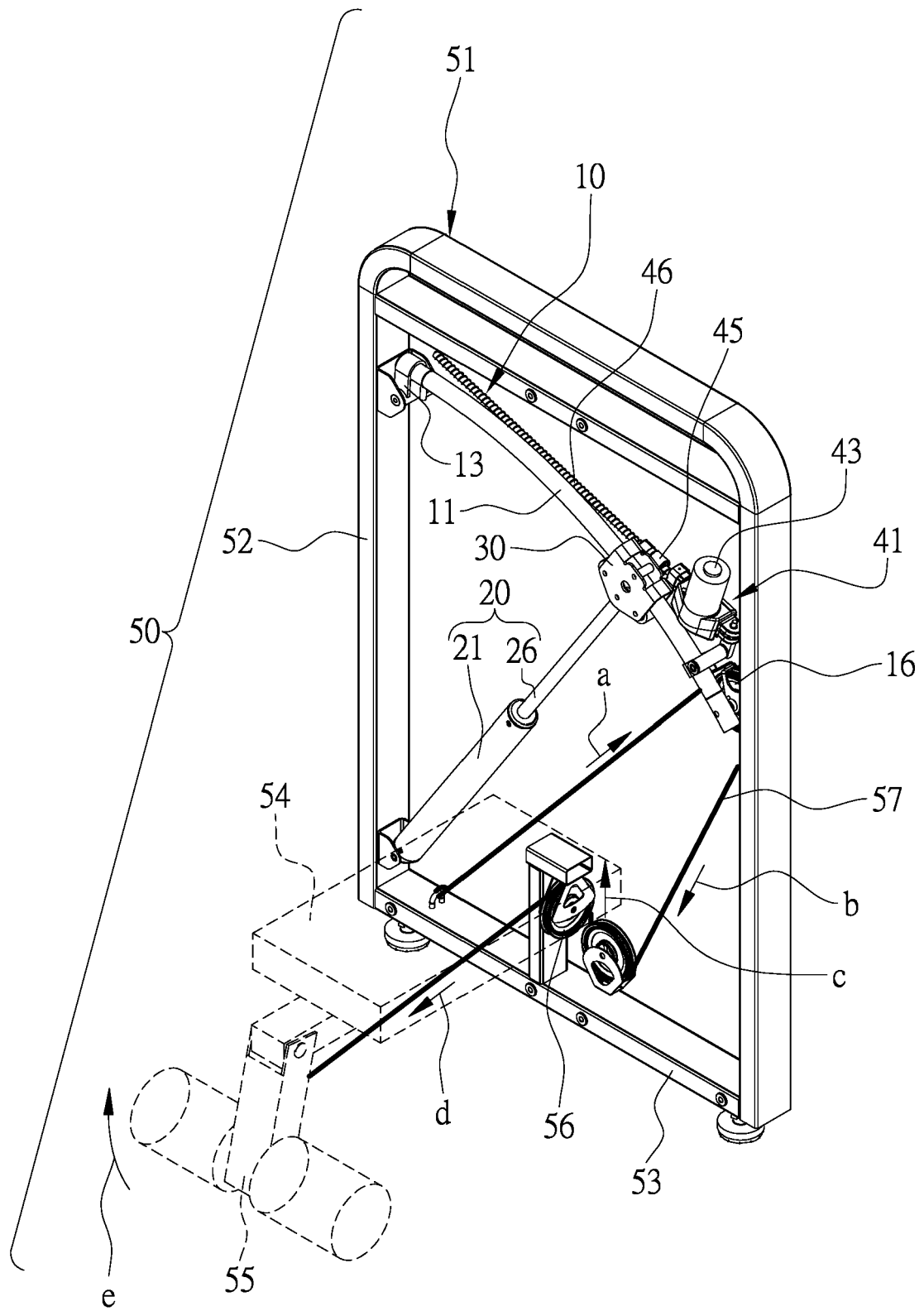


FIG. 9

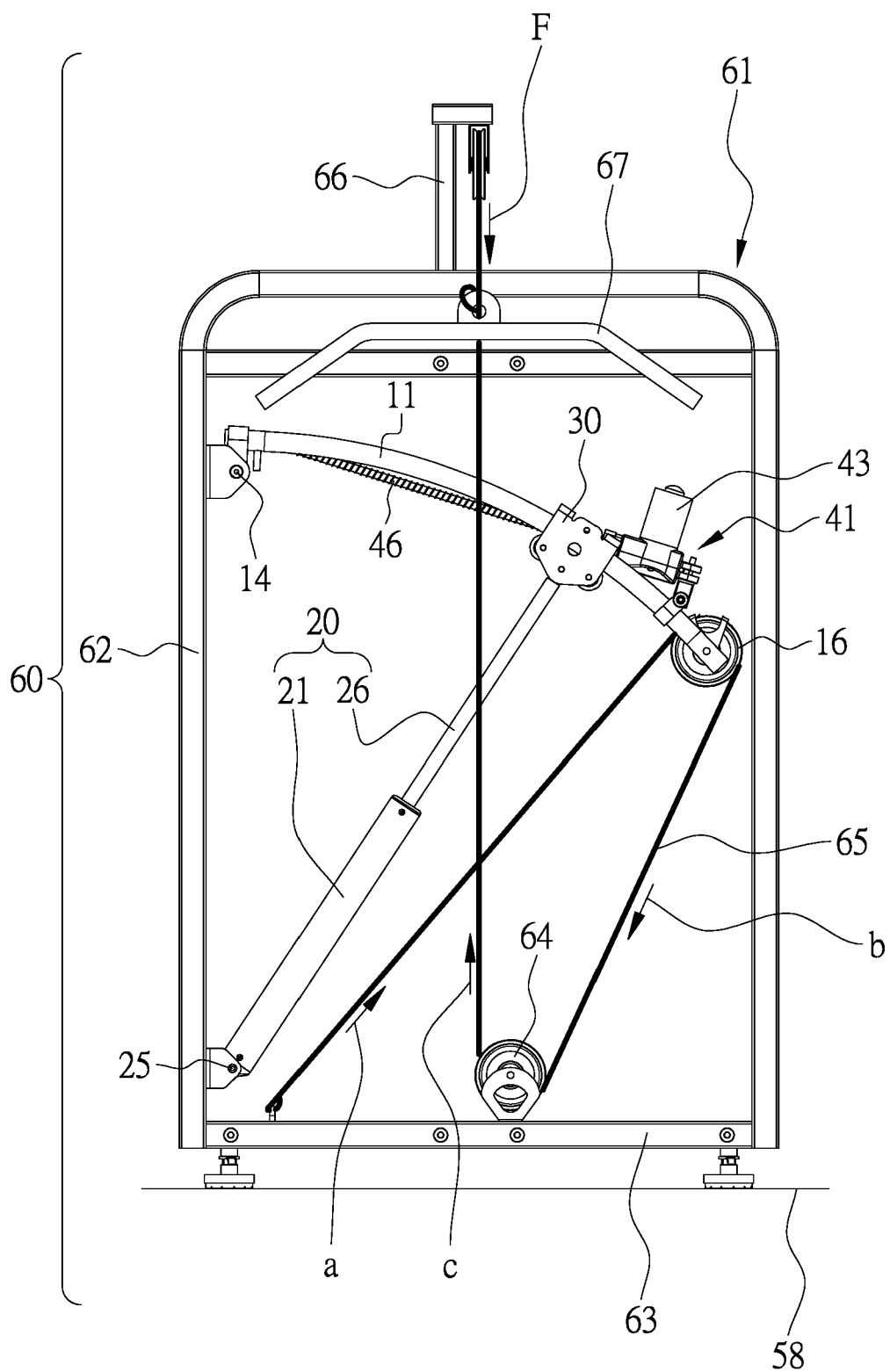


FIG. 10



EUROPEAN SEARCH REPORT

Application Number

EP 21 19 7582

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EPO FORM 1503 03.82 (P04C01)

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	US 4 426 077 A (BECKER HERMANN-JOSEF [DE]) 17 January 1984 (1984-01-17) * column 1 - column 3; figures * -----	1-9	INV. A63B21/005 A63B21/00
X	US 10 960 253 B2 (MEREDITH JEFFREY OWEN [US]; HOIST FITNESS SYSTEMS INC [US]) 30 March 2021 (2021-03-30) * column 12; figures * -----	1	
A	EP 1 960 062 A1 (KOLOMEIR JOSEPH [CA]) 27 August 2008 (2008-08-27) * abstract; figures * -----	1	
A	US 2003/027693 A1 (BUSHNELL RAYMOND B [US]) 6 February 2003 (2003-02-06) * abstract; figures * -----	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			A63B
1 The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 9 March 2022	Examiner Borrás González, E
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EP 21 19 7582

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09-03-2022

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4426077 A	17-01-1984	DE 3011404 A1 US 4426077 A	01-10-1981 17-01-1984
US 10960253 B2	30-03-2021	US 2018345063 A1 US 2019336808 A1	06-12-2018 07-11-2019
EP 1960062 A1	27-08-2008	AT 498434 T CA 2631984 A1 EP 1960062 A1 US 2007129223 A1 WO 2007065255 A1	15-03-2011 14-06-2007 27-08-2008 07-06-2007 14-06-2007
US 2003027693 A1	06-02-2003	AU 2002322859 A1 US 2003027693 A1 WO 03011399 A2	17-02-2003 06-02-2003 13-02-2003

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 7758479 B [0005]