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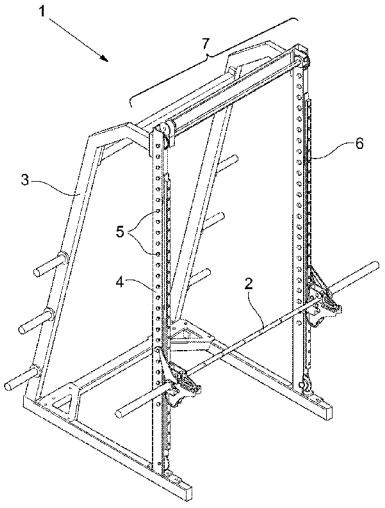
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(54) Title: COUNTERBALANCED WEIGHT LIFTING APPARATUS

Fig.1



(57) Abstract: A weight lifting apparatus (1) comprising: a frame (3) including a pair of vertical sliding rails (6), a pair of connectors (12) each slidably mounted on a respective sliding rail (6) of the frame (3) and comprising means for securing a barbell (2), and a chain drive (7) including an upper sprocket (8) and a lower sprocket (9) associated with each of the pair of sliding rails (6) rotatably mounted on the frame (3), and a chain (11) trained about the upper sprocket (8) and the lower sprocket (9) associated with the respective sliding rail (6), wherein the ends of the chain (11) are attached to the connector (12) on the respective sliding rail (6), wherein the upper sprockets (8) are interconnected by means of a horizontal rod (10) for synchronising the rotational movement of the chain drive (7), wherein the weight lifting apparatus (1) further comprises a resilient member mounted between the frame (3) and the chain drive (7) or at least one of the connectors (12) and adapted to exert a force on the chain drive(7) or the at least one connector (12) over the range of motion of the connector (12) along the sliding rail (6).

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DESCRIPTION

Title of Invention:

COUNTERBALANCED WEIGHT LIFTING APPARATUS

Technical Field

[0001] The present invention relates generally to exercise equipment especially used in weight training and more specifically to a weight lifting apparatus.

Background Art

[0002] Exercise trends in weight training constantly change with time. Presently, weight training for both regular exercisers and elite athletes in all sports is dominated by training with free weights. For example, weight lifting using an Olympic size barbell is one of the fundamental features of training at gyms around the world today. Free weight lifting activates a plurality of muscle groups in that the user must stabilise the weights and keep his or her balance. As such, training with free weights also places great demands on the exerciser.

[0003] As an alternative, the Smith machine was developed in the 1950s. The Smith machine consists of a barbell that is fixed within steel rails, allowing only vertical or near-vertical movement. Behind each vertical post (runner) is a series of slots on which the barbell can be hooked. This means that unlike an ordinary barbell, the Smith machine need not be re-racked after a set of repetitions: it can be secured at any point. This supposedly makes it safer for those who lift without a spotter, as one only needs to twist the wrist in order to lock the barbell in place in the event that the weight becomes too great. On the other hand, the Smith machine requires less stabilisation and balance by the lifter since it is restrained to move only in one plane, which means that only selected muscle groups are activated during lifting.

[0004] WO 2017/099656 discloses a connector for weight lifting apparatus which makes it possible to combine both free weight training and weight lifting with a fixed path movement such as in a Smith machine. Thus, an optimal exercise regime may be achieved focusing on the advantages of both types.

[0005] However, it has been found that such a connector poses a new challenge not seen in conventional Smith machines. Although the connector allows for a rigid connection with respective ends of the barbell, there will still be a play between the connector and the barbell. This may result in differences in the vertical movement of the two connectors along the sliding rail of the weight lifting apparatus, which could lead to jamming of the barbell when the user tries to lift and/or lower the barbell.

[0006] US 4,836,535 discloses a power building machine similar to a Smith machine with a weight bar assembly with free weights running along vertical guide rods and connected to weight stacks. A sprocket system including an endless chain is employed to control, load and synchronize the weight bar assembly. The upper sprockets are splined to a horizontal synchronizer rod to ensure equal chain movements on each side of the frame. US 4,836,535 also mentions operationally associating some of the weight block members with the chain to counter balance the mass of the weight bar assembly. However, this is a cumbersome solution and requires the user to manipulate several weight members in different positions about the power building machine in order to achieve adequate counter balance.

[0007] Thus, there is a need for a solution which limits or eliminates differences in the movement of the connectors along the sliding rail and facilitates counter balancing of the weight bar assembly.

Summary of Invention

[0008] An object of the present invention is to provide an improved weight lifting apparatus adapted to limit or eliminate differences in the movement of respective ends of a barbell along the sliding rail and facilitate counter balancing of the barbell. Accordingly, in a first aspect there is provided a weight lifting apparatus comprising a frame including a pair of vertical sliding rails, a pair of connectors each slidably mounted on a respective sliding rail of the frame and comprising means for securing a barbell, and a chain drive including an upper and a lower sprocket associated with each of the pair of sliding rails rotatably mounted on the frame, and a chain trained about the upper and the lower sprocket associated with the respective sliding rail, wherein the ends of the chain are attached to the connector on the respective sliding rail, wherein the upper sprockets are interconnected by means of a horizontal rod for synchronising the rotational movement of the chain drive.

[0009] The weight lifting apparatus further comprises a resilient member mounted between the frame and the chain drive or at least one of the connectors and adapted to exert a force on the chain drive or the at least one connector over the range of motion of the connector along the sliding rail.

[0010] By providing a resilient member arranged between the frame and the chain drive or at least one of the connectors, it is possible to provide a simple but effective counter balance of the connectors, and barbell when secured therein. The counter balance increases the safety when using the weight lifting apparatus and does not require any additional manipulation by the user.

[0011] In preferred embodiment, the resilient member comprises a constant-force spring in the form of a rolled ribbon of spring metal arranged in a housing mounted on the top of the frame and connected to one of the connectors. The resilient member in this case resembles a self-retracting spring tape measure connected to one of the connectors which is arranged to apply an upwardly directed force on the connector including a barbell when secured therein to counter balance the weight of the connector.

[0012] In an alternative embodiment, the resilient member comprises a torsion spring arranged coaxially on the horizontal rod, wherein one end of the torsion spring is rigidly mounted in relation to the frame and the other end is mounted to one of the upper sprockets and/or the horizontal rod for co-rotation therewith. The torsion spring provides an alternative solution for counter balancing the weight of the connector. Additionally, since the torsion spring is arranged on the horizontal rod, it does not interfere with the space adjacent the connectors during the sliding movement along the sliding rails.

[0013] In an advantageous embodiment, the weight lifting apparatus further comprises a housing accommodating the horizontal rod. The housing protects the horizontal rod and the torsion spring when mounted thereon and prevents accidental contact with users of the weight lifting apparatus.

[0014] In a further preferred embodiment, the stiffness of the resilient member is configured such that the resulting forces acting on the connectors substantially cancel each other out. In other words, the spring force of the resilient member is chosen to be substantially equal but opposite to the force of gravity on the connectors. Thereby the connectors may be substantially completely counter balanced and only the weight of the

barbell and the weights attached to it is felt by the user. Complete counter balance also facilitates smooth running/sliding of the connectors on the sliding rail.

[0015] In an advantageous embodiment, the sliding rails are mounted directly on the frame and present a substantially I or H-shaped cross section comprising a pair of flanges and a web section. Thereby, the weight lifting apparatus may be made more compact with the sliding rails mounted closer to (i.e. on) the frame. Additionally, the I or H-shaped cross-section prevents rotation of the connector about the sliding rail for improved control of the sliding motion.

[0016] In a preferred embodiment, the connectors comprise a fitting adapted to receive the flanges of the sliding rails. Preferably, the connectors further comprise one or more roller bearings arranged in the fitting and adapted to roll against the sliding rails. The shape of the fitting complements the shape of the sliding rail and the roller bearings facilitates the sliding motion of the connectors in preventing jamming.

[0017] In an advantageous embodiment, the connectors comprise means for releasably securing a barbell. Preferably, the securing means comprise a recess formed in the connector adapted to receive the barbell, and a pivotal member which may be brought between a first position wherein the barbell may be inserted into or removed from the recess, and a second position wherein the pivotal member locks the barbell in the recess. Thus, the connectors enable releasably securing basically any type of free barbell to the weight lifting apparatus in a quick and reliable manner.

Brief Description of Drawings

[0018] The invention is now described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 shows a perspective view of a weight lifting apparatus according to the present invention;

Figs. 2 and 3 show a perspective view of an upper portion of a weight lifting apparatus according to the present invention;

Fig. 4 and 5 show a perspective view of a lower portion of a weight lifting apparatus according to the present invention;

Figs. 6 and 7 show a close-up, partial view of a connector 12 and sliding rail according to one embodiment; and

Figs. 8 and 9 show perspective views of embodiments of a weight lifting apparatus according to the present invention.

Description of Embodiments

[0019] In the following, a detailed description of a weight lifting apparatus according to the invention is presented. In the drawing figures, like reference numerals designate identical or corresponding elements throughout the several figures. It will be appreciated that these figures are for illustration only and are not in any way restricting the scope of the invention.

[0020] A weight lifting apparatus known in the art, such as a Smith machine, will now be discussed. Hence forth, the term Smith machine will be used to describe a weight lifting apparatus with a fixed and controlled movement path. It should however be clear that the connector 12 of the present invention is not limited to use with Smith machines only but may be used with any weight lifting apparatus with a fixed and controlled movement path. A conventional Smith machine comprises a pair of parallel upright steel pipes arranged a distance apart. On each steel pipe, a bearing is arranged to slide up and down along the pipe. A barbell is fixed to or integrally formed with each bearing such that movement of the barbell is restricted to the plane defined by the two steel pipes. Arranged immediately behind and parallel to each pipe is a weight lifting rack having uprights including a plurality of lateral, spaced apart protrusions. This rack provides a stable frame for the Smith machine. The purpose of the protrusions on the rack is to provide locking positions at different heights for the barbell when the user finishes his set of repetitions.

[0021] In Fig. 1, a perspective view of a weight lifting apparatus 1 according to the present invention is shown. The weight lifting apparatus 1 consists of a frame 3 including among others a pair of vertical posts 4 exhibiting lateral protrusions 5 as explained above. On each vertical post 4 of the frame 3 there is mounted a sliding rail 6 on which a connector 12 for a barbell 2 is slidingly arranged. As may be seen in Fig. 1, a barbell 2 is secured in the respective connectors 12 and ready to be used in exercise.

[0022] Referring now to Figs. 2 and 3, an upper portion of the frame 3 is shown. Arranged adjacent the upper portion of the frame 3 is a chain drive 7 including upper sprockets 8 rotatably mounted on the frame 3, above and substantially aligned with the sliding rails 6. The upper sprockets 8 are interconnected by means of a horizontal rod 10

for synchronising the rotational movement of the chain drive 7. The sprockets are profiled wheels comprising teeth or cogs, which are adapted to engage and mesh with chains 11 (shown in Figs. 8 and 9) trained about the upper sprockets 8.

[0023] Figs. 4 and 5 illustrate a lower portion of the frame 3, wherein lower sprockets 9 are rotatably mounted on the frame 3, below and substantially aligned with the sliding rails 6. The lower sprockets 9 are more or less identical to the upper sprockets 8 and may, although not necessarily, also be interconnected by a horizontal rod 10. The chains 11 are similarly trained about the lower sprockets 9, wherein each end of the respective chains 11 is attached to the respective connectors 12 on each side of the frame 3 to create a loop. As shown Fig. 7, the upper portion of the connector 12 comprises a bracket 17 with a through-going hole for attaching the chain 11 thereto. Thus, the chain drive 7, including the upper and lower sprockets 9, the chains 11, and the horizontal rod 10, provides controlled, synchronised movement of the barbell assembly 2, i.e. the connectors 12 on the sliding rails 6. In one embodiment, the vertical posts 4 may be hollow to accommodate the chains 11 therein.

[0024] Referring now to Figs. 6 and 7, a close-up, partial view of a connector 12 and sliding rail 6 according to one embodiment is shown. The connector 12 comprises a main body and a fitting 14 adapted to engage with and slide along the sliding rail. Extending outwardly from the connector 12 in a direction substantially perpendicular to the rail 6 is a support arm 13 which may be integrally formed with or attached to the connector 12. The support arm 13 provides a support or rack for a barbell 2 when used in free weight exercise. The outer end portion of the support arm 13 may be slightly upwardly bent to prevent the barbell 2 from rolling off. In use, a connector 12 is mounted on respective sliding rails 6 of the weight lifting apparatus 1 to provide two points of attachment for the barbell 2.

[0025] To this end, the connector 12 comprises means for releasably securing the barbell 2 such that the barbell 2 may only be moved in a fixed, controlled direction defined by the rails 1 of the Smith machine. The securing means may be realised in various ways, as previously described in WO 2017/099656, incorporated herein by reference. In any case, the connector 12 comprises a recess 18 substantially conforming to the diameter of the barbell 2 and arranged to receive the barbell 2 therein.

[0026] In one embodiment, a pivotal member 15 acts as securing means. As shown in Figs. 6 and 7, the pivotal member 15 is pivotally attached to the connector 12 about an axis substantially perpendicular to the longitudinal extension of the connector 12 and the rail 6, and substantially parallel to the barbell 2, e.g. by means of a pin or bolt 16. The pivotal connection enables the pivotal member 15 to be pivoted from a first, non-engaged position, wherein the pivotal member 15 is downwardly suspended from the support arm 13, leaving the recess 18 free such that the barbell 2 may be inserted into or removed from the recess 18, to a second, engaged position shown in Figs. 6 and 7, wherein the pivotal member 15 has been pivoted towards the recess 18 and abuts against and engages with the barbell 2 to lock the barbell 2 in a secure manner in the recess 18. The length of the pivotal member 15 is preferably approximately the same as, or slightly greater than, the distance between the end of the support arm 13 and the barbell 2, when it is received in the recess 18, such that the pivotal member 15 is at a slight angle relative to a horizontal plane in the second position.

[0027] The sliding rails 6 mounted on the frame 3 are also shown in a closer view in Figs. 6 and 7. As may be seen, the sliding rail 6 has a profile or cross section which differs from conventional pipes known in the art, also shown in Fig. 7. The profile of the sliding rail 6 according to one embodiment of the present invention has an approximate I or H-shaped cross section including a web section 22 and a pair of laterally extending flanges 23. The profile emulates an I- or H-beam, but in a more compressed form wherein the height of the web section 22 is considerably smaller than the width of the flanges 23. This provides a more compact arrangement of the sliding rails 6 compared to conventional pipes.

[0028] To enable sliding motion of the connector 12 along the sliding rail, the connector 12 comprises a fitting 14 arranged on the side facing the frame 3 of the weight lifting apparatus 1. The fitting 14 is adapted to receive the flanges 23 of the sliding rails 6 in a correspondingly shaped recess. This configuration allows for improving the control of the sliding movement in that it prevents rotation of the connector 12 about the longitudinal axis of the sliding rail, thereby limiting the degrees of freedom.

[0029] In order to facilitate the sliding motion, the fitting 14 is provided with roller bearings (not shown) arranged in the recess of the fitting 14. The roller bearings roll

against the sliding rail 6 and reduce friction between the fitting 14 and the sliding rail 6 to ensure smooth sliding of the connector 12.

[0030] Furthermore, the connector 12 comprises a rotational latching device, e.g. in the shape of a hook 19, which is adapted to engage lateral protrusions 5 of the weight lifting apparatus 1 in order to lock the connector 12 and barbell assembly 2 at a desired height. The hook 19 is rotationally coupled to the connector 12 and adapted to be rotated about a rotational axis substantially coinciding with the longitudinal axis of the barbell 2 when securely fastened to the connector 12. Further details of the rotational latching device are provided in WO 2017/099656, incorporated herein by reference.

[0031] In use, the user pushes the barbell 2 towards the connector 12 to insert the barbell 2 into the corresponding recess of the hook on either side of the weight lifting apparatus 1 and subsequently pivots the pivotal member 15 to the second position shown in Figs. 6 and 7 to lock the barbell 2 in place. Next, the user rotates the barbell 2 to disengage the hook 19 from the protrusions 5 on the posterior rack or frame 3 of the Smith machine and begins to lift. When the desired number of repetitions have been completed, the user rotates the barbell 2 in the opposite direction to re-engage the hook 19 with the protrusions 5 and the barbell 2 remains fixed at the selected height.

[0032] When the user wishes to change from fixed controlled movement in the Smith machine to free weight exercise, he or she releases the pivotal member 15 and pivots it back towards the first position, and then pulls the barbell 2 out from the recess 18 such that the barbell 2 rests on the support arm 13 in the first position.

[0033] Returning to the chain drive 7 described above in conjunction with Figs. 2 and 3, the present invention provides an improved solution for achieving counter balance of the barbell assembly 2 to increase safety and facilitate smooth operation of the weight lift apparatus. To this end, there is provided a resilient member, mounted directly or indirectly between the frame 3 and the chain drive 7 or between the frame 3 and at least one of the connectors 12, as illustrated in Fig. 8. Thus, the resilient member is adapted to exert a force on the chain drive 7 or the connector 12 in order to provide a counter balance. In one embodiment, the stiffness of the resilient member is configured such that the forces acting on the connectors 12 cancel each other out, i.e. the spring force is substantially equal to and opposite the force of gravity, thus achieving a substantially zero resulting net force.

[0034] The resilient member in one embodiment comprises a constant-force spring in the form of a rolled ribbon 21 of spring metal arranged in a housing 20 mounted on the top of the frame 3 and connected to one of the connectors 12. In Figs. 1 and 2, only the housing 20 is shown. Further, the rolled ribbon 21 is directly, or indirectly by means of an elongated strip, attached to one of the connectors 12. The resilient member in this case resembles a self-retracting spring tape measure connected to one of the connectors 12 which is arranged to apply an upwardly directed force on the connector 12 (including a barbell 2 when secured therein) to counter balance the weight of the connector 12.

[0035] In an alternative embodiment (not shown), the resilient member comprises a torsion spring arranged coaxially on the horizontal rod 10. One end of the torsion spring is rigidly mounted in relation to the frame 3 and the other end is mounted to one of the upper sprockets 8 for co-rotation therewith. Alternatively, the torsion spring may be attached to the horizontal rod 10. The torsion spring may be configured to provide an approximately constant force over the range of motion of the connector 12 along the sliding rails 6, similar to the rolled ribbon 21 of spring metal describe above.

[0036] Referring now to Fig. 9, a perspective view according to an alternative embodiment is shown. In this embodiment, the horizontal rod 10 is accommodated in a housing 24, suitable for protecting the horizontal rod 10 and when present, the resilient member in the form of a torsion spring as explained above. Further, the sliding rails 6 have a circular cross-section and are not mounted directly on the vertical posts 4, but instead with a gap therebetween. As with the embodiment shown in Figs. 1–8, the connectors 12 are adapted to the shape of the rails 6 in order to slide there along. Moreover, the pivotal members 15 are shown here with a slightly different shape but providing the same functionality as the pivotal members 15 described above in conjunction with Figs. 5–7.

[0037] The connectors 12 may be retrofitted to an existing Smith machine or similar weight lifting apparatus 1 to provide the dual function of controlled movement in a fixed path with free weight exercise in a single piece of exercise equipment. This can save considerable costs in that existing equipment need not be fully replaced. Of course, the connectors 12 may also be mounted on a weight lifting apparatus 1 already upon manufacture, which is also envisaged by the present invention.

[0038] Preferred embodiments of a weight lifting apparatus 1 according to the invention have been described. However, the person skilled in the art realises that this can be varied within the scope of the appended claims without departing from the inventive idea.

[0039] All the described alternative embodiments above or parts of an embodiment can be freely combined without departing from the inventive idea as long as the combination is not contradictory.

CLAIMS

1. A weight lifting apparatus (1) comprising:

- a frame (3) including a pair of vertical sliding rails (6),
- a pair of connectors (12) each slidably mounted on a respective sliding rail (6) of the frame (3) and comprising means for securing a barbell (2), and
- a chain drive (7) including an upper sprocket (8) and a lower sprocket (9) associated with each of the pair of sliding rails (6) rotatably mounted on the frame (3), and a chain (11) trained about the upper sprocket (8) and the lower sprocket (9) associated with the respective sliding rail (6), wherein the ends of the chain (11) are attached to the connector (12) on the respective sliding rail (6),

wherein the upper sprockets (8) are interconnected by means of a horizontal rod (10) for synchronising the rotational movement of the chain drive (7),

characterised in that the weight lifting apparatus (1) further comprises a resilient member mounted between the frame (3) and the chain drive (7) or at least one of the connectors (12) and adapted to exert a force on the chain drive (7) or the at least one connector (12) over the range of motion of the connector (12) along the sliding rail (6).

2. The weight lifting apparatus (1) according to claim 1, wherein the resilient member comprises a spring in the form of a rolled ribbon (21) of spring metal arranged in a housing (20) mounted on the top of the frame (3) and connected to one of the connectors (12).

3. The weight lifting apparatus (1) according to claim 1, wherein the resilient member comprises a torsion spring arranged coaxially on the horizontal rod (10), wherein one end of the torsion spring is rigidly mounted in relation to the frame (3) and the other end is mounted to one of the upper sprockets (8) and/or the horizontal rod (10) for co-rotation therewith.

4. The weight lifting apparatus (1) according to any one of the preceding claims, further comprising a housing (24) accommodating the horizontal rod (10).

5. The weight lifting apparatus (1) according to any one of the preceding claims, wherein the stiffness of the resilient member is configured such that the resulting forces acting on the connectors (12) substantially cancel each other out.

6. The weight lifting apparatus (1) according to any one of the preceding claims, wherein the sliding rails (6) are mounted directly on the frame (3) and present a substantially I or H-shaped cross section comprising a pair of flanges (23) and a web section (22).

7. The weight lifting apparatus (1) according to claim 6, wherein the connectors (12) comprise a fitting (14) adapted to receive the flanges (23) of the sliding rails (6).

8. The weight lifting apparatus (1) according to claim 7, wherein the connectors (12) further comprise one or more roller bearings arranged in the fitting (14) and adapted to roll against the sliding rails (6).

9. The weight lifting apparatus (1) according to any one of the preceding claims, wherein the connectors (12) comprise means for releasably securing a barbell (2).

10. The weight lifting apparatus (1) according to claim 9, wherein the securing means comprise a recess (18) formed in the connector (12) adapted to receive the barbell (2), and a pivotal member (15) which may be brought between a first position wherein the barbell (2) may be inserted into or removed from the recess (18), and a second position wherein the pivotal member (15) locks the barbell (2) in the recess (18).

Fig.1

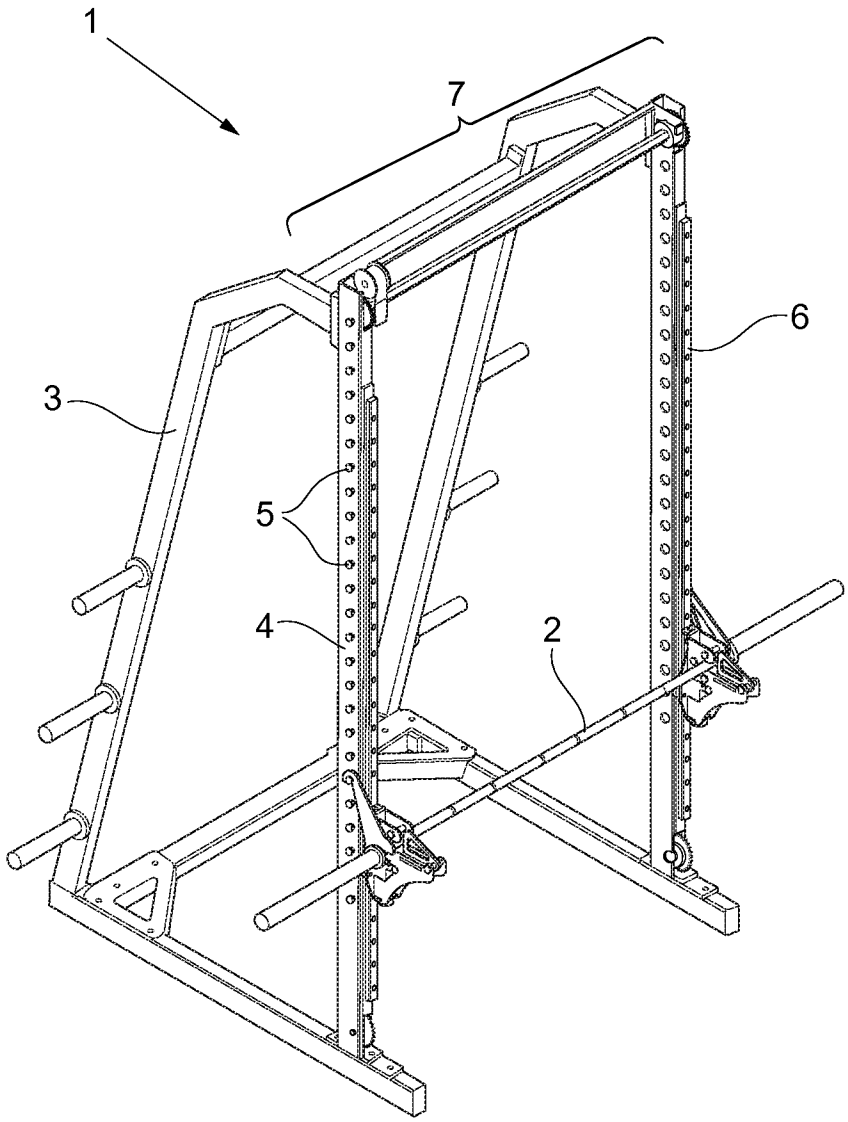


Fig.2

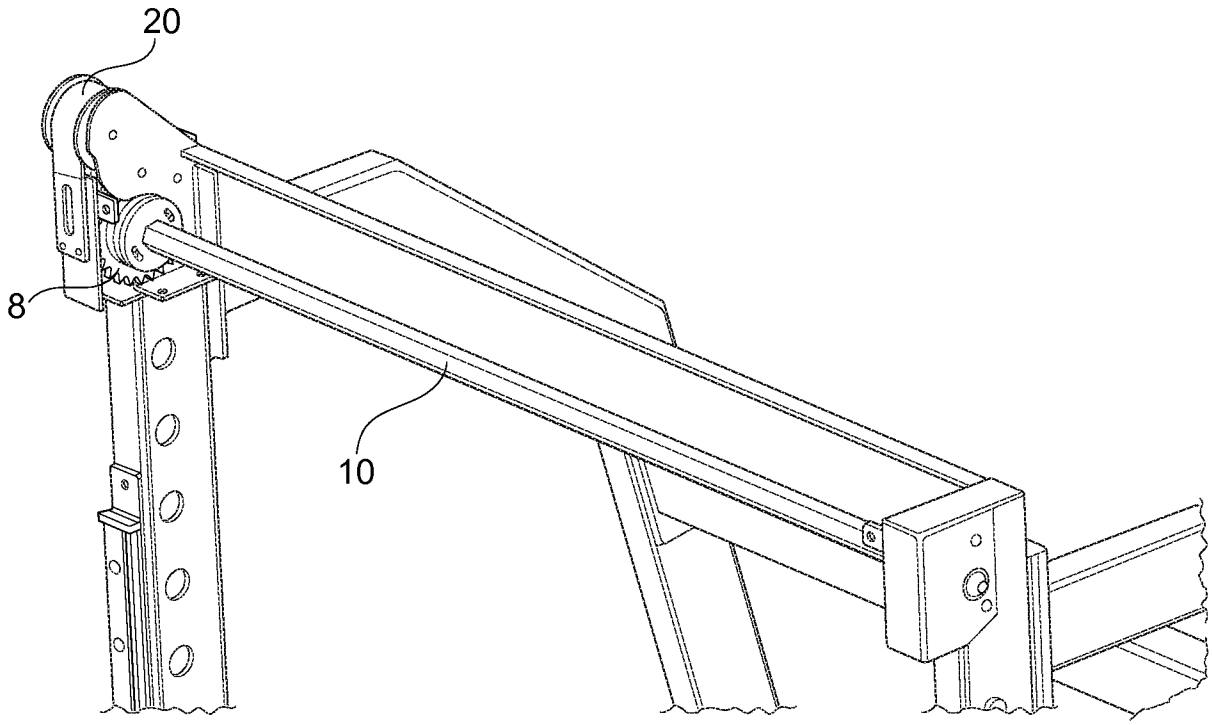


Fig.3

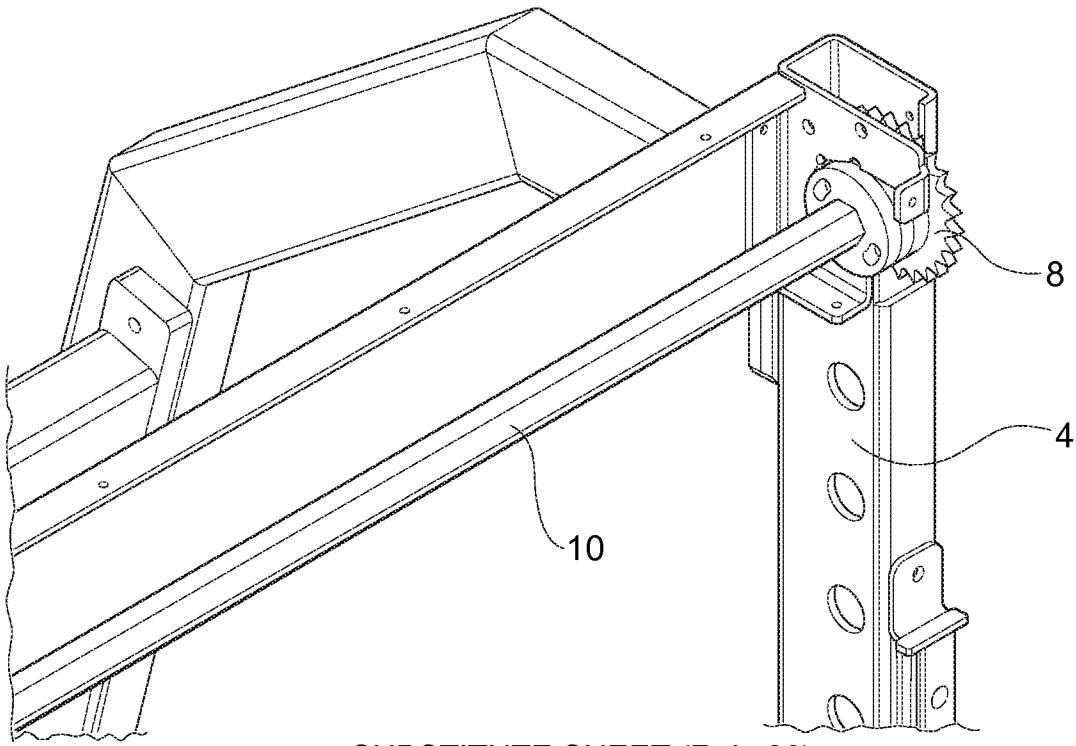


Fig.4

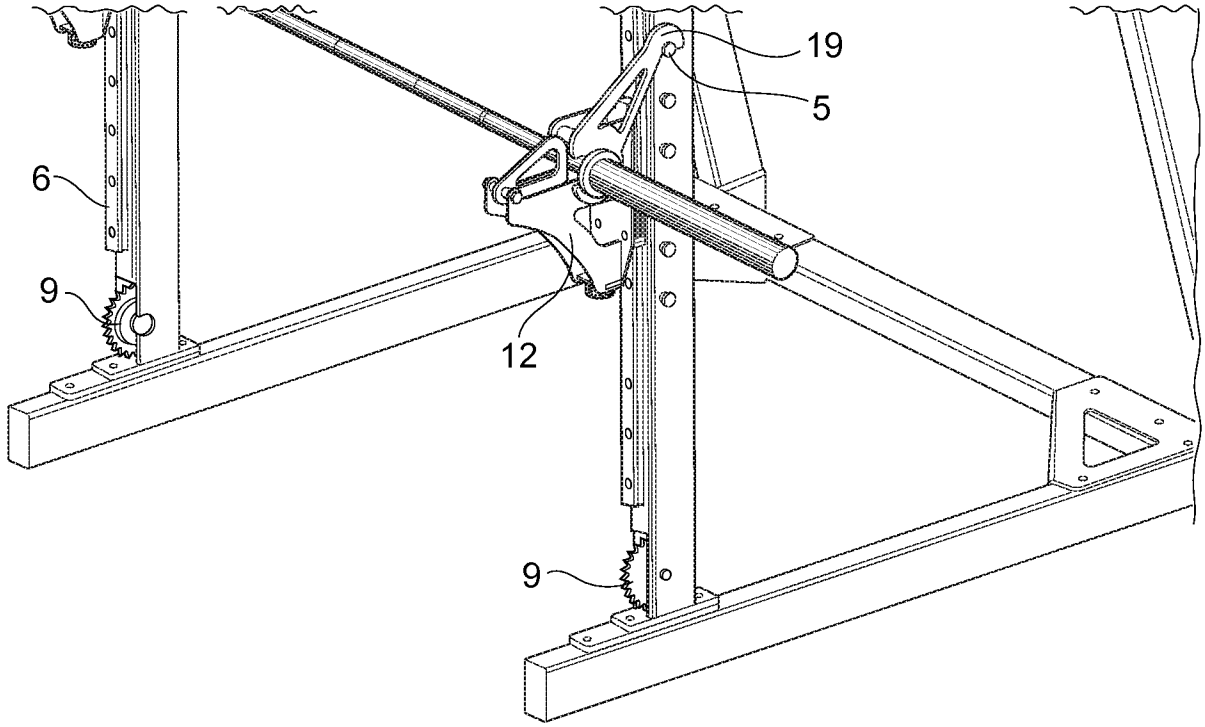


Fig.5

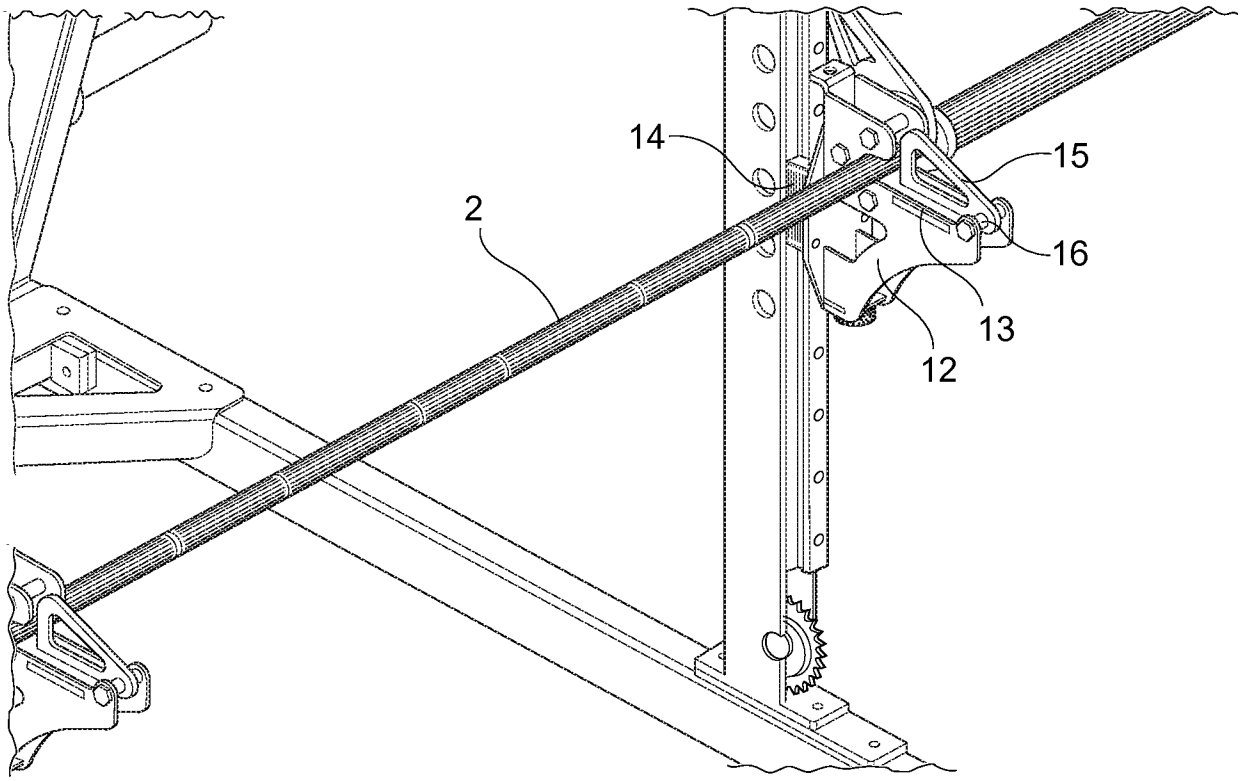


Fig.6

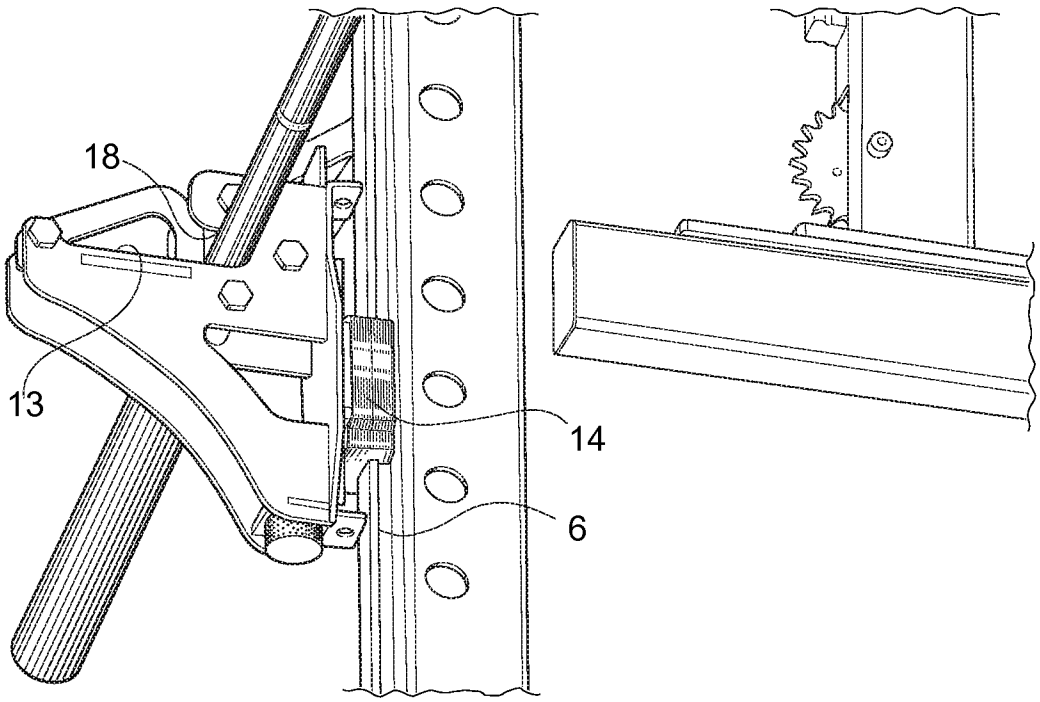


Fig.7

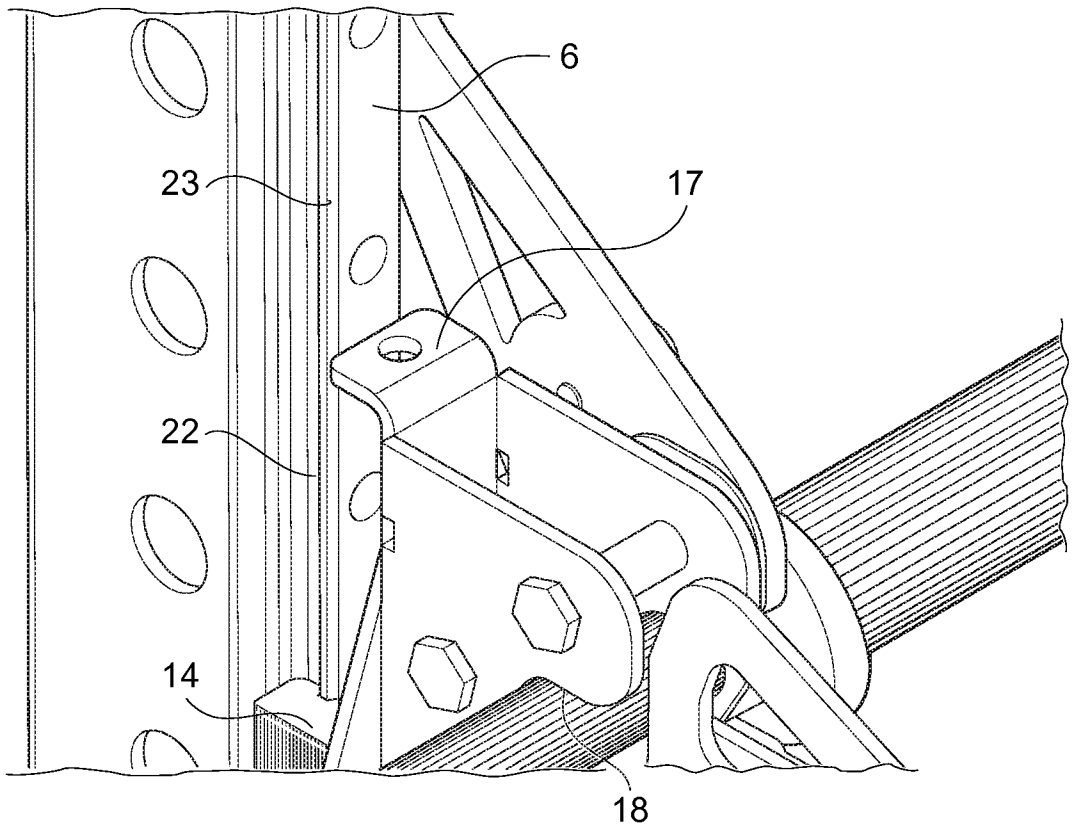


Fig.8

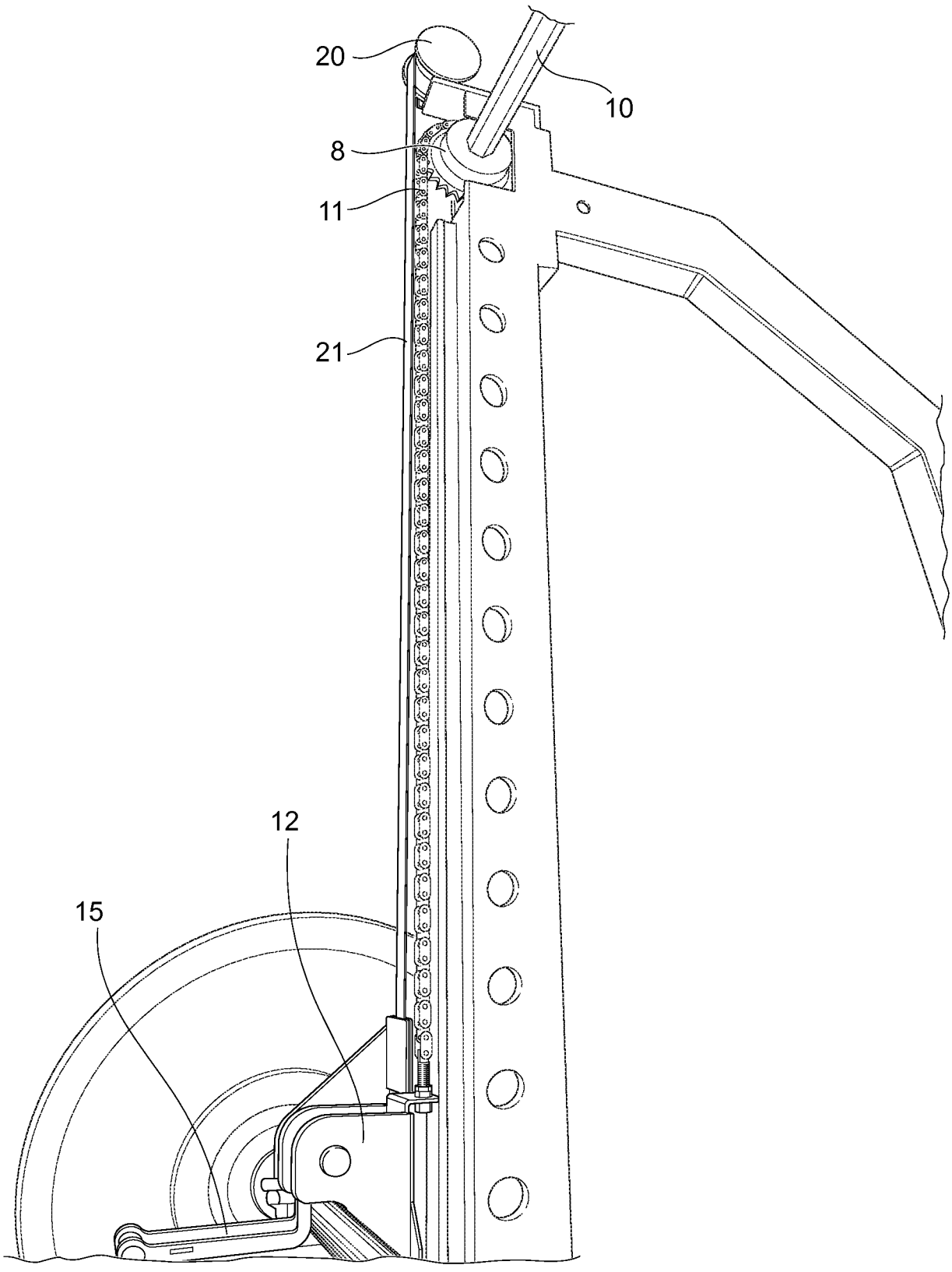
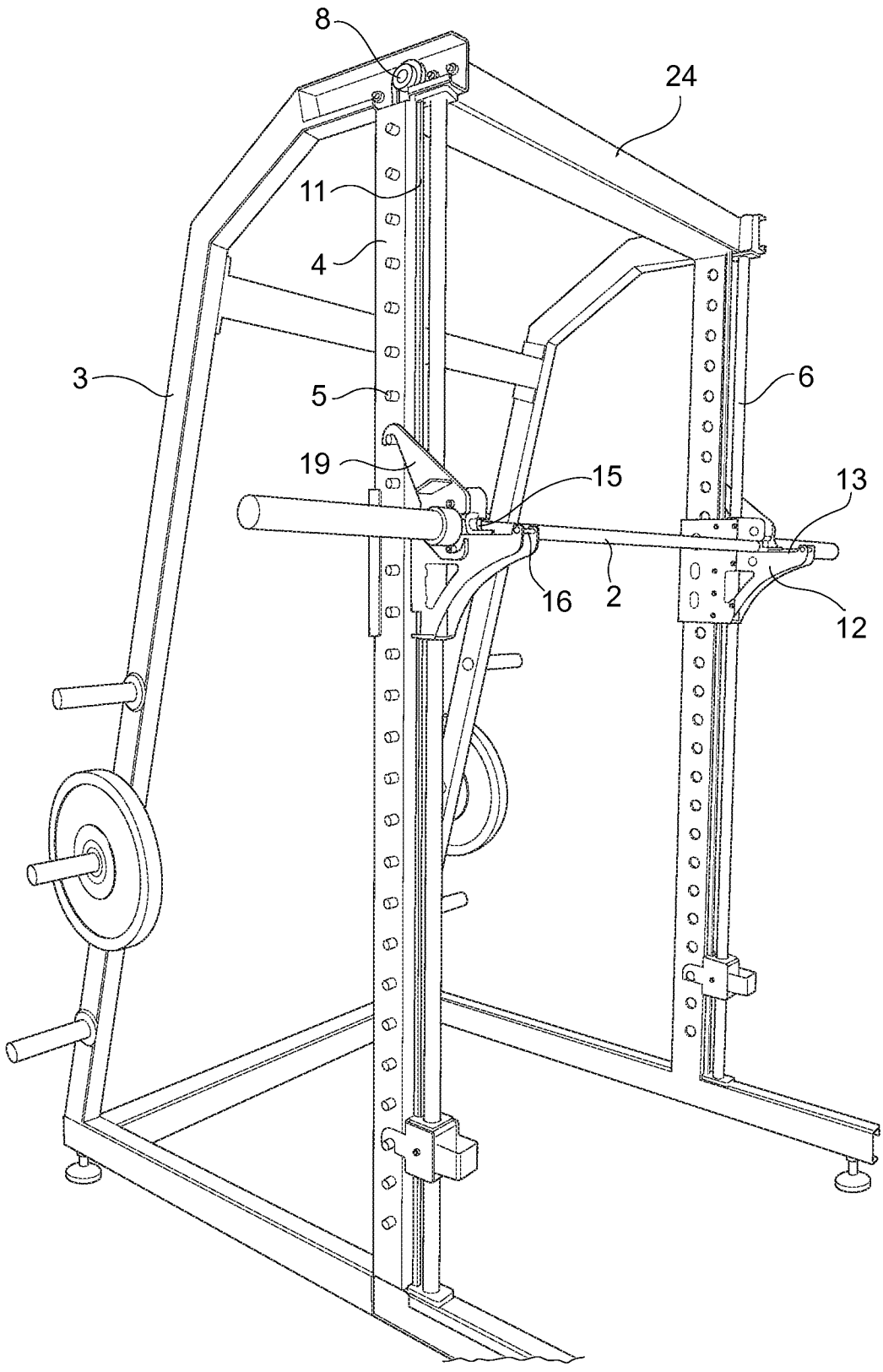


Fig.9



INTERNATIONAL SEARCH REPORT

International application No
PCT/SE2019/050625

A. CLASSIFICATION OF SUBJECT MATTER
INV. A63B21/062 A63B21/072 A63B21/078 A63B21/00
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)
A63B

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.
Y	WO 92/22357 A1 (NORSEARCH LTD [AU]) 23 December 1992 (1992-12-23) page 5, lines 7-24; figures	1-10
Y	WO 96/09854 A1 (LONG EUGENE [IE]) 4 April 1996 (1996-04-04) page 4, lines 25-32; figures	1-10
Y	US 2012/244999 A1 (TAURIAINEN JAKE SAMUEL [CA]) 27 September 2012 (2012-09-27) paragraph [0037]; figures	1-10
Y	EP 2 345 459 A1 (TECHNOGYM SPA [IT]) 20 July 2011 (2011-07-20) paragraph [0021]; figures	6-8

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
9 September 2019	02/10/2019

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No
PCT/SE2019/050625

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2017/099656 A1 (AASA JESPER [SE]; AASA BJÖRN [SE]) 15 June 2017 (2017-06-15) cited in the application paragraph [0027] - paragraph [0028] -----	9,10

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/SE2019/050625

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9222357 A1	23-12-1992	NONE	
WO 9609854 A1	04-04-1996	AU 3576595 A	19-04-1996
		WO 9609854 A1	04-04-1996
US 2012244999 A1	27-09-2012	NONE	
EP 2345459 A1	20-07-2011	CN 102133462 A	27-07-2011
		EP 2345459 A1	20-07-2011
		IT 1397641 B1	18-01-2013
		US 2011172070 A1	14-07-2011
WO 2017099656 A1	15-06-2017	EP 3386600 A1	17-10-2018
		SE 1551603 A1	08-06-2017
		US 2018272176 A1	27-09-2018
		WO 2017099656 A1	15-06-2017