



US 20060116260A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2006/0116260 A1**

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(43) **Pub. Date:**

**Jun. 1, 2006**

(54) **FOUR-BAR LINKAGE STRETCHING EXERCISE APPARATUS**

(52) **U.S. Cl.** ..... 482/139; 482/92

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(57) **ABSTRACT**

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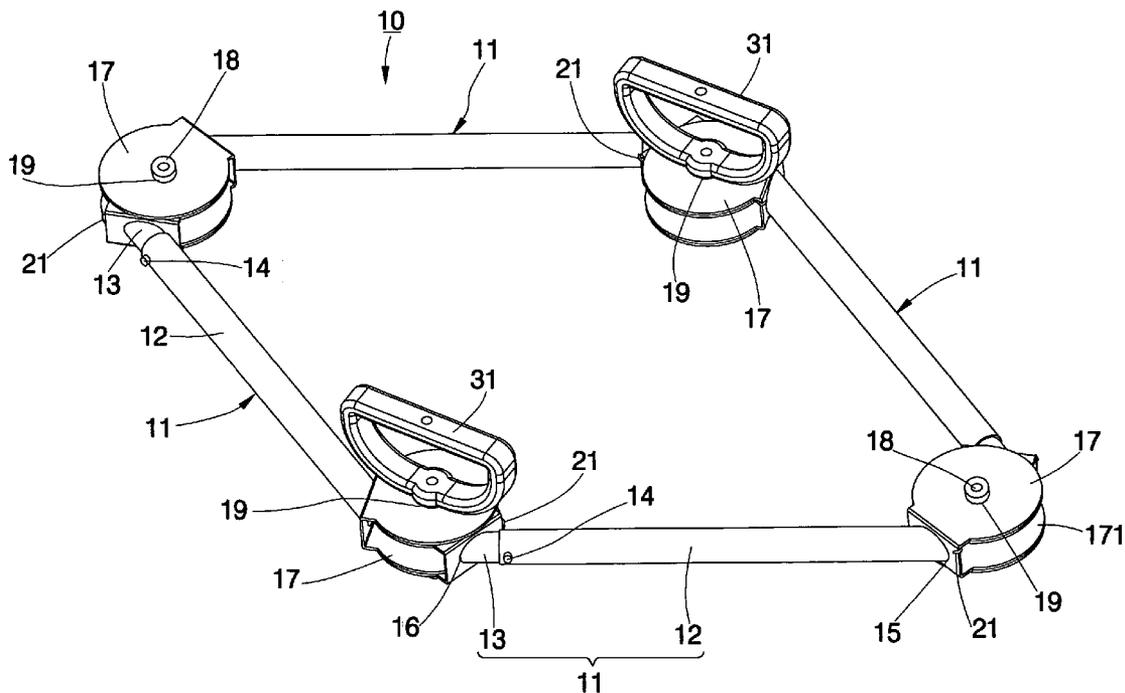
A four-bar linkage stretching exercise apparatus includes four bars, four torsion springs, and two handles. Each of the four bars has two U-shaped yokes provided respectively at two ends thereof. The four bars are pivotably interconnected by one of the two U-shaped yokes of one of the bars coupled with one of the two U-shaped yokes of the bar by pivots to form a quadrangular body that is deformable. The handles are respectively mounted on the quadrangular body for holding by a user for applying an external force on the quadrangular body to deform the quadrangular body. The torsion springs are respectively mounted on the pivots for providing the quadrangular body a retaining force against the external force.

(21) **Appl. No.:** 10/997,853

(22) **Filed:** Nov. 29, 2004

**Publication Classification**

(51) **Int. Cl.**  
*A63B 21/00* (2006.01)  
*A63B 71/00* (2006.01)



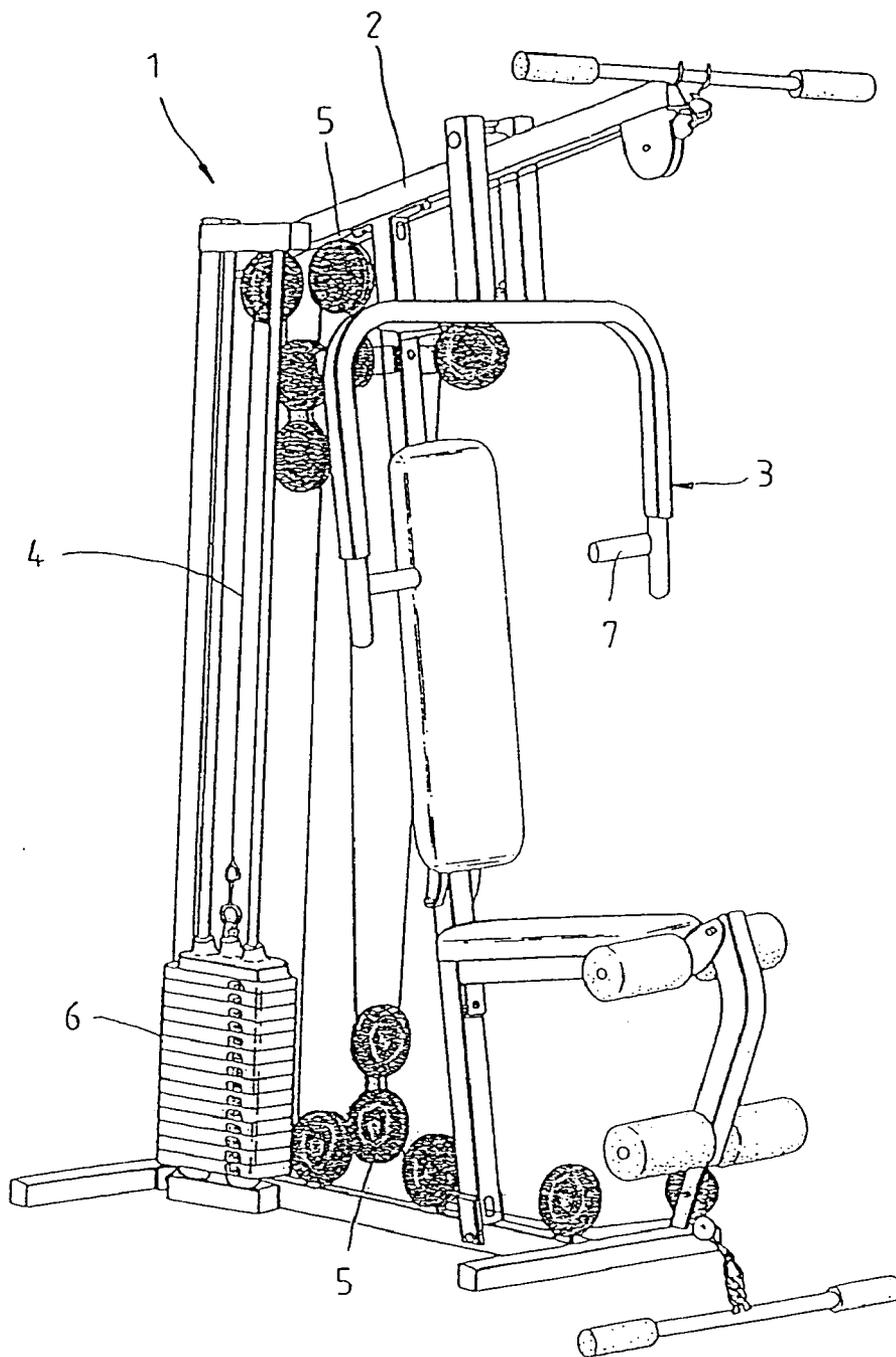


FIG. 1  
PRIOR ART





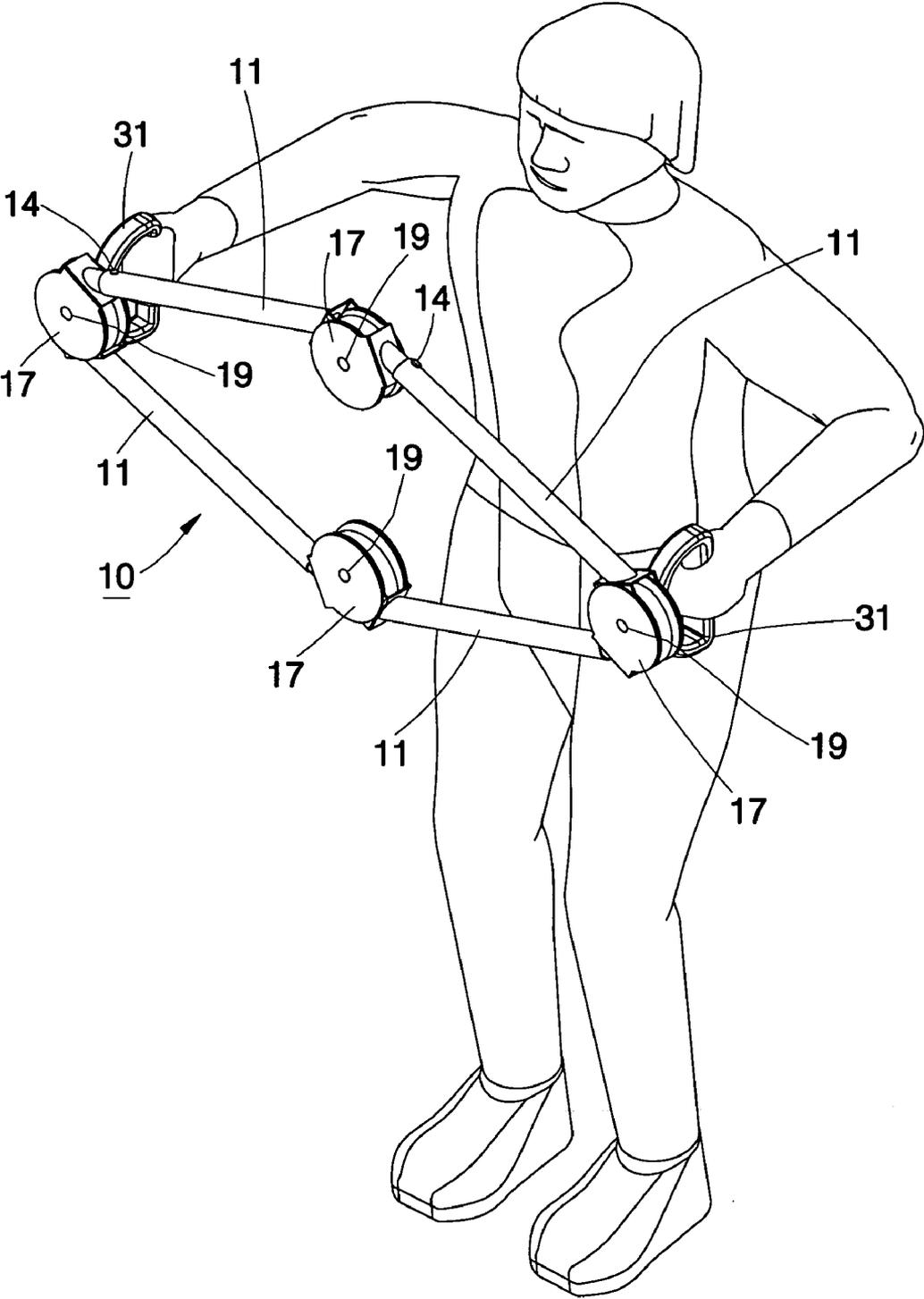


FIG. 4

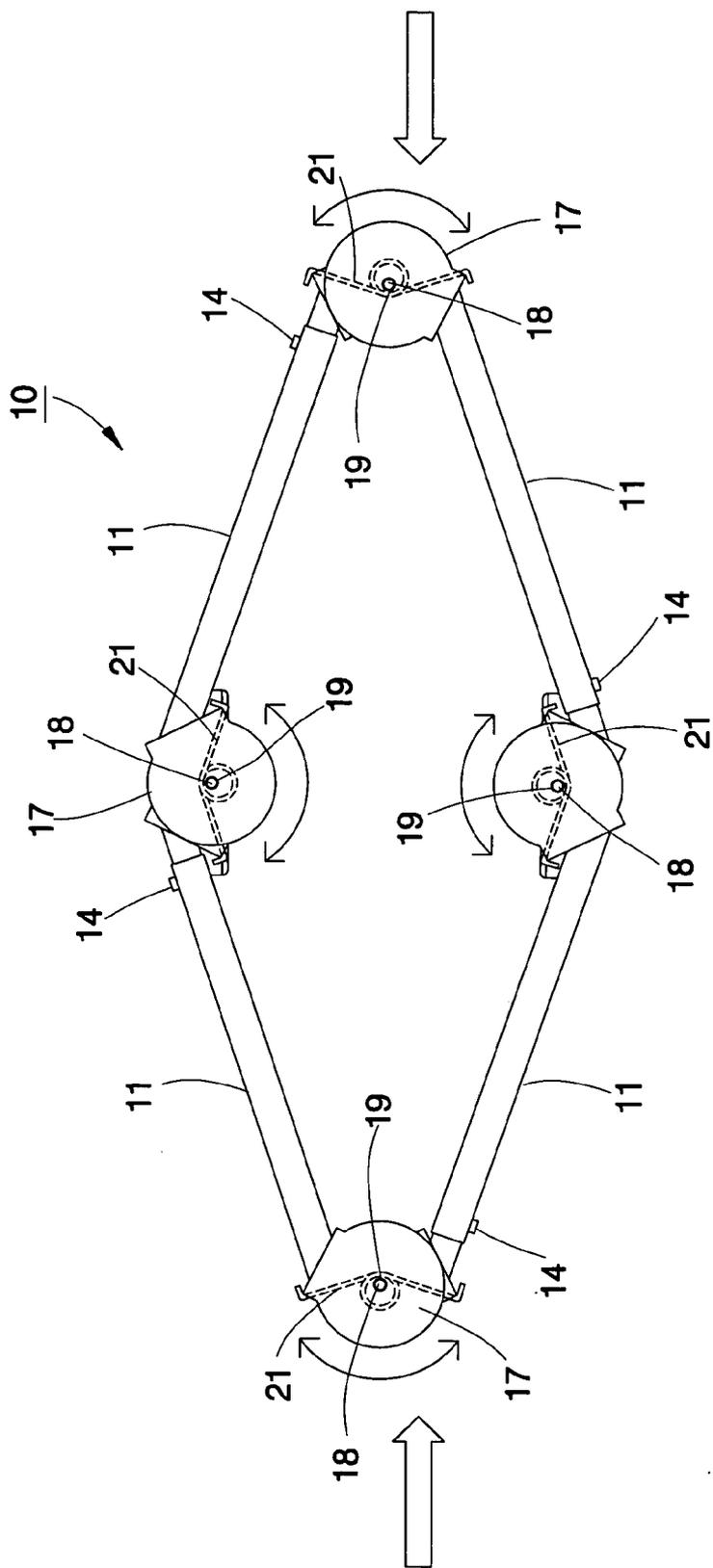


FIG. 5



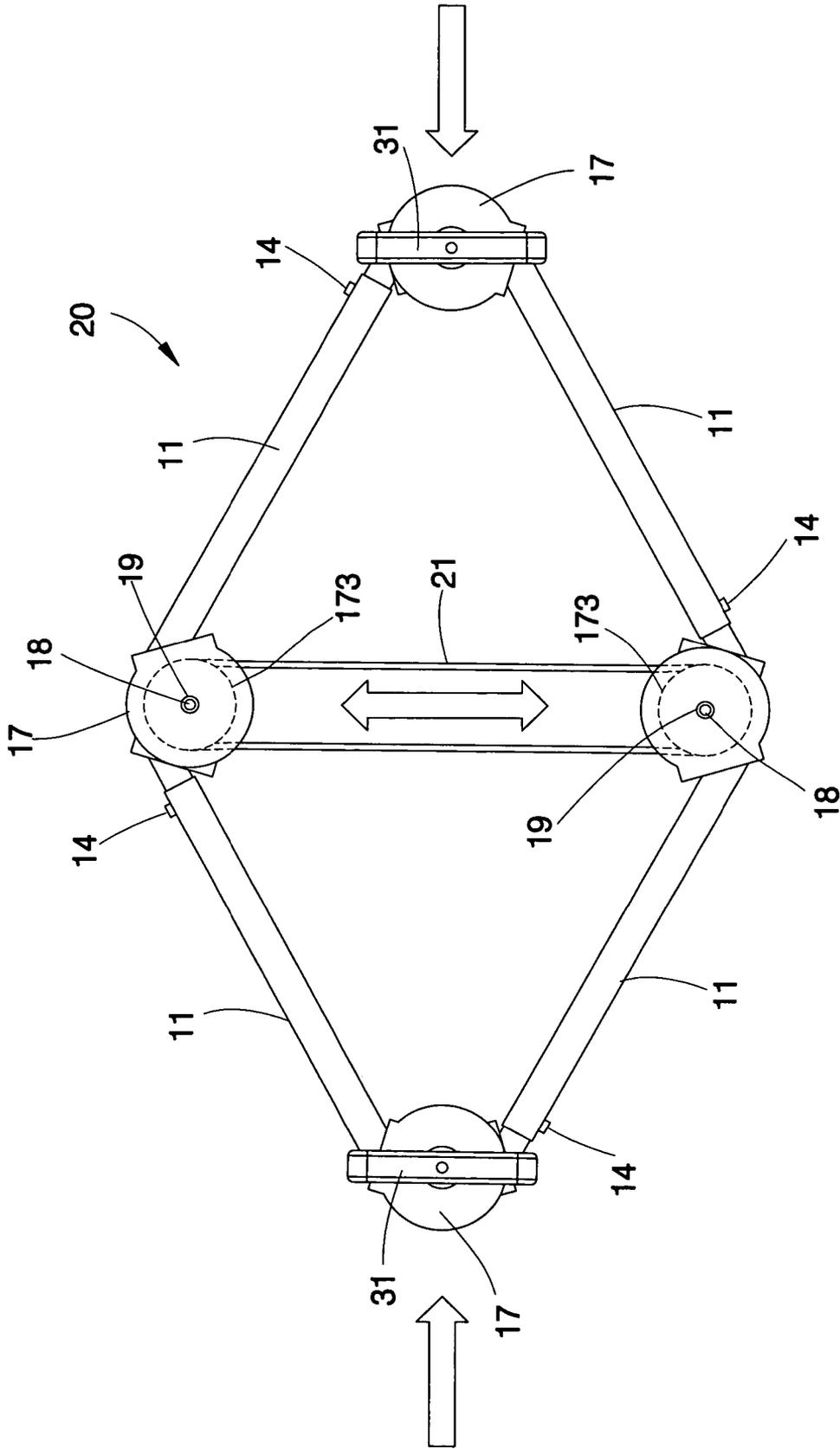


FIG. 7

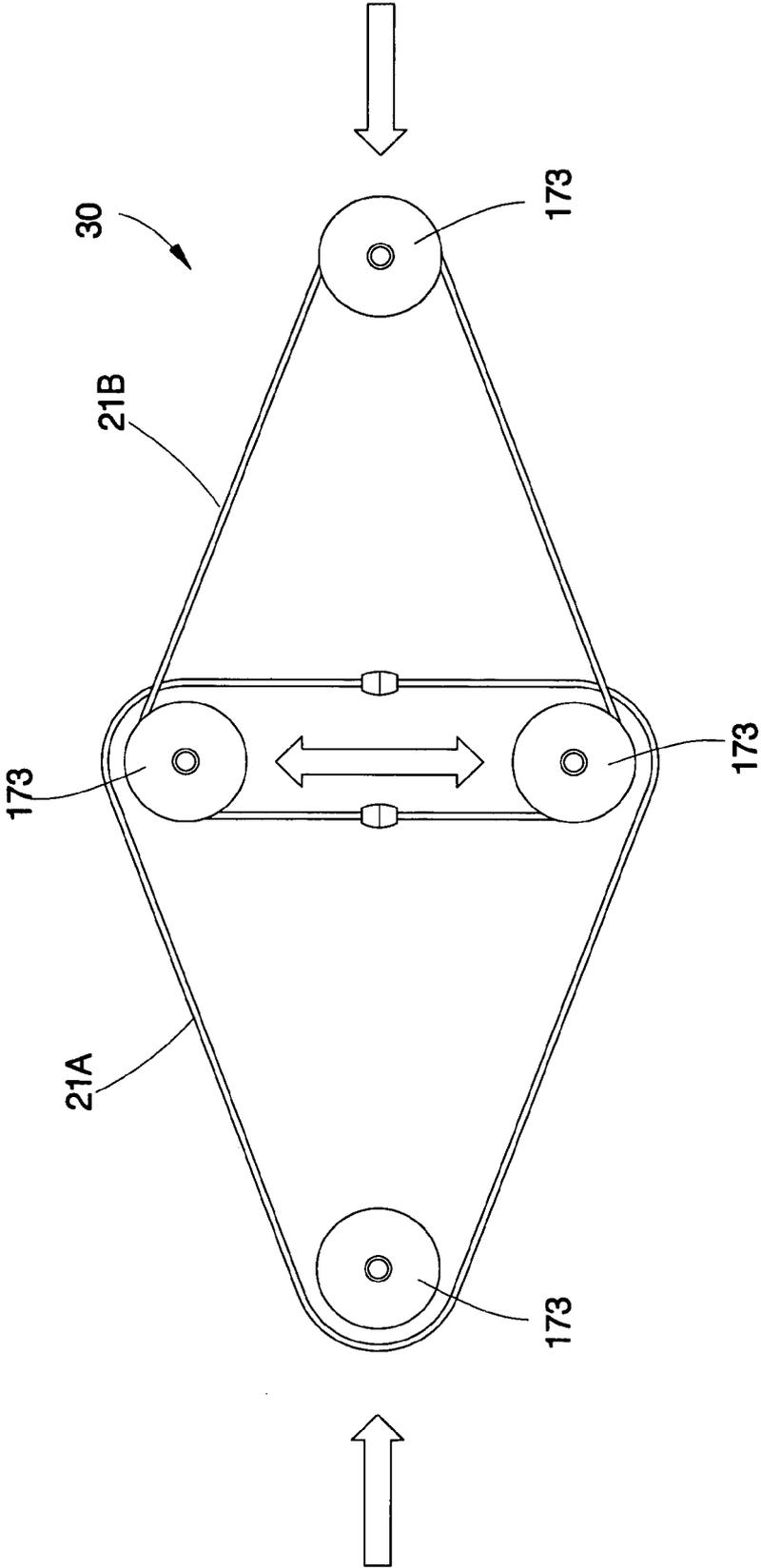


FIG. 8

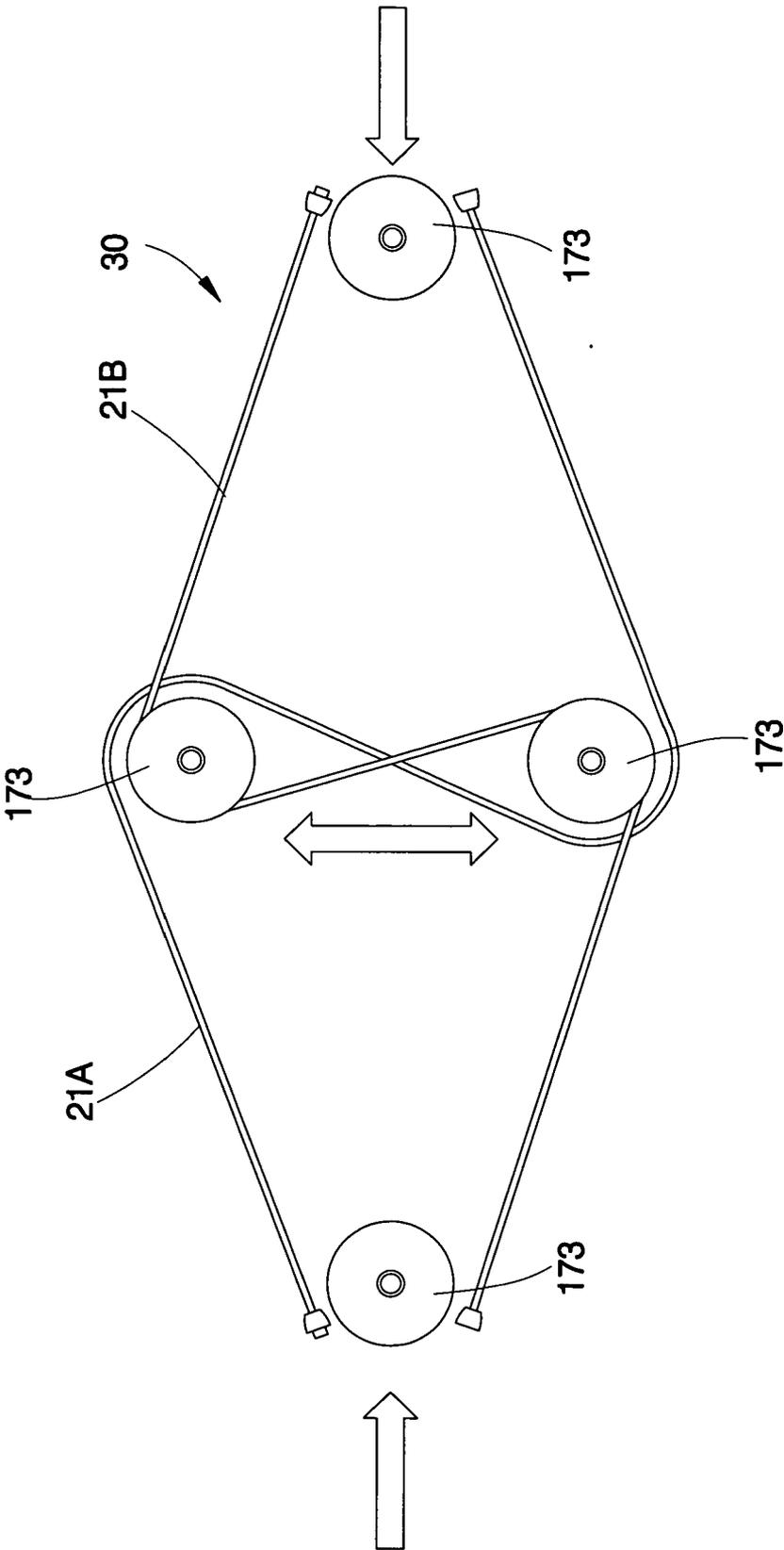


FIG. 9



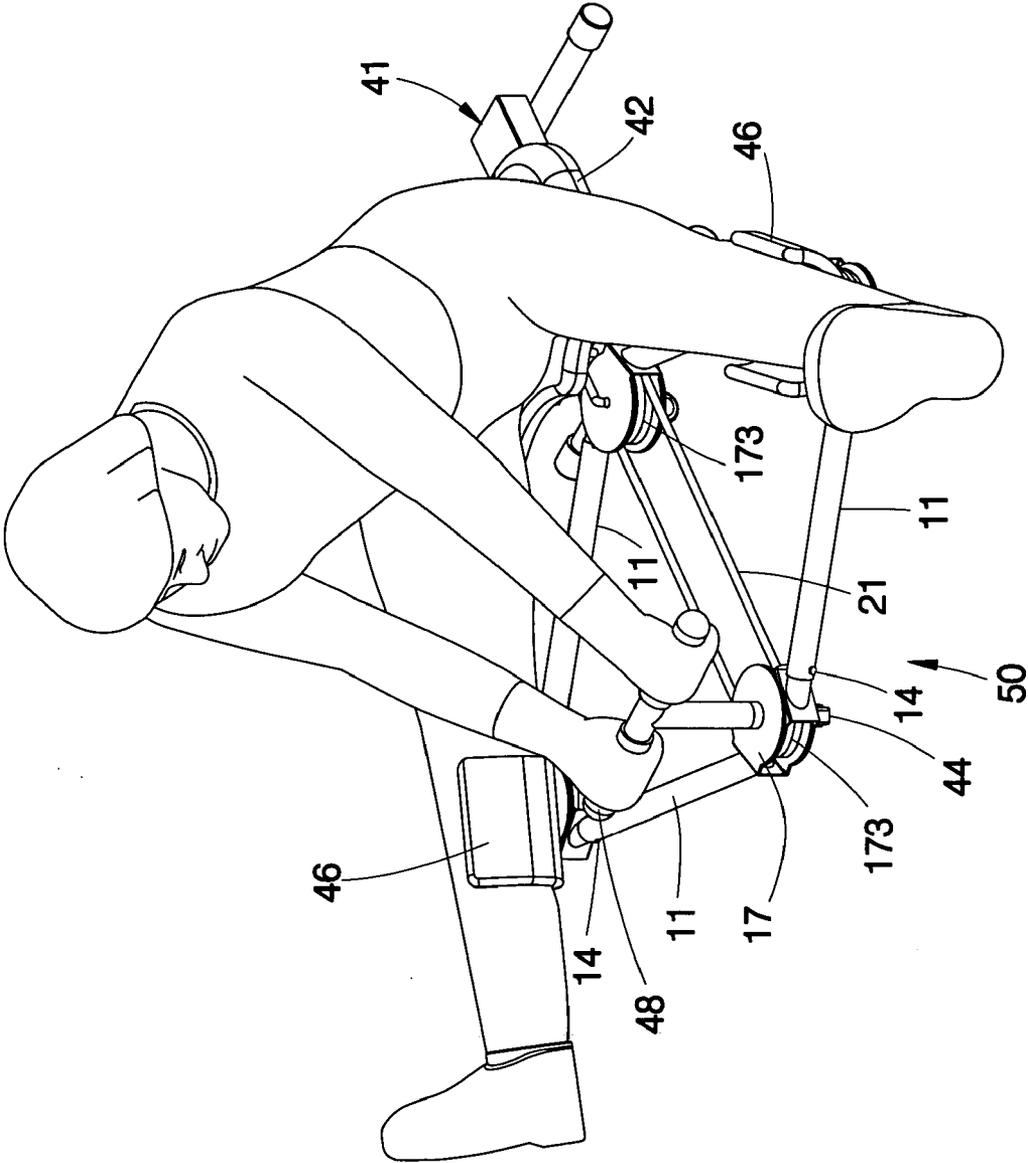


FIG. 11

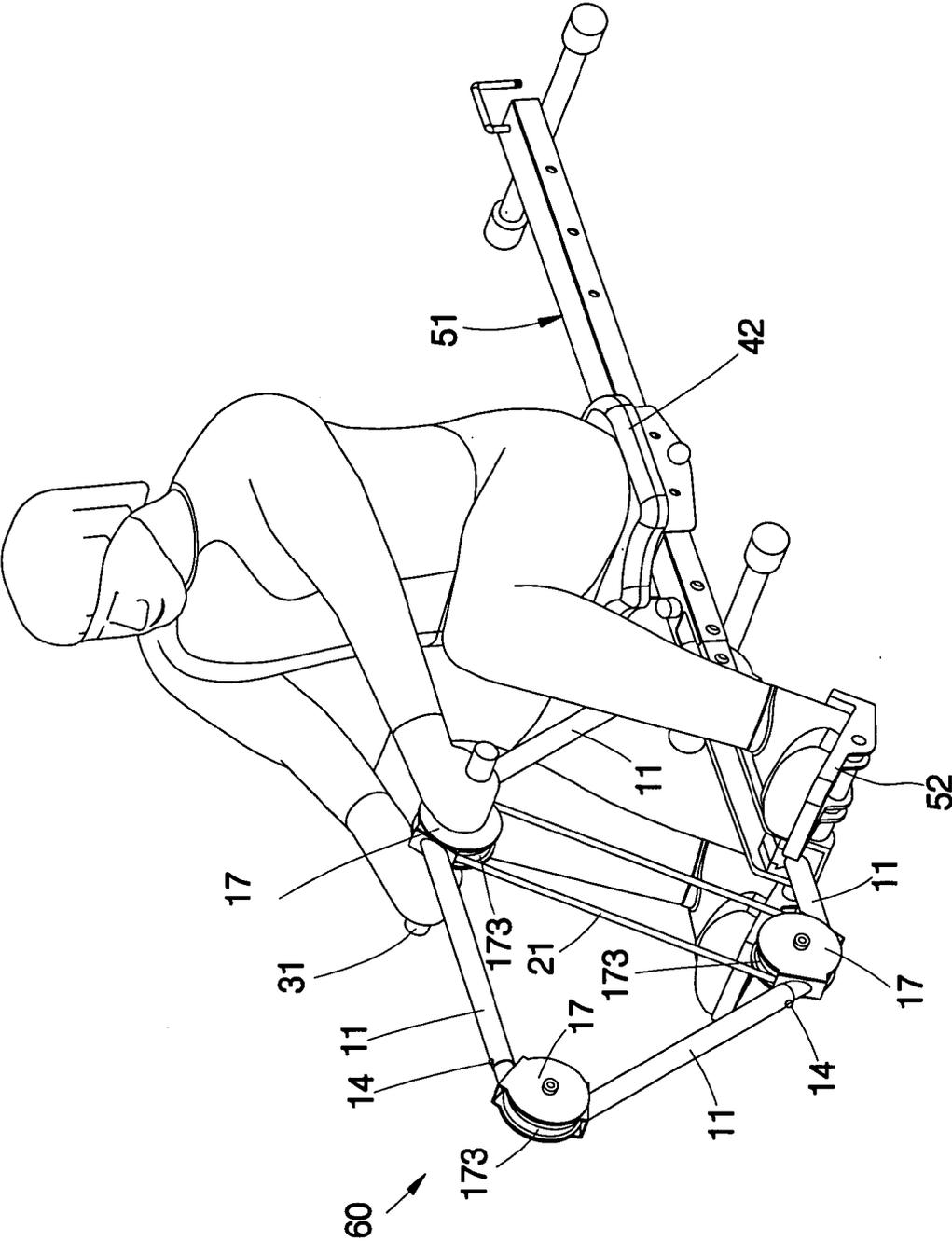


FIG. 12

**FOUR-BAR LINKAGE STRETCHING EXERCISE APPARATUS**

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates generally to exercise apparatuses, and more particularly to a four-bar linkage stretching exercise apparatus.

[0003] 2. Description of the Related Art

[0004] A conventional exercise apparatus 1, as shown in FIG. 1, is composed of a support frame 2, a pressing mechanism 3 mounted on the support frame 2, a movable weight set 6, a plurality of pulleys 5, and a rope 4 connected with the pulleys 5 and the movable weight set 6. When the user does pressing exercise, the user must hold a handlebar 7 of the pressing mechanism 3 by hands and then push the handlebar 7 upwards to counterwork a counterforce generated by the movable weight set 6. However, the exercise apparatus 1 is not only structurally complicated but also operationally boring by that the user could only do exercise in a fixed direction so as to exercise and strengthen fixed portion of the user's muscle, failing to exercise and strengthen multiple portions of the muscle in multiple ways. Thus, the conventional exercise apparatus 1 is imperfect and requires improvement.

SUMMARY OF THE INVENTION

[0005] The primary objective of the present invention is to provide a four-bar linkage stretching exercise apparatus, which offers multiple exercise modes.

[0006] The foregoing objective of the present invention is attained by the four-bar linkage stretching exercise apparatus comprises four bars pivotally connected one by one by four pivots respectively to form a quadrangular body which is deformable, holding means for holding by a user for applying an external force on the quadrangular body to deform the quadrangular body, and resilient means for providing the quadrangular body a retaining force against the external force applied on the quadrangular body.

[0007] Preferably, the resilient means comprises four torsion springs mounted respectively on the pivots.

[0008] Preferably, the resilient means comprises four pulleys rotatably respectively mounted to the pivots, and a resilient endless rope fitted around at least two of the pulleys opposite to each other.

[0009] Preferably, the holding means comprises two handles respectively mounted to two of the pivots opposite to each other.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. 1 is a perspective view of a prior art;

[0011] FIG. 2 is a perspective view of a first preferred embodiment of the present invention;

[0012] FIG. 3 is an exploded view of the first preferred embodiment of the present invention;

[0013] FIG. 4 is a perspective view of the first preferred embodiment of the present invention in operation;

[0014] FIG. 5 is a schematic view of the first preferred embodiment of the present invention under force;

[0015] FIG. 6 is an exploded view of a second preferred embodiment of the present invention;

[0016] FIG. 7 is a schematic view of the second preferred embodiment of the present invention under force;

[0017] FIG. 8 is a schematic view of a third preferred embodiment of the present invention under force;

[0018] FIG. 9 is another schematic view of the third preferred embodiment of the present invention under force;

[0019] FIG. 10 is a perspective view of a fourth preferred embodiment of the present invention in operation;

[0020] FIG. 11 is a perspective view of a fifth preferred embodiment of the present invention in operation; and

[0021] FIG. 12 is a perspective view of a sixth preferred embodiment of the present invention in operation.

DETAILED DESCRIPTION OF THE INVENTION

[0022] Referring to FIGS. 2 and 3, a four-bar linkage stretching exercise apparatus 10 constructed according to a first preferred embodiment of the present invention includes four bars 11, resilient means comprising four torsion springs 21, and holding means comprising two handles 31.

[0023] Each of the four bars 11 includes an external tube 12 and an internal tube 13, which are sleeved with each other, and an adjustable screw 14 threadedly mounted thereon for adjustably fixing the external and internal tubes 12 and 13 with each other and for adjustably changing the length thereof. (Note that the way for adjustably fixing the external and internal tubes 12 and 13 and for adjustably changing the length of the bar 11 is not limited to the screw.) Each of the bars 11 includes a first end 15 and a second end 16 and two U-shaped yokes 17 respectively mounted at the first end 15 and the second end 16. Each of the yokes 17 has an opening 171 and two pivoting holes 172 coaxially respectively positioned at two opposite sides thereof. The two yokes 17 of each bar 11 are coupled respectively with one yoke 17 positioned at the first end 15 of one of the other three bars 11 and one yoke 17 positioned at the second end 16 of one of the other two bars 11 to define four sets of the coupled yokes 17, and a bolt 18 is securely inserted into the pivoting holes 172 of each set of coupled yokes 17 to define a pivot 19, such that the four bars 11 are pivotally interconnected to construct a substantially quadrangular body and the quadrangular body can be adjustably deformed subject to the angle between the two adjacent bars 11 on the pivot 19.

[0024] The resilient means for providing the quadrangular body a retaining force against an external force acted on the quadrangular body is embodied as four torsion springs 21 as shown in FIG. 3. The four torsion springs are jammed respectively inside the four sets of the coupled U-shaped yokes 17 for generating a counterforce against an external force while the force is applied to deform the quadrangular body to enable the user to do the exercise by counterworking the counterforce.

[0025] The holding means for holding by the user for applying an external force to deform the quadrangular body

is embodied as two handles **31** as shown in **FIGS. 2-4**. The handles **31** are connected respectively to bolts **18** that insert through the pivoting holes **172** of the two sets of the coupled U-shaped yokes **17** for facilitating the user's holding and pressing.

[0026] While operating the four-bar stretching exercise apparatus **10** of the present invention, as shown in **FIGS. 4 and 5**, the user holds the two handles **31** by hands and pushes the same inwards or pulls the same outwards to deform the quadrangular body to further do the exercise by counterworking the aforementioned counterforce.

[0027] Referring to **FIG. 6**, the four-bar linkage stretching exercise apparatus **20** constructed according to a second preferred embodiment of the present invention is different from the first preferred embodiment in the resilient means as follows. The resilient means provided by the second preferred embodiment comprises four pulleys **173** respectively mounted inside the four sets of the coupled U-shaped yokes **17**, and one resilient member **21**, which is a resilient endless rope fitted around the two pulleys **173** mounted inside the two of the coupled yokes **17** opposite to each other for generating a counterforce against an external force while the resilient rope **21** is under the force. While operating the four-bar linkage stretching exercise apparatus **20**, as shown in **FIG. 7**, the user holds the two handles **31** by hands and pushes the same inwards to deform the quadrangular body to further do the exercise by counterworking the counterforce.

[0028] Referring to **FIGS. 8 and 9**, the four-bar linkage stretching exercise apparatus **30** constructed according to a third preferred embodiment of the present invention is different from the aforementioned preferred embodiment by that the resilient means comprises four pulleys **173** and two resilient members **21**, which are two resilient endless ropes **21A** and **21B** crossly fitted respectively around the four pulleys **173** inside the U-shaped yokes **17** for the same purpose and result as recited above. In addition, the magnitude of the counterforce can be varied subject to different ways and tightness of putting the resilient endless ropes fitted around the pulleys **173**.

[0029] Referring to **FIG. 10**, the four-bar linkage stretching exercise apparatus **40** constructed according to a fourth preferred embodiment of the present invention is different from the aforementioned preferred embodiments by the following recitation. The four-bar linkage stretching exercise apparatus **40** comprises a support frame **41**, a quadrangular body as aforementioned embodiments which has one of the pivots **19** mounted to the support frame **41**, resilient means as mentioned in the second preferred embodiment and holding means including two handles **31** and a pressing member **48** mounted at the other opposite pivot **19**. The support frame **41** includes a seat **42** mounted thereon for the user's sitting thereon. Accordingly, the user can sit on the seat **42**, put the legs on the pressing member **48**, and then push the legs against the pressing member **48** for leg extension exercise. A roller **44** can be mounted below at least one of the pivots **19** to preferably facilitate the leg extension exercise.

[0030] Referring to **FIG. 11**, the four-bar linkage stretching exercise apparatus **50** constructed according to a fifth preferred embodiment of the present invention is different from the aforementioned preferred embodiments in the holding means. The holding means in this embodiment

comprises two support members **46**, instead of the two handles **31** of the first preferred embodiment, mounted at the two opposite pivots **19** for respectively supporting the two legs lying thereon, and a pressing member **48** for holding by the user. Accordingly, the user can sit on the seat **42**, put the two legs respectively on the two support members **46** and hold the pressing member **48** by hands, and then push the hands against the pressing member **48** for the body and leg extension exercise at the same time.

[0031] Referring to **FIG. 12**, the four-bar linkage stretching exercise apparatus **60** constructed according to a sixth preferred embodiment of the present invention is different from the aforementioned preferred embodiments by the following recitation. The quadrangular body is vertically mounted on a support frame **51**. The holding means comprises a pressing member **31** mounted at one of the pivots **19**. The support frame **51** includes two pedals **52** symmetrically mounted at a front end thereof for supporting the user's two legs treading thereon. Accordingly, the user can sit on the seat **42**, hold the pressing member **31** by hands, and then pull the pressing member **31** backwards and upwards for the user's body extension exercise.

What is claimed is:

1. A four-bar linkage stretching exercise apparatus comprising:

four bars each having two U-shaped yokes respectively provided at two ends thereof, each of said yokes having two opposite sides which have respectively a pivoting hole coaxially aligned with each other, said four bars being pivotably interconnected by one of said two U-shaped yokes of one of said bars coupled with one of said two U-shaped yokes of another said bar by inserting respectively a pivot into the pivoting holds of the corresponding yokes to construct a quadrangular body such that the quadrangular body is deformable;

holding means for holding by a user for applying an external force on the quadrangular body to deform the quadrangular body; and

resilient means for providing the quadrangular body a retaining force against the external force applied on the quadrangular body.

2. The four-bar linkage stretching exercise apparatus as defined in claim 1, wherein each of said bars comprises an external tube and an internal tube, which are sleeved with each other and are adjustably fixed with each other by an adjustable screw threaded into the external tube and the internal tube to enable the length of said bars to be adjustable.

3. The four-bar linkage stretching exercise apparatus as defined in claim 1, wherein said resilient means comprises four torsion springs mounted respectively on the pivots.

4. The four-bar linkage stretching exercise apparatus as defined in claim 1, wherein said resilient means comprises four pulleys mounted respectively to the pivots that connect said U-shaped yokes, and a resilient endless rope fitted around at least two of said pulleys opposite to each other.

5. The four-bar linkage stretching exercise apparatus as defined in claim 1 further comprising a support frame connected to the quadrangular body, said support frame having a seat mounted thereon.

6. The four-bar linkage stretching exercise apparatus as defined in claim 5, further comprising at least one roller mounted respectively below said pivots.

7. The four-bar linkage stretching exercise apparatus as defined in claim 5, wherein said holding means comprises two support members mounted respectively to two of said pivots opposite to each other for resting of the user's legs, and a pressing member mounted to one of said pivots between the support members for holding by the user.

8. The four-bar linkage stretching exercise apparatus as defined in claim 5, wherein said holding means comprises two handles mounted respectively to two of said pivots

opposite to each other, and a pressing member mounted to one of said pivots between the two handles.

9. The four-bar linkage stretching exercise apparatus as defined in claim 1, wherein said holding means comprises two handles mounted on the quadrangular body opposite to each other.

10. The four-bar linkage stretching exercise apparatus as defined in claim 1, wherein said two handles are respectively mounted to two of said pivots opposite to each other.

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