

[72] Inventors **James M. Wellman**
Lakeland, Fla. (c/o Wellman-Lord, Inc.,
New Mulberry Hwy., P.O. Box 2436, Fla.);
James I. Baer, Lakeland, Fla.

[21] Appl. No. **745,909**

[22] Filed **July 18, 1968**

[45] Patented **Feb. 16, 1971**

[73] Assignee **Said Baer to said Wellman**
Continuation-in-part of application Ser. No.
623,258, Mar. 15, 1967.

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Primary Examiner—Richard C. Pinkham
Assistant Examiner—William R. Browne
Attorney—Morton, Bernard, Brown, Roberts & Sutherland

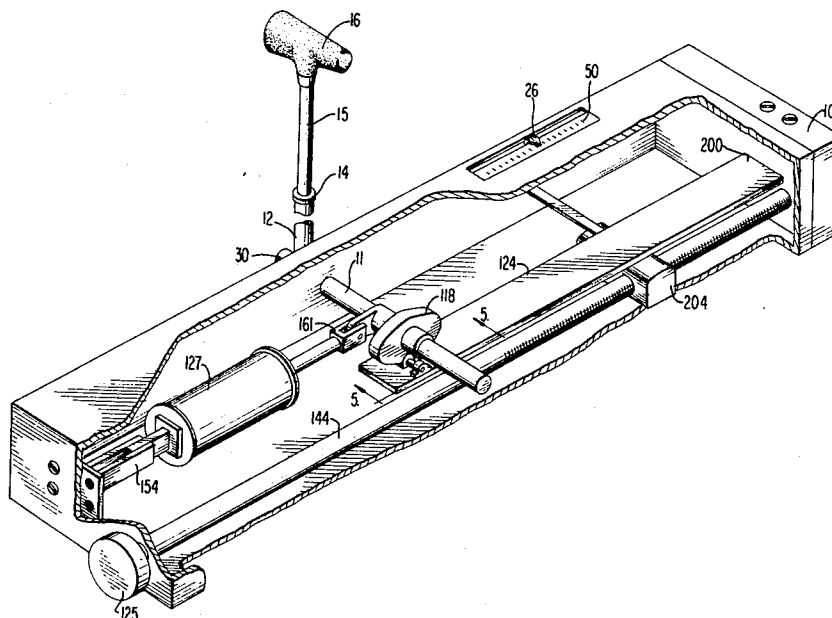
[54] **ARM EXERCISER**
17 Claims, 5 Drawing Figs.

[52] U.S. Cl..... **272/83,**
73/380

[51] Int. Cl..... **A63b 21/00**

[50] Field of Search..... **124/7, 39;**
272/54, 79, 67, 83, 72; 273/1; 73/380

ABSTRACT: Apparatus for imparting tension in a smooth manner having tension imparting means adapted to impart smooth tension through the action of a tension transmission means and the incorporation of this apparatus in an arm exercising mechanism providing an actuating arm which can be placed under tension when force is applied and means to avoid fly-back of the arm.



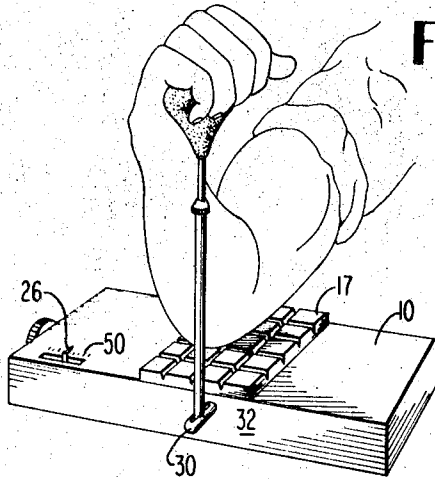


FIG. 1

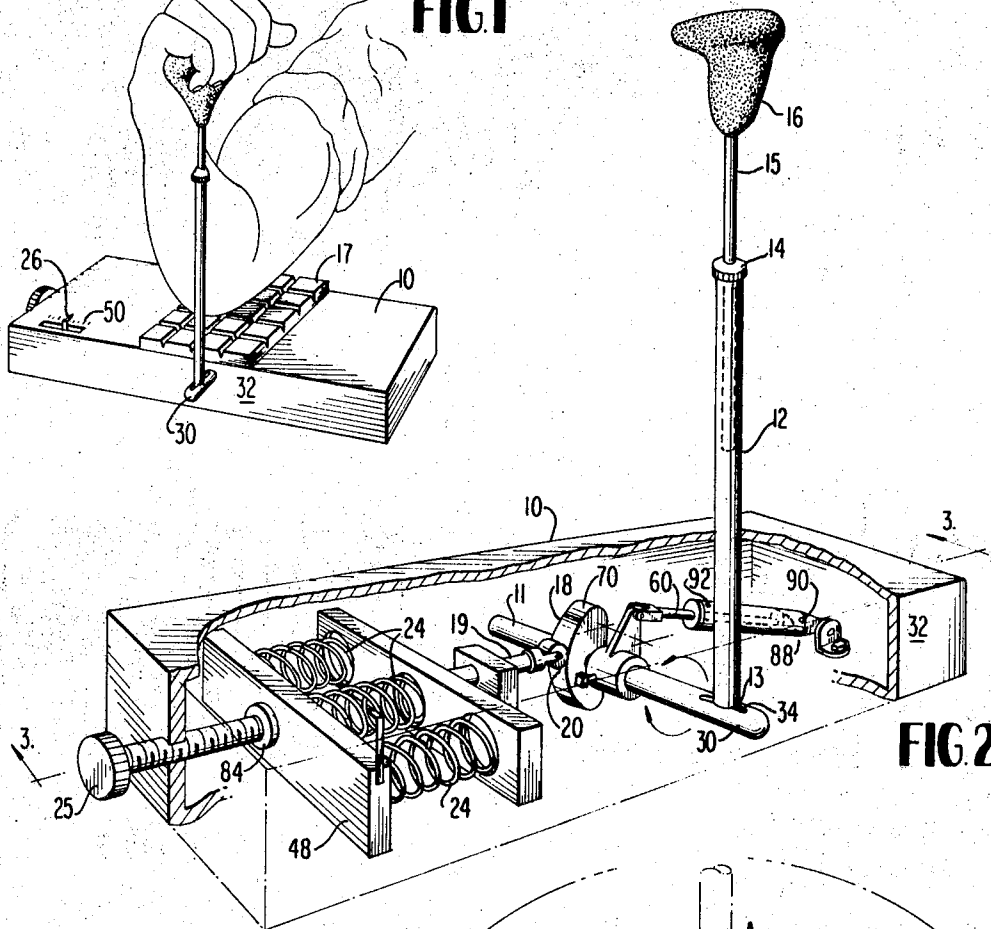


FIG. 2

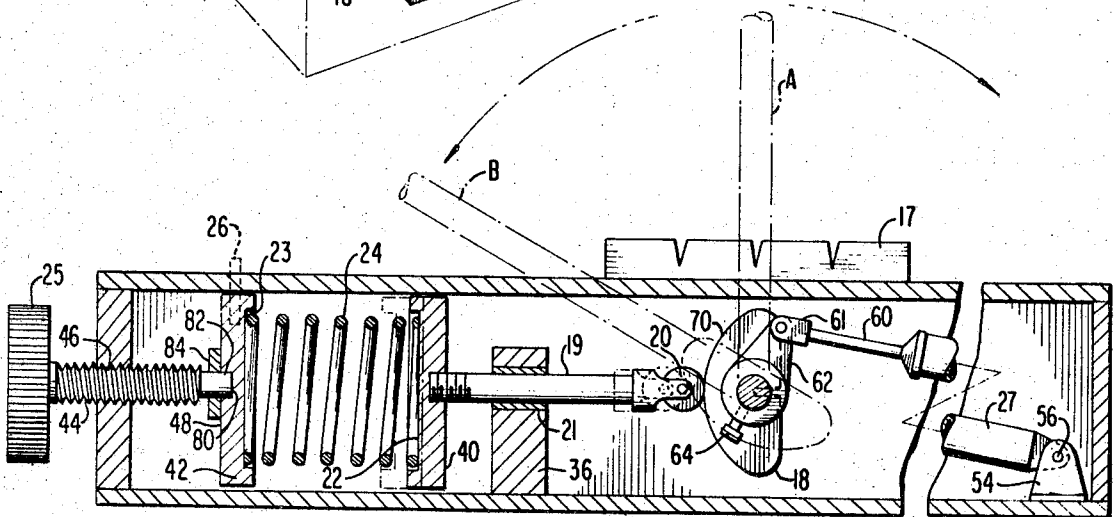


FIG. 3

INVENTORS
JAMES M. WELLMAN
JAMES I. BAER

BY *McLean, Norton & Bonstead*

ATTORNEYS

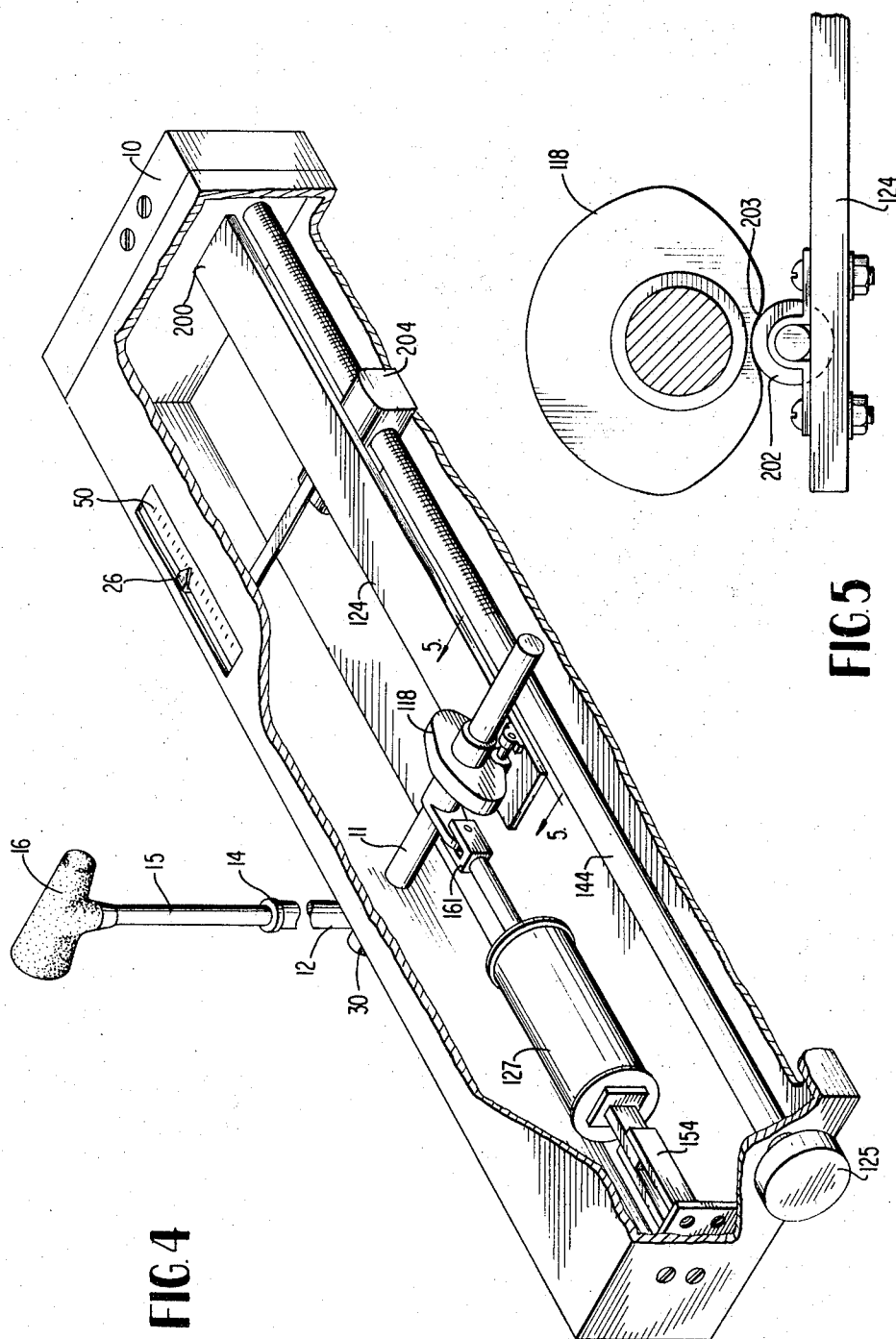


FIG. 5

FIG. 4

INVENTOR

JAMES M. WELLMAN

JAMES I. BAER

BY *McLean, Norton & Boush*
ATTORNEY

ARM EXERCISER

This application is a continuation-in-part of U.S. Pat. application Ser. No. 623,258, filed Mar. 15, 1967.

This invention relates to tension imparting apparatus and particularly to a mechanical arm exerciser having an oscillating arm which is under tension when the user moves it from a vertical position towards a horizontal position.

The exerciser is advantageously compactly mounted in a small portable box with a detachably mounted arm to provide for convenient use in the home or office or while traveling. In addition, the exerciser advantageously provides tension adjusting means to vary the tension which the user must overcome by the application of force to the arm and means to prevent "fly-back," i.e. an abrupt release of the tension against the direction of the application of force, should the arm be accidentally released.

The invention will be illustrated with reference to preferred embodiments in conjunction with the accompanying drawings wherein:

FIG. 1 is a perspective view of the exerciser showing the arm of the user;

FIG. 2 is a partially cutaway perspective view showing the various operating parts of a first embodiment of the exercise;

FIG. 3 is a cross section taken along line 3-3 of FIG. 2;

FIG. 4 is a partially cut away perspective view showing the various operating parts of a second embodiment of the exercise;

FIG. 5 is a fragmentary view taken along the line 5-5 of FIG. 4.

As depicted in FIG. 1, the tension imparting apparatus of the present invention can take the form of an exerciser enclosed in a suitable housing 10 which can be made of wood, metal or plastic. Axle 11 is suitably journaled for rotation relative to the housing, and end 30 of axle 11 extends through side 32 of the housing. Mounting end 13 of actuating arm 12 is detachably mounted in slot 34 of end 30. The actuating arm is mounted for oscillation and is preferably loose fitting to accommodate some sideway forces during operation. Arm 12 includes threaded ferrule 14 and an adjustable extension arm 15 and terminates in a suitably molded hand grip 16. The arm can be lengthened or shortened to accommodate the length of the participant's forearm by loosening the ferrule, adjusting the length of extension arm 15, and tightening the ferrule.

On top of the housing above the axle a padded area 17 may be included to provide comfort and to prevent lateral slipping of the user's elbow during operation. The housing may be fastened to a table or other surface during operation by suitable clamps, screws or suction cups.

As shown in FIG. 2 and FIG. 3, the various mechanisms inside housing 10 are set to put the actuating arm in the vertical position when no force is applied, and the user must apply force to move the arm away from that position.

Attached to axle 11 is cam 18 having a surface designed to extend cam surface in a linear direction when the axle is rotated and biased against roller 20 which is fixedly attached to a first and end of rod 19. This roller rides on the surface of cam 19, moves in a linear direction corresponding with the direction of cam movement, and provides for a smooth, friction-free operation. Rod 19 is mounted for horizontal reciprocating in bearing 21, which is fixedly positioned in housing 10 by support 36. Rod 19 contains on its other end fixedly attached piston head 40 having a recessed spring retainer face 22 which is adapted to hold helical springs 24 which are of the expansive type. Support 36 serves as a pillow block for rod 19, and as such prevents flexure of the rod.

Tension adjusting means for adjusting the tension of springs 24 and thus the degree of force applied by the springs against spring retainer face 22 include a piston head 42 having a recessed spring retainer face 23, a threaded adjusting screw 44, and a fixedly attached knob 25. Compression springs 24 are disposed longitudinally in force-exerting relationship between faces 22 and 23 to provide greater force against face 22 when the tension of the springs is increased by action of screw 44 on face 23 in compressing the springs and less force

against face 22 when the tension is decreased by action of screw 44 on face 23 in the opposite direction. Distortion of springs 24 is the source of back pressure encountered when the participant endeavors to force the actuating arm to a horizontal position.

Internally threaded opening 46 of housing 10 is adapted to threadedly engage screw 44. Spring retainer face 23 is firmly positioned as desired by turning screw 44 with knob 25. Rotating knob 25 to move screw 44 toward the springs places the springs under greater tension while rotating knob 25 to move screw 44 away from the springs places the springs under less tension. Screw 44 engages back plate 48 of piston 42 with reduced stem 80 freely received in opening 82 of piston head 42 to allow rotation of the end of screw 44 without substantially revolving piston head 42. The force applied by springs 24 against the piston head aids in maintaining engagement of back plate 48 with screw 44. Collar 84 serves as an abutment for plate 48. Both forward spring retainer 22 and rear spring retainer 23 have outer dimensions slightly smaller than the interior of the housing, allowing them to freely slide therein.

The position of rear piston head 42 is adjusted by revolving screw 44, and this position may be shown on housing 10 indicator 26 which can indicate a relative degree of tension on graduated scale 50. This permits the user to set the desired degree of force or back pressure he will have to overcome to rotate the handle and is an indication of accomplishment insofar as it gives the participant a "target" in his exercise program.

An advantageous feature of the present invention involves the use of shock absorber means 27 attached to the axle 11 and to the housing 10 for safety purposes to prevent fly-back of the actuating arm should the user accidentally release the grip. This shock absorber may be a conventional dashpot having a reciprocating, close-fitting plunger 88 therein which bleeds air in or out of a cylinder through orifices 90 and 92 at a controlled slot flow rate. This results in a cushioning or slow release of arm 12 during its upward movement.

The shock absorber or energy absorbing means in the housing may also be hydraulic, pneumatic, electrical or frictional. An example of a suitable hydraulic device are those presently used on rowing machines. A dashpot of the type described above but more powerful than needed for that purpose would be an example of a pneumatic mechanism. A suitable frictional mechanism would be a coaster brake such as conventionally used on bicycles.

Shock absorber means 27 is fixedly attached to housing 10 by support 54 and is adapted to oscillate about pin 56. It includes the conventional pneumatic plunger disposed within it and containing reciprocating rod 60 mounted in a variable motion relationship with axle 11 by connection 61 to attaching flanged, annular means 62 which is fixed to the axle by force screw 64.

Cam 18 having eccentric surface 70 is designed to require greater and greater force to move the arm to a horizontal position. It allows rod 19 to be at a maximum extension when the actuating arm is in position A, the null or at rest position, and forces the shaft further back as the actuating arm is rotated either counterclockwise as shown in B, or clockwise. The geometry of the cam surface will determine the relationship between the rate of angular movement of arm 12 and the rate of linear movement of rod 19. The relationship is preferably not constant, making it increasingly difficult to move the arm the further it is from the vertical.

FIGS. 4 and 5 depict a second embodiment of the various mechanisms within housing 10 which can be utilized to place actuating arm 12 in a vertical position when no force is applied and which resist the application of force by the user when he attempts to move arm 12 away from the vertical position. Attached to axle 11 is a cam 118 having an eccentric, substantially elliptical outer surface. Tongue spring 124, which for example may be an elongated, rectangular piece of spring steel, is fixedly connected at end 200 to the end wall of container 10. Adjacent cam 118, a roller 202 is mounted on

tongue spring 124 to permit rotation of roller 202. Cam 118, which for example might be a hardened steel, preferably includes a depression 203 to provide a rest or home position on roller 202, thereby insuring that arm 12 is vertical when no force is applied. Thus, as arm 16 is moved away from its vertical position, cam 118 rotates against roller 202 to distort tongue spring 124 by bending it downward. As spring 124 is deflected downward, it bends across fulcrum 204, the longitudinal position of which is determined by threaded rod 144, which is supported at each of its ends by the end members of housing 10. Knob 125 on the exterior of housing 10 permits rotation of rod 144 to adjust the location of fulcrum 204. The elliptical shape of cam 118 necessitates the use of increasingly greater force as arm 12 is moved away from its vertical position. The degree of force required to move arm 12 from its vertical position is controlled by turning knob 125 to move fulcrum 204 closer to or further away from cam 118. When knob 125 is rotated in a first direction, fulcrum 204 is moved closer to cam 118, thereby increasing the amount of force required to move arm 12 from its vertical position. Rotation of knob 125 in the opposite direction moves fulcrum 204 away from cam 118, decreasing the force required to move arm 12 from the vertical position. Shock absorber means 127, attached by support 154 to housing 10 and attached by connection 161 to axle 11, prevents fly-back of arm 12 in the event that hand grip 16 slips from the user's grasp.

Indicator 26, which is attached to fulcrum 204, indicates on graded scale 50 the relative degree of force required to move handle 12 from the vertical position.

It is understood that the above descriptions and preferred embodiments are by way of example only, and are not intended to limit the invention. Many equivalent mechanisms within the scope of this invention will be immediately apparent to one skilled in the art.

We claim:

1. Tension imparting apparatus comprising an axle; means mounting said axle in a rest position and permitting rotary oscillation about the longitudinal axis thereof; an eccentric cam mounted on said axle for oscillation therewith; and tension means in tension communicating relationship with said cam for imparting tension to said cam both when said axle is rotated clockwise from the rest position and when said axle is rotated counterclockwise from the rest position, said tension means comprising a tongue spring having a first end and a second end; means fixedly mounting the tongue spring first end relative to the axle longitudinal axis with the tongue spring second end adjacent said cam to be deflect as said cam is rotated.

2. An arm exerciser comprising an actuating handle; means mounting said handle in a rest position and permitting oscillation of said handle both from said rest position in a first direction and from said rest position in a second direction opposite said first direction; tension transmission means engaging said handle; tension providing means engaging the tension transmission means for transmitting tension from the tension providing means to the handle to oppose oscillation of said handle both when the handle moves in the first direction and when the handle moves in the second direction; and energy absorbing means for absorbing energy produced by release of the handle under tension, the energy absorbing means including means for exerting pneumatic resistance, and means for transmitting said resistance to the handle to prevent fly-back of the handle when the handle is released.

3. An arm exerciser comprising an actuating handle; means mounting said handle in a rest position and permitting oscillation of said handle both from said rest position in a first direction and from said rest position in a second direction opposite said first direction; tension transmission means engaging the handle; tension providing means engaging the tension transmission means for transmitting tension from the tension providing means to the handle to oppose oscillation of said handle both when the handle moves in the first direction and when the handle moves in the second direction; and energy

absorbing means for absorbing energy produced by release of the handle under tension, the means mounting the handle and the tension transmission means including an axle; means mounting said axle for rotation about the longitudinal axis thereof and permitting oscillation of said axle and the handle; and an eccentric cam fixedly attached to the axle for rotation therewith and wherein the tension providing means comprises a tongue spring having a first end and a second end; means fixedly mounting the tongue spring first end relative to the axle longitudinal axis with the tongue spring second end engaging the cam, said tongue spring being deflected by the cam, as the cam rotates, the deflection of the tongue spring imparting tension to the handle is moved from a rest position to a tension position.

4. In an arm exerciser containing a horizontally disposed axle having a rest position, an actuating arm connected to said axle to be oscillated thereby, said actuating arm essentially vertically disposed when said axle is in said rest position and terminating in a suitable handgrip, the improvement comprising an eccentric cam mounted on said axle, spring means contacting said cam and increasingly distorted both as the actuating arm is moved away from the vertical in a first direction and as the actuating arm is moved away from the vertical in a second direction opposite the first direction, and energy absorbing means adapted to resist rotary movement of the axle, said springs means including means to vary the force resisting movement of the actuating arm away from the vertical.

5. The improvement of claim 4 wherein the axle, spring means and energy absorbing means are enclosed within a box, the top surface of which contains an elbow support for use during operation.

6. The improvement of claim 4 wherein the spring means includes a tongue spring which is increasingly deflected as the actuating arm is moved from the vertical.

7. In an arm exerciser including an axle; means mounting said axle in a substantially horizontal rest position and permitting rotary oscillation about the longitudinal axis thereof; an actuating arm connected to said axle and essentially vertically disposed when said axle is in said rest position, said actuating arm terminating in a suitable handgrip and adapted for oscillation with the axle, the improvement comprising a cam mounted on said axle and having an eccentric cam surface, a spring means contacting said cam surface, said spring means continuously distorted by said cam surface both when the axle is rotated clockwise from the rest position and when the axle is rotated counterclockwise from the rest position to resist rotation of the axle, said spring means including means to vary the force of the spring means on the cam surface, and energy absorbing means connected to the axle to prevent fly-back of the handle when the handle is released while under tension.

8. Tension imparting apparatus comprising an axle, means for mounting said axle in a rest position and permitting rotary oscillation about the longitudinal axis thereof, an eccentric cam surface attached to the axle, a roller, means mounting said roller to roll on the cam surface to move in a linear direction in response to camming action of the cam surface both as the axle rotates in a clockwise direction from the rest position and as the axle rotates in a counterclockwise direction from the rest position, and tension means for imparting tension to the roller in response to linear movement thereof.

9. An arm exerciser comprising an actuating handle; an axle connected to said actuating handle; means for mounting said axle in a rest position and permitting rotary oscillation about the longitudinal axis thereof; a cam fixedly attached to the axle; a rod; a roller attached to one end of the rod; means for mounting the rod for reciprocation with the surface of the roller adjacent the cam to cooperate with the cam surface to cause the rod to reciprocate in response to camming action of the cam surface as the axle rotates; surface means attached to the other end of the rod; spring tension means; means mounting said spring tension means to exert tension against said surface means to transmit tension to the handle both when the

handle is rotated clockwise from the rest position and when the handle is rotated counterclockwise from the rest position; and energy absorbing means for absorbing energy produced by release of the handle under tension.

10. The arm exerciser of claim 9 wherein the energy absorbing means includes means for exerting pneumatic resistance, and means for transmitting said resistance to the handle to prevent fly-back when the handle is released.

11. An arm exerciser comprising an axle; means mounting said axle for rotary oscillation about the longitudinal axis thereof; an actuating arm fixedly mounted on said axle for rotary oscillation therewith; and eccentric cam surface attached to said axle; a roller having a rolling surface in engagement with the cam surface, said roller moving in a linear direction in response to camming action of the cam surface when the axle is rotated; and bias means for resisting movement of said roller in said linear direction to provide bias for said arm upon rotation of said arm with said axle.

12. An arm exerciser as claimed in claim 1 wherein said mounting means mounts said axle in a rest position for rotary oscillation about the longitudinal axis thereof and wherein said roller moves in a linear direction in response to camming action of the cam surface both when the axle is rotated clockwise from the rest position and when the axle is rotated counterclockwise from the rest position.

13. An arm exerciser as claimed in claim 11 in which said

bias means comprises a rod, means mounting said rod for reciprocation, said roller attached to one end of said rod to cause the rod to reciprocate in response to camming action of said cam as the axle oscillates; surface means; spring tension means mounted to exert tension against said surface means; the other end of the rod connected to the surface means to transmit tension through said axle to the actuating arm when the actuating arm is moved both when said axle rotates clockwise from the rest position and when said axle rotates counterclockwise from the rest position; and energy absorbing means for absorbing energy produced by release of the actuating arm when said axle is rotated from the rest position.

14. An arm exerciser as claimed in claim 11 wherein the said bias means is spring means.

15. An arm exerciser as claimed in claim 14 wherein said spring means is a coil spring adapted to be increasingly compressed as said roller moves in said linear direction.

16. An arm exerciser as claimed in claim 11 further comprising energy absorbing means for absorbing energy produced by release of said actuating arm under bias.

17. An arm exerciser as claimed in claim 11 further comprising enclosure means for enclosing said axle, said eccentric cam surface, said roller, and said bias means, while leaving said actuating arm exposed.

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