ABSTRACT OF THE DISCLOSURE

Muscle strength testing apparatus for use in an isometric physical therapy program for measuring or testing the strength of various muscle groups. The apparatus consists of a frame comprising an elongate base having plates at each end. A pair of inwardly bowed metal bands are secured to one of the plates and to a strap or webbing connected to the other plate. A dial and pointer of a gauge are moveable one of the bands for actuation by a mechanism connected to the other band. When a force is applied against the webbing, as by pushing against the webbing with the arm or leg, the metal bands tend to straighten, thereby actuating the gauge in proportion to the magnitude of the applied force.

Background of the invention

This invention relates to muscle strength testing apparatus, and more particularly to apparatus for testing the strength of various muscles in the human body. Physical therapy has long been recognized as an acceptable method of regaining the strength of an injured muscle or muscle group. One such type of physical therapy which has recently found wide spread use in the rehabilitation of injured muscles is the isometric types of exercise. It has been found that by adherence to an isometric exercise program prescribed by competent personnel, such as a doctor or physical therapist, an injured or strained muscle can be rehabilitated in a minimum of time, effort and discomfort.

Whereas types of equipment have been developed and are commercially available for conducting isometric exercises. For example, the isometric exercise apparatus illustrated in coassigned U.S. Patents Des. 197,076 and Des. 203,123 to Spackman and Johnson are extremely useful in isometric exercise programs intended to strengthen the lower and upper extremities of the body, respectively. Although such equipment is used primarily to rehabilitate or strengthen the muscles in an athletic environment, their use, of course, is not so limited.

A problem which has arisen in the use of this type of isometric exercise equipment is that it is difficult to determine or measure the progress and effectiveness of a particular exercise program for determining when the program has been successful and when it may be discontinued. Another problem is the lack of a means of motivating an individual to pursue an exercise program through to its completion. Therefore, it would be highly desirable to provide equipment which not only provides an indication of the progress of a particular exercise program, as by comparing the strength of the muscle group in question to the strength of the same muscle group on the opposite side of the body, but which also motivates the user to pursue the exercise program to its completion.

Summary of the invention

Among the several objects of this invention may be noted the provision of muscle strength testing apparatus suitable for use with isometric exercise equipment; the provision of such apparatus which may be used to test the strength of substantially any muscle in the human body; the provision of such apparatus which provides a continual indication of the progress being made in an exercise program; the provision of apparatus of the class described in which a comparison may be made of the strength of one muscle group with the strength of the identical muscle group on the opposite side of the body; the provision of such apparatus which motivates the user to pursue a prescribed exercise program through to completion; and the provision of apparatus of the class described which is characterized by simplicity of construction, low cost and ease of operation and use.

Briefly, muscle strength testing apparatus of this invention is comprised of a frame comprising an elongated base having a gauge mounted on the frame toward one end of the base, the gauge comprising a scale having scale markings thereon and a pointer. A member is moveable longitudinally on the base and means are provided for yieldably resisting movement of the movable member in the direction toward the other end of the base. A strap is connected at one end to the movable member and at its other end to the other end of the base with the strap spaced from the base. The strap is engageable by a body member for muscle strength testing to force the strap toward the base with resultant longitudinal movement of the movable member to actuate the pointer. Other objects and features will be in part apparent and in part pointed out hereinafter.

Brief description of the drawings

FIG. 1 is a plan view of the apparatus of this invention; FIG. 2 is a section taken on line 2—2 of FIG. 1; and FIG. 3 is a section taken on line 3—3 of FIG. 2. Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Description of the preferred embodiment

Referring to the drawings, a muscle strength testing apparatus of this invention is indicated in its entirety at 1. Briefly, this apparatus is comprised of a frame 3 comprising an elongate base 5 having a suitably calibrated gauge 7 at one end. Within the gauge 7 are a pair of inwardly bowed metal bands 9 and 9' secured at one of their ends to one end of the base and at their other ends to one end of a webbing or strap 11. The other end of the webbing 11 is secured to the other end of the base 5. The gauge 7 is actuated by a mechanism 13 connected to the band 9, as will appear more fully hereinafter.

More specifically, base 5 comprises a pair of elongate parallel bars 15 and 17 each having a transversely extending plate 19 welded to one end, hereinafter referred to as the forward end, and a second transversely extending plate 21 welded to its other end, hereinafter referred to as the rearward end. Bars 15 and 17 are spaced and plates 19 and 21 are notched between the bars, as indicated at 20 and 22, for mounting the apparatus on a suitable isometric exerciser, as will appear. Gauge 7 consists of a lower rectangular housing portion 23 slidably mounted on bars 15 and 17 for longitudinal adjustment by a plurality of fasteners 25 extending downwardly through elongate slots 27 in the bottom of the lower housing portion and threadedly engaging apertures in the bars. A threaded stud 29 is welded to the forward end of the lower housing portion at 31. This stud extends forwardly through an aperture in the plate 19 and receives a knurled thumbscrew 33 on the side of plate 19 opposite housing portion 23. A roller 35 is journaled between the open rearward sides of housing portion 23 for guiding webbing 11. An upper housing portion or cover 37 is secured to the lower housing portion by means of screws 39.
A split block 41 is fixed to the inside face of the forward wall of lower housing portion 23 by means of screws 43. Clamped between the sections of this block by screws 45 are the forward ends of bands 9. The rearward ends of the bands are clamped between the sections of a similar split block or movable member 47 by means of screws 49, the block 47 being fixed to the housing for longitudinal movement in the direction toward plate 21. Block 47 has a recess at its rearward end spanned by a pin 53 and one end of webbing 38 is trained. The other end of the webbing passes through a slot in plate 21 and is trained around a pin 53. The two sides of the webbing are fastened together, as by sewing or cementing.

Upper housing portion 57 has a circular opening near its center. A transparent crystal 55 covers the opening on the upper surface of the housing and a calibrated face plate or dial 57 covers the lower surface of the opening. A U-shaped bracket 59 is secured at its base to band 9' and extends transversely across the housing beneath dial 57. The upper leg of the bracket is secured to the dial. A shaft 61 carrying a pointer 63 extends upward through an aperture in the dial and is journaled for rotation in the legs of bracket 59. The mechanism 13, for actuation of the gauge in response to transverse movement of the bands, comprises a cord 65 colled about shaft 61 and anchored at one end to movable block 47 via a spring 67 and an S-shaped hook 69. The other end of cord 65 is trained around a pulley 71 and is anchored to one of the legs of bracket 59. The pulley 71 is secured to band 9 by a clip 73. The pointer 63 has an upwardly extending tab 75 near its end for engaging and rotating a maximum reading indicator hand 77. A reset knob 79 extends through the top of crystal 55 for returning the hand 77 to its initial position after each use of the apparatus.

For example, the present testing apparatus may be used, for example, with the isometric leg exerciser and the isometric ladder exerciser shown in the above-identified patents to Spackman et al. The apparatus 1 permits testing of the muscle strength in substantially every muscle group in the body. For example, with one weak leg or a weak muscle group in one leg, the testing apparatus may be used to demonstrate the difference in strength between the weak leg and the strong leg, both before and after corrective exercise. Thus, at the time of an injury in athletics, for example, the normal side and the injured side of the body are measured with the apparatus. A program intended to strengthen the weak or injured side is then initiated and the gain in strength is measured as often as necessary to indicate the progress of the program and to motivate the athlete to work harder to regain his strength. The athlete should not be permitted to compete again until the injured side is as strong as the normal side.

The apparatus 1 may also be used in other fields. For example, it can be used to measure pre-operative and post-operative strength in orthopedic surgery cases, or to measure the strength of future employees in industrial physical examinations. In testing the lower extremities or low back, the apparatus 1 is inserted between one of the bars on the isometric leg exerciser shown in Patent Des. 197,076 (or any other suitable surface) and the ankle, heel, side of the foot, or dorsum of the foot, depending upon the particular muscle being tested. For this purpose, the spacing of parallel bars 15 and 17 and the semicircular notches 20 and 22 in plates 19 and 21 facilitate mounting of the apparatus on the bar of the exerciser. The portion of the body to be tested is placed against webbing 11 in a comfortable position. For example, in a knee extension test, the lower leg is placed against the webbing while, in an ankle dorsiflexion test, the toes and dorsum are placed against the webbing. Hand 77 is then turned to zero and the subject is instructed to gradually push or pull against the webbing. When maximum exertion is achieved, the score is recorded and the hand 77 is again turned to zero. The apparatus is then moved to a position where the other extremity may be tested similarly.

In an ankle dorsiflexion test, the toes and dorsum are placed against the webbing while, in an ankle dorsi flexion test, the toes and dorsum are placed against the webbing. Hand 77 is then again turned to zero and the subject is instructed to push or pull against the webbing. When maximum exertion is achieved, the score is recorded and the hand 77 is again turned to zero. The apparatus is then moved to a position where the other extremity may be tested similarly.

In the present testing apparatus, the subject is instructed to push or pull against the webbing while, in an ankle dorsiflexion test, the toes and dorsum are placed against the webbing. Hand 77 is then again turned to zero and the subject is instructed to push or pull against the webbing. When maximum exertion is achieved, the score is recorded and the hand 77 is again turned to zero. The apparatus is then moved to a position where the other extremity may be tested similarly.
of the movable member, and a strap connected at one end to said movable member and at its other end to the other end of the base with the strap spaced from said base, said strap being engageable by a body member for muscle strength testing to force the strap toward the base with resultant longitudinal movement of said movable member to actuate the pointer.

2. Apparatus as set forth in claim 1 wherein said means for actuating the pointer is connected to said band.

3. Apparatus as set forth in claim 1 wherein a pair of transversely bowed bands are connected between said movable member and said one end of the base.

4. Apparatus as set forth in claim 3 wherein said scale and pointer are mounted on one of said bands and said means for actuating the pointer is connected to the other band.

5. Apparatus as set forth in claim 4 wherein said bands are bowed inwardly toward each other.

6. Muscle strength testing apparatus comprising a frame comprising an elongate base, a gauge mounted on said base, a pair of inwardly bowed bands extending lengthwise of said base, said bands being secured at one of their ends to said base, a strap spaced from the base and interconnecting the other ends of said bands with said base, and means interconnecting said gauge with said bands, said strap being engageable by a body member for muscle strength testing to force the strap toward the base with resultant transverse movement of the bands to actuate the gauge.

7. Apparatus as set forth in claim 6 wherein said base comprises an elongate bar having a transversely extending plate at each of its respective ends, and said one ends of the bands are connected to one of said plates.

8. Apparatus as set forth in claim 7 wherein said bands are adjustably secured to said plate for longitudinal movement on said bar.

9. Apparatus as set forth in claim 8 wherein the other ends of the bands are secured to said strap and the strap is secured to the other plate.

10. Apparatus as set forth in claim 7 wherein said base comprises a pair of spaced parallel bars and said plates have semicircular notches between the bars for mounting the apparatus on an isometric exerciser.

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U.S. Cl. X.R.

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