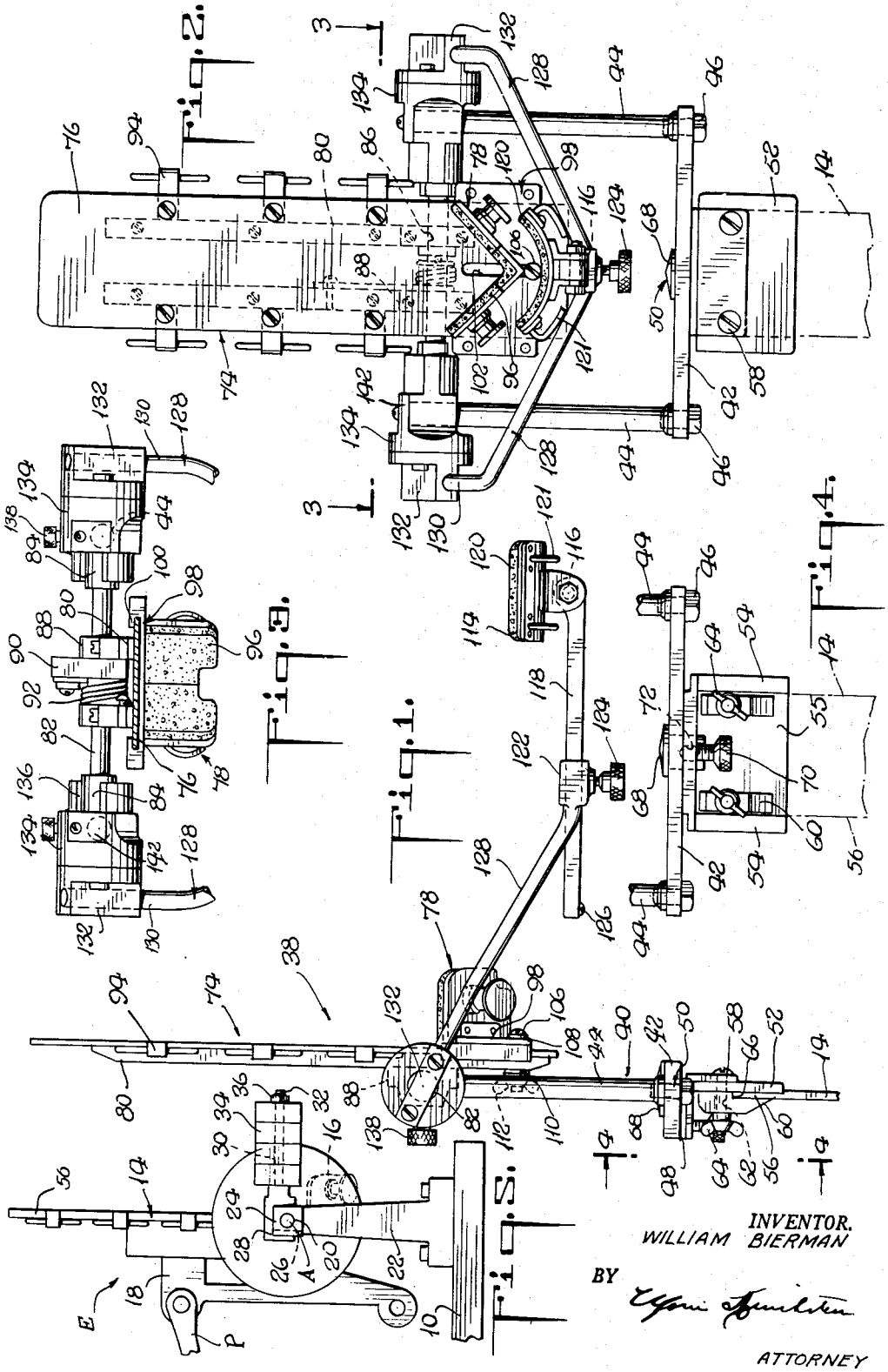
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EXERCISERS FOR SUB-NORMAL MUSCLES

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EXERCISERS FOR SUB-NORMAL MUSCLES

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This invention relates to exercisers for subnormal muscles of the body extremities, i. e. the feet, legs, hands and arms. More particularly, the invention relates to an attachment for such an exerciser.

It is a principal object of the present invention to provide for an exerciser of the character described an attachment for permitting the exerciser to better exercise the limbs.

It is another object of the present invention to provide an attachment of the character described which will properly position a limb whose muscles are to be exercised.

Another object of the present invention is to provide an attachment of the character described which is readily adjustable for different positions and/or sizes of limbs.

Another object of the present invention is to provide an attachment of the character described which is easily detachably attachable to an exerciser.

Another object of the present invention is to provide an attachment of the character described which is simple to adjust, and light, portable, and inexpensive to manufacture.

Another object of the present invention is to provide an attachment of the character described which can be employed by a patient himself without constant assistance and supervision from doctors and technicians, whereby not only will the patient be psychologically aided but his treatment will be less financially burdensome.

Other objects of the invention in part will be obvious and in part will be pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements and arrangements of parts hereinafter described and of which the scope of application will be indicated in the appended claims.

In the accompanying drawings in which is shown one of the various possible embodiments of my invention,

Fig. 1 is a side view of an attachment embodying the present invention, the same being shown attached to an exerciser;

Fig. 2 is a front view of the attachment shown in Fig. 1;

Fig. 3 is a sectional view taken substantially along the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary view taken substantially along line 4—4 of Fig. 1; and

Fig. 5 is a side view of the functional end of the exerciser with the attachment removed.

To facilitate explanation of my invention, reference will be made herein to the conventional system of muscle grading, wherein a completely paralyzed muscle is known as grade 0; a muscle which can cause just a flicker of motion is known as grade 1 or as a "trace"; a muscle which can move a joint, but not against gravity, e. g. can move a joint in water, is known as grade 2 or "poor"; a muscle which can move a joint against gravity but not against resistance is known as grade 3 or "fair"; a muscle which can move a joint against some resistance is known as grade 4 or "good"; and a muscle which is able to move a joint against ordinary resistance is known as grade 5 or "normal."

For grade 0 muscles, no improvement can be effected. However, atrophy of such muscles can be minimized or checked by proper movement thereof.

For grade 1 and 2 muscles, an improvement in condition is achieved first by determining with extreme precision the degree of muscle power remaining and then by applying just the exact minimal amount of resistance to enable that muscle to complete its normal range of movement.

For grade 3 muscles, the desired result is secured by causing the joint to move against a minute resistance which gradually and progressively is increased as the muscle passes to grade 4.

To aid in comprehension of the present invention a general description of an exerciser E with which it is to be used, follows:

The exerciser includes a platform for a limb extremity, the platform being mounted in such a way as to be capable of oscillation about a horizontal axis. The platform is oscillated by power. Said exerciser is shown, described and claimed in co-pending application Serial No. 177,196, for Exercisers for Subnormal Muscles, filed August 2, 1950, now Patent No. 2,674,242.

More specifically, the exerciser E comprises a base **10**. An elongated platform **14** of suitable dimensions and shape for a limb extremity is provided at the functional end of the exerciser, the same including a vertically adjustable heel rest **16**. Said platform is mounted on a bridge **18** which in turn is mounted on the base, the latter mounting permitting rocking of the bridge about a horizontal axis A. An end **20** of the bridge extends beyond a post **22** and is provided with a block **24** of rectangular cross-section which has a face formed with a pair of parallel rails **26**.

A bracket **28** of complementary shape is employed in connection with the block. The bracket is of U-shaped configuration, one of the legs of the U being designed to be snugly received between the rails **26**, the opposite leg of the U slidably engaging the opposite face of the block. Said bracket serves to support a bar **30** having a threaded free end **32**. The bar slidably receives a plurality of apertured cylinders **34** the weights of which may be of different values. Any pre-determined total of weights is placed on the bar and held in position by threading a nut **36** down the rod to engage the uppermost cylinder.

The platform is operated by a power drive P selectively capable either of oscillating the platform back and forth about the horizontal axis A or of intermittently swinging the platform about said axis in one direction only in order to permit a non-powered retrograde movement.

The reference numeral **38** denotes an attachment constructed in accordance with the present invention. The attachment includes a frame **40** having a bottom plate **42**, and two parallel spaced, upwardly extending side columns **44** affixed to the top of the plate by any conventional means, e. g. by bolts **46**.

Means is provided to detachably affix the attachment to the top of the exerciser platform. Said means includes a flat element **48** attached to the plate at **50**. The element **48** is formed with a perpendicular downwardly extending flange **52**. A rectangular flat tab **54** is located on each side of the rear face **55** of the flange, the tabs being parallel and spaced apart a distance slightly greater than that between the opposite sides **56** of the top of the exerciser platform to serve as lateral guides therefor. Two spaced bolts **58** screw into tapped openings in the

flange 52, the openings being disposed between the rectangular tabs. The ends of the bolts project an appreciable distance beyond the tabs. A clamp element 60 having an opening 62 through which a bolt can be fitted is selectively retained on each bolt 58 by a wing nut 64. The clamp elements 60 are formed with recessed portions 66 below the openings 62 and facing the flange.

The top of the exerciser platform is received between the rectangular tabs and between the clamp elements and flange. Thus, by tightening of the wing nuts the frame of the attachment can be detachably secured to the exerciser platform, said frame constituting a prolongation of the latter.

The frame 40 is pivotally mounted on the element 48 at 50 by a journal 68 and shaft (not shown) which enable said frame to turn about an axis perpendicular to the axis A. A set screw 70 screws into a tapped opening 72 in element 48, the opening communicating with the undersurface of the plate 42. The set screw serves to selectively retain the plate in any position of rotation about the journal 68. Openings for receiving the set screw are provided on the undersurface of the plate on opposite sides of the journal, said openings being disposed at and 90° away from the position of the set screw when the frame is facing frontwardly.

Pursuant to the present invention the distance between the body extremity of the limb to be moved by the exerciser and the horizontal axis of rotation A is increased. To this end the columns already described are provided. The reason for this is that if an entire limb is to be exercised by moving an extremity thereof, the range of movement of the extremity must be considerably greater than if it alone were to be exercised.

A platform 74 is located on the frame of the attachment, the bulk of the former projecting above the top of the columns. When the exerciser platform is rocked, the attachment also will rock but over a much greater distance because of its displacement from the horizontal axis A. Thus the platform 74 permits exercising of a limb by movement of its extremity.

The platform 74 comprises an elongated plate 76 on the front of which a heel rest 78 is disposed. The front of the plate is adapted to receive a limb extremity. The back of the plate has two long strips 80 disposed thereon in spaced relationship, the purpose of these strips appearing hereinafter.

Platform 74 is rockably mounted at the top of the frame on a shaft 82 (Fig. 3) non-rotatably secured at its ends to the tip of each column by fittings 84. The shaft is parallel to the horizontal axis A. Preferably, the heel rest is located near the shaft.

The shaft passes freely through registered openings 86 in journals 88 secured to each strip 80, the journals being located near the bottom of the plate 76. A stop 90 is carried by the shaft between the journals and extends away from the platform, and a torsion coil spring 92 encircles the shaft between the stop and a journal, one end of the spring being secured to the stop and the other end to the platform 74. The spring is designed to urge the platform to a position substantially parallel to the columns and opposes rocking motion of the same about the shaft 82. Such motion is limited in both directions by abutment of the stop against the back of the plate.

T-shaped projections 94 located on each side of the platform serve to permit bandaging of a limb extremity to the platform.

The heel rest comprises a V-shaped element 96 carried by a rider 98. The latter is slidable on the plate, being held thereto by inturned flanges 100 integral with the edges of the rider and extending behind and against the back of the plate. A central longitudinal slot 102 in the platform plate near the bottom thereof communicates with a hole in the rider. A headed bolt 106 passes through the hole and slot thus preventing the rest from sliding beyond the ends of the slot. The bolt passes through a washer 108 at the front of the rider and a washer 110 at the back of the plate. By tightening a wing nut 112 located on the bolt behind the washer 110, the heel rest can be selectively maintained in any position within the range of the slot.

The attachment further includes supporting means for the limb to be exercised. This means serves to keep the limb steady and to retain it in proper position relative to the ankle. Said means constitutes an elongated upwardly concave support 114 journaled at 116 to a rod 118, said support being disposed in line with the center of the platform 74. The support may have a foam rubber cushion 120 disposed thereon and be provided with hooks 121 on its undersurface. A bearing 122 is slidable on the rod and has a tapped opening therein communicating with the rod. A set screw 124 fits the opening and serves to selectively retain the bearing in place on the rod. A screw 126 at the end of the rod remote from the journal serves to prevent the bearing from coming off the rod at that end, and the journal prevents the rod from coming off at the other end.

Two diverging arms 128 extend upwardly from the bearing and away from the support, said arms terminating in parallel reaches 130.

The supporting means is rotatably and detachably secured to the fittings 84 at the top of the frame as follows: a member 132 is secured to each reach. On the facing surfaces of said members clamps 134 are rotatably attached, the axes of rotation being in alignment with shaft 82. Each clamp has a slotted portion 136 adapted to receive a fitting 84. Set screws 138 received in tapped openings in the clamp communicating with the interiors of the slotted portions serve to rotatably hold the clamps and thus the whole supporting means to the top of the frame. Guide means constituting a stop 142 at one end of each slotted portion may be provided to prevent the fittings from slipping through the slotted portions when the clamps are being attached.

The rod and arms in effect jointly constitute a radius arm of variable length which swings about the axis of rotation of the platform 74 and holds the support.

In the form of the invention herein shown a body extremity passes the securing means for the support in order to reach the platform 74. The diverging arms form with the rod a Y-shaped structure permitting such passage. The arms are of equal length so that the support will be disposed in line with the platform, i. e. directly in front thereof.

To use the attachment the frame is clamped to the platform of the exerciser.

If the exerciser is to be employed for flexion and extension of a limb, the platform is turned on the journal 68 until it faces forwardly as shown in the drawings and the set screw 70 made fast to hold the platform in such position. The supporting means is fixed to the frame. The limb extremity is bandaged to the platform 74 and the power is turned on in the exerciser. As the platform rocks, the limb will be moved in flexion and extension and the supporting means will move with the limb, such movement being permitted by the rotatable clamps 134. It will be noted that as the exerciser platform 14 moves back and forth the corresponding movement of the attachment platform 74 is exaggerated thus enabling the desired degree of extension and flexion to be obtained. The degree of extension and flexion can be varied by shifting the heel rest 78.

If the muscles which move the limb in flexion and extension are completely paralyzed, i. e. are grade 0 muscles, the exerciser is set to oscillate the attachment platform 14 back and forth thereby toning the paralyzed muscles and preventing or minimizing atrophy thereof.

Should one set of these muscles, i. e. the muscles used for flexion, or the muscles used for extension, not be completely paralyzed and it be desired to exercise the same so as to develop these muscles, the muscles should be

permitted to perform work by moving the limb. If the muscles are grade 1 or 2, they must be aided in performing their work and if the muscles are grade 3 or 4 they must be resisted in this performance. For example, where the muscles which perform flexion are grade 2 and the same are to be exercised, the exerciser is set to extend the limb under power but not to flex the limb and flexion is performed by the muscles of the limb. The bracket **28** is placed on the proper side of the block **24** for the weights **34** to oppose flexion of the limb so that when the muscles flex, the limb must work against these weights. The number and size of weights is so adjusted that the muscles must strain themselves to their utmost to flex the limb. When said muscles are being exercised in the foregoing manner, retrograde movement of the attachment for extension is power actuated and it makes no difference whether the muscles used for extension are paralyzed or of grades 1 to 5.

If it is desired to exercise the muscles which extend the limb, the exerciser is set for powered movement of the platform **14** in a direction to flex the limb, and movement of said platform in a direction to extend the limb must be performed by the muscles.

The attachment also can be used for exercising a limb in abduction and adduction. When the attachment is thus employed, the supporting means is removed, the set screw **70** is loosened and the frame **40** turned 90°. The set screw thereupon is tightened; when a limb is placed on the platform **74**, it will be 90° to the position which the limb would assume if placed on said platform in the position illustrated in Figs. 1–4. When the exerciser is energized, the limb will be moved in abduction and adduction instead of flexion and extension. As in the case previously described, the limb simply may be moved in abduction and adduction to keep completely paralyzed muscles in tone or the muscles for either abduction or adduction can be assistively or resistively exercised in varying selective degrees.

It thus will be seen that there is provided a device which achieves all the objects of the invention and is well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein described, or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

Having thus described the invention, there is claimed as new and desired to be secured by Letters Patent:

1. The combination with an exerciser having a platform for limb extremities and means defining an axis about which the platform is rockable, of an attachment including a platform for limb extremities, means defining an axis parallel to and spaced from the exerciser rocking axis and about which the attachment platform is rockable, a member supporting said last mentioned means, means detachably securing said member to said exerciser platform, and supporting means for a limb, said limb-

supporting means including a support and means mounting said support in spaced relation to, in the front of, and in line with the attachment platform, the support mounting means including an element detachably and rotatably attached to the member.

2. The combination with an exerciser having a platform for limb extremities and means defining an axis about which the platform is rockable, of an attachment including a platform for limb extremities, means defining an axis parallel to and spaced from the exerciser rocking axis and about which the attachment platform is rockable, a member supporting said last mentioned means, and means detachably securing said member to said exerciser platform.

3. An exerciser comprising a first platform for limb extremities, a second platform for limb extremities, means defining an axis about which the first platform is rockable, means defining an axis about which the second platform is rockable, a member carrying said last mentioned means and means detachably securing said member to the first platform.

4. An exerciser comprising a first platform for limb extremities, a second platform for limb extremities, means defining an axis about which the first platform is rockable, means defining an axis about which the second platform is rockable, a member carrying said last mentioned means, means detachably securing said member to the first platform, and a supporting means for a limb, said limb-supporting means including a support and means mounting said support in spaced relationship to, in front of and in line with the second platform means, the support mounting means including an element detachably and rotatably attached to the member.

5. For use with a limb exerciser an attachment having a platform for limb extremities, means defining an axis about which the platform is rockable, a member carrying said means, means detachably attachable to said exerciser, and means connecting said detachably attachable means to said member for relative rotation about an axis perpendicular to the first-named axis.

6. An exerciser comprising a first platform for limb extremities, a second platform for limb extremities, means defining an axis about which the first platform is rockable, means defining an axis about which the second platform is rockable, a member carrying said last mentioned means, means detachably securing said member to the first platform, and means carried by the member for supporting a limb, an extremity of which is adapted to be located on the second platform.

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