

FINGER AND HAND MUSCLE EXERCISE DEVICE

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3 Sheets-Sheet 1

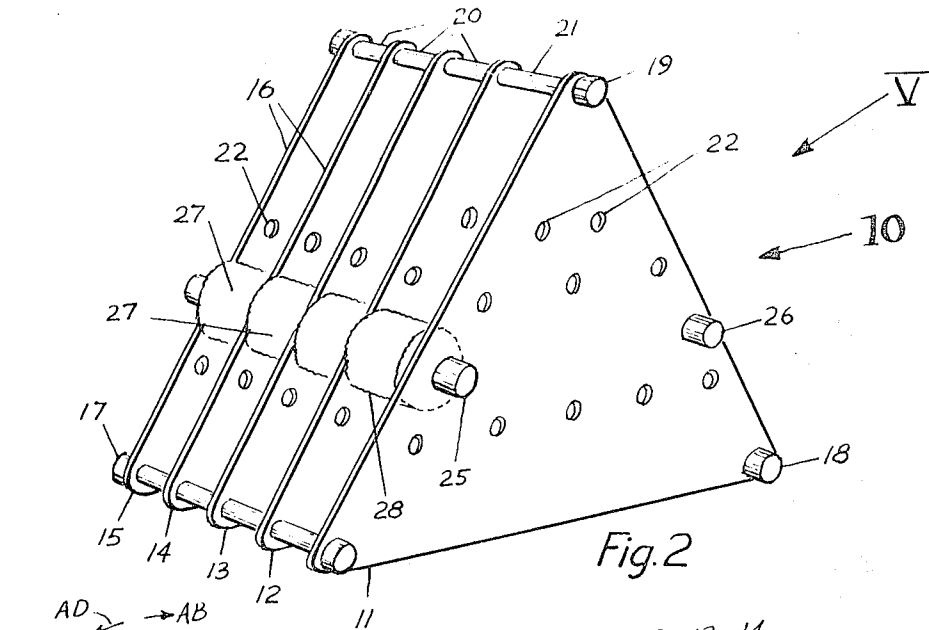


Fig. 2

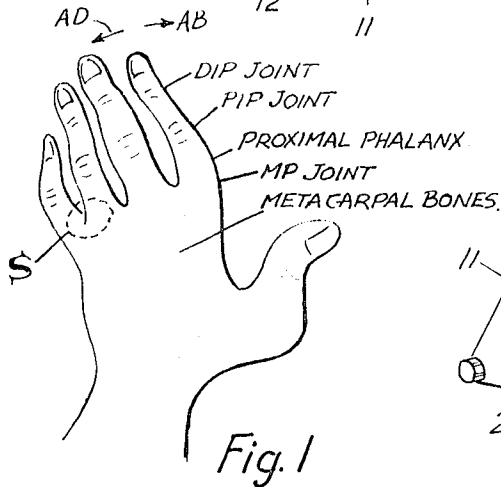


Fig. 1

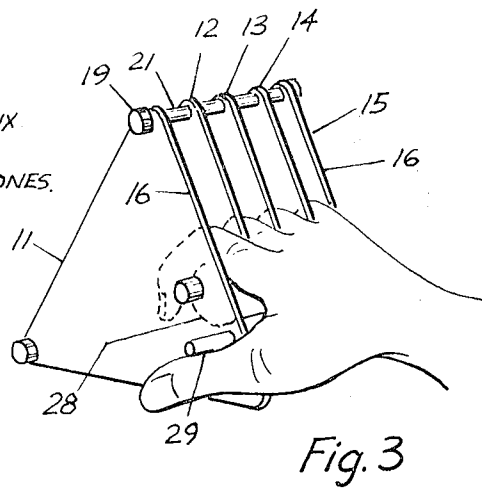


Fig. 3

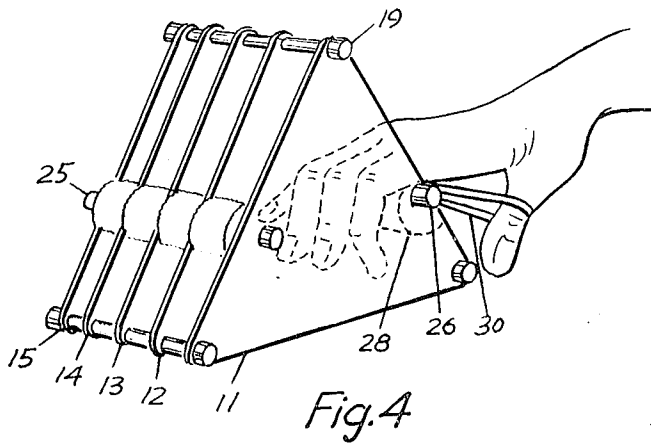


Fig. 4

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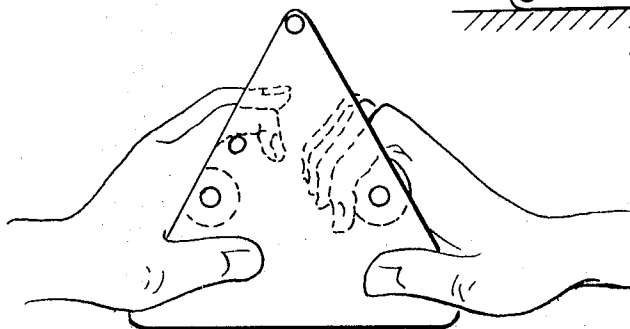
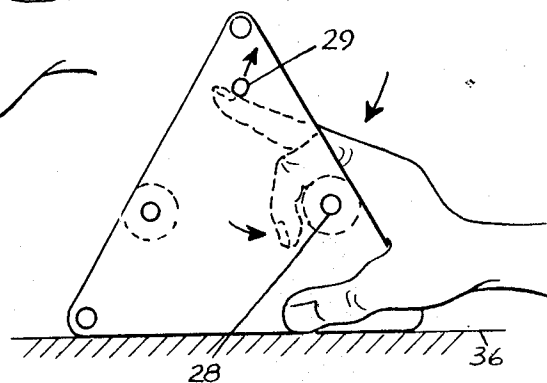
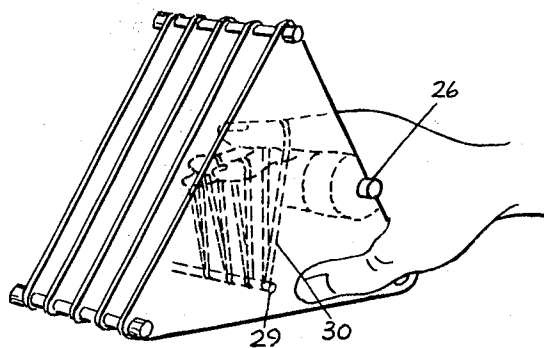
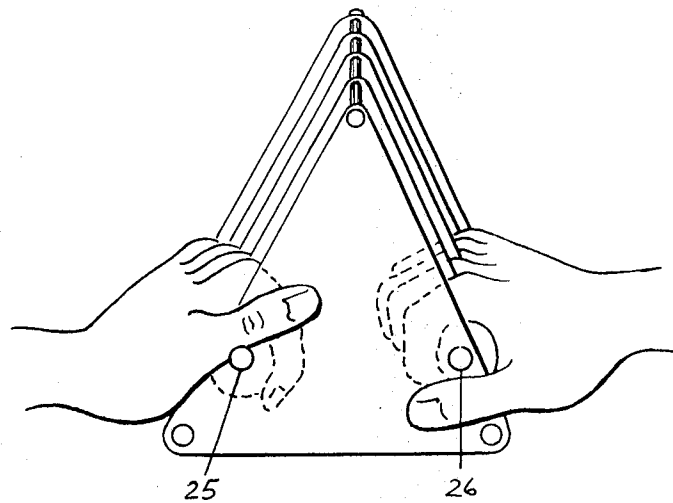
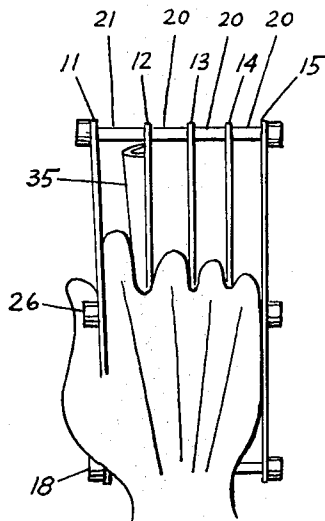
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3 Sheets-Sheet 2



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1

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**FINGER AND HAND MUSCLE
EXERCISE DEVICE**
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19 Claims

ABSTRACT OF THE DISCLOSURE

A support forms a rest for the palmar side of the proximal phalanx in the region of the bone insertion of the intrinsic muscle and the metacarpal-phalangeal joint of the second to fifth fingers to rest thereon; a plurality of walls, forming slots for the fingers therebetween in the order of a width of a finger, extend in a direction generally perpendicularly away from said support adapted to confine and separate the fingers therebetween, so that the fingers can fan out from the support. The walls are sufficiently rigid to act as a resistance for isometric exercise of finger abduction and adduction thereagainst with transverse holes therethrough for the insertion of stop pins against which the fingers may be exercised, and around which rubber bands may be looped for additional exercising of finger and hand muscles. The support may be a molded plastic structure, integral with the walls, or it may be a cushioned support rod for the proximal phalanx, extending between the walls.

The present invention relates to a hand muscle exercising device and particularly to an exercising device for arthritic patients to exercise finger and hand muscles and strengthen the intrinsic and extrinsic flexors, and extensors, and counteract intrinsic muscle contractures, without straining any weakened ligaments, or joint structures, and which inhibit movements detrimental to the arthritic hand.

Various exercising devices for finger muscles and hand muscles have been proposed, the most simple being a rubber ball which the patient is asked to squeeze. A mere grasping, or clutching exercise does not provide movement in which the fingers are separated and fanned out, that is, in which the fingers are not parallel to each other as they extend from the metacarpal-phalangeal joint. Some medical authorities have warned against excessive use of such exercises using a rubber ball, squeezing sponges or the like, since the exercise provided is one-sided, invites overly-forceful grasping, straining of the pathological hand and joint structure, and does not provide exercise for the extensor muscles. Additionally, isometric exercises, for example by squeezing fingers against each other, are frequently inefficient as the stronger of the respective pair of fingers is not suitably exercised when pressing against the resistance of a weaker neighboring finger.

It is an object of the present invention to provide a hand and finger muscle exercising device, particularly for use by arthritic patients, which is simple, difficult to be mis-applied and thus safe in use, versatile and immersible, so that it can be used in hot baths; and which further is easily portable.

2

Subject matter of the present invention

Briefly, in accordance with the present invention, a support body is provided having a support region on which the palmar side of the proximal phalanx is supported in the area of the bone insertion of the intrinsic muscle and the metacarpal-phalangeal joint of the second to the fifth fingers. The point of support provided in thus not at the wrist, but adjacent to the individual fingers. A plurality of walls extend from the support region in a direction away from the support region. The support region will be linear and may be straight or slightly bowed, and the walls will extend therefrom generally perpendicularly. The walls define, between themselves, a plurality of slots which may be parallel or fan out, so as to permit the fingers to exercise while fanned out. In one form of the invention, the body is a molding of plastic, rubber, or the like, with walls extending therefrom which thicken towards their end to form slots which fan out. The walls themselves are sufficiently strong to provide a counter-resistance for isometric exercise; a projecting stop is provided on the side to form a counter-resistance for isometric exercise of the thumb. Preferably, the body is provided with attachment means for rubber bands. By curling the fingers in the slots, they will be restrained from lateral deviation by the fan-shaped slots; flexing muscles can be strengthened by squeezing around the body, between the slots similar to a rubber ball; contrary to grasping a ball, however, the metacarpal joint can be supported to be essentially non-flexed, and the fingers fanned out. Extensor muscles can be strengthened by attachment of a rubber band and pulling thereagainst, with lateral muscle exercise being possible by isometric exercise against the walls or the projecting stop. Transverse bearing rods can be passed through aligned openings in the walls, against which isometric exercises can be carried out, both by pressing down thereagainst, or lifting up thereagainst, or looping rubber bands around the rods to be pulled up by the fingers.

In another form of the invention, the walls are parallel plates, with the space between the plates for the index finger being somewhat larger and preferably an insert therein to force the index finger laterally away from a direction perpendicular to the hand and to ensure a fanned-out position. The plates are formed with aligned holes through which the bearing rods can be inserted. The support preferably is formed of a similar rod, suitable padded to have the above referred region of the fingers rest thereon.

The invention will be described by way of example with reference to the accompanying drawings, wherein:

FIG. 1 is a generally perspective illustrative view of an arthritically deformed left hand;

FIG. 2 is a perspective view of one embodiment of the exercising device of the present invention;

FIG. 3 is a perspective view from the other side of FIG. 2, showing the device in use with the right hand;

FIG. 4 is a view similar to FIG. 2, to a reduced scale and with features omitted showing a different exercise;

FIG. 5 is a view of the device of FIG. 2 taken in direction of arrow V, in use;

FIG. 6 is a front view in cabinet projection illustrating use, simultaneously, by two hands in one form;

FIG. 7 is a view similar to FIG. 4 illustrating a different form of exercise;

FIG. 8 is a front elevation view illustrating a different exercise;

FIG. 9 is a front elevational view illustrating use with two hands;

FIG. 10 is a top view of another embodiment of the present invention;

FIG. 11 is a top view of the device of FIG. 10, with parts broken away, illustrating use of the device;

And FIG. 12 is a bottom, reverse view of the device of FIG. 10, in use.

FIG. 1 shows, in exaggerated form, an arthritically deformed hand. For a better understanding of the invention, and the way the device is to be used as a finger exercise apparatus, some of the medical terms for the hand will be referred to. The metacarpal bones of the hand extend up to the metacarpal (MP) joint. Each finger then has a first region, termed the proximal phalanx, followed by the proximal interphalangeal (PIP) joint; the last finger joint is the distal interphalangeal (DIP) joint. Movement of a finger in the direction of the arrows AB and AD, respectively, is referred to as abduction and adduction, respectively. The dotted zone S is termed the "root of the finger" and is the region of bone insertion of the intrinsic muscles. The side of the palm of the hand is referred to as the palmar side.

The device 10 is an exercising device, with safeguards to prevent acceleration of deformities while using the device. Device 10 comprises a group of plates 11, 12, 13, 14, 15, which are parallel and define slots or spaces therebetween. The plates are held in position by means of holding pins or screws 17, 18, 19, spaced from each other as desired by spacers 20 and 21; spacer 21 is somewhat larger than spacers 20, so that the slot between walls 11 and 12, and designed for use by the index finger, will be wider than the slots between the remaining walls and intended for use by the other fingers. In addition to the holding pins 17, 18, 19, a pair of cross pins 25, 26 extend transversely of the plates, so that plates 11-15 will extend perpendicularly to pins 25, 26; deviations from a right angle are permissible and walls which extend generally perpendicularly, and fan out to provide fanned-out slots, are also suitable. Pins 25, 26 are cushioned by cushioning members 27, 28, which may, for example, be foam rubber, polyurethane foam, or the like. The walls are all formed with holes 22 of predetermined alignment, for example a straight line, through which cross bearing pins 29 may be passed. The cushions, 27, 28 match in width the spacer members 20, 21, cushion 28 again being wider than cushion 27. The bearing pins 29 are readily removable, and rubber bands 30 can be looped thereover against which the fingers may be exercised. The device of FIGS. 2 to 9 is designed to rest on a table top 36 (FIG. 8). Between plates 11 and 12, a bearing or spacer member 35 can be arranged, either secured to plate 12, or loose to be removable. The purpose of this member is to force the second or index finger into a fan-shaped alignment.

The use of the device will be discussed in connection with FIGS. 3 to 9. In FIG. 3, the proximal phalanx of the fingers is supported on the cushioned cross pins 26. The palm rests against the edges 16 of the plates 11-15 to keep the tendons aligned over the metacarpal joints. One form of exercise is merely to loop the fingers around the cushioned support pin 26 and squeeze. Isometric exercise of the thumb, pressing upwardly against a cross bearing pin 29 and inserted in one of the lower holes can be done simultaneously. Alignment of the index finger that the tendon of the fingers passes over the joint in an essentially straight line, and contra to the showing of FIG. 1, is assisted by bearing member 35 (FIG. 5), so that the tendons will extend essentially fan-shaped as schematically illustrated in that figure. The thumb can be exercised by means of a rubber band (FIG. 4) looped around one of the end pins, for example pin 26, or around a pin 29 and inserted in a suitable hole 22.

The hand is prevented from sliding deeply between the walls 11-15 by edges 16 on the walls, which will dig into the skin between the fingers, and effectively prevent a strong grasp (FIG. 3) or an excessive pull (FIG. 4) which might be more damaging to the injured hand than therapeutically helpful. Both hands can be exercised at the same time (see FIG. 6) where isometric exercise of the thumb against a projecting end of pins 25, 26 is illustrated, one thumb being pressed upward, the other one pressing down. The unit is preferably made of plastic, for example Lucite plates, and the pins likewise of plastic, Plexiglas, or the like, so as to be completely immersible, for example in a hot bath.

FIG. 7 illustrates a finger extensor exercise, in which rubber bands 30 are looped around a cross pin 29. The various holes 22 have been omitted from the showing of FIGS. 3, 4 and 6 to 9, to simplify the drawing. By use of a number of rubber bands, one for each finger, they can be retained substantially parallel to each other so that each finger is exercised in line with the normal non-pathological alignment of the tendons and muscles.

FIG. 8 illustrates the device placed on a table top 36, in which isometric exercises can be done against a pin 29 located in an upper hole, with force thereagainst as indicated by the arrow; a gripping exercise can also be carried out with force again being applied as indicated by the arrows. The palm rests against edges 16 of the plates.

FIG. 9 illustrates a combined exercise by both hands, in which the right hand carries out a squeezing, or pinching exercise of all fingers with the palm resting against edges 16 so that the metacarpal joint is extended. Simultaneously, the fingers of the left hand exercise against a cross pin 29 above the cushioned pin 25, for isometric exercise of the region between the second and third finger joint, the metacarpal-phalangeal joint being supported on cushioned pin 25.

The cross pins against which the fingers bear may be made of metal, with plastic or nylon end bushings or tips; cross pins 29 may, if desired, likewise be cushioned, or cushioning sleeves provided to be slipped over the pins as they are inserted through holes 22 (FIG. 2).

The device 10 is form-stable, readily supported on a table 36 (FIG. 8) or against the body, and held in position by simultaneous exercise of both hands (see FIGS. 6 and 9).

FIGS. 10 to 12 illustrate a different form of the invention, in which part of the hand is supported beneath the wrist. Device 50 includes a body 56, which may be of molded rubber, molded foamed plastic, or the like. It has walls 51, 52, 53, 54, 55 extending therefrom, the walls being sufficiently thick and shaped to leave slots 61, 64 therebetween, which fan out from the base part of the body. The body 56 is preferably slightly raised as illustrated at 56', to lie smoothly in the hand and to be stable in use. The entire device is held over the hand by a strap 57, secured at corners in a suitable manner, for example by plastic welding or bonding at 58; the strap may be of flexible transparent plastic, so that the entire device is immersible and easily cleaned. The device 50 is further formed with a bearing stop 59, against which the thumb can be placed for isometric exercise, to bear down thereover, or up thereagainst. Rubber bands 60, 60' can be secured to an attachment pin 67, at the underside of the device (see FIG. 12) to enable stretching and extension exercises by the fingers. The underside of the body of device 50 is preferably formed with a depression 65, to permit the thumb to lie therein, not only to hold the entire body 56 but also to act as a counter bearing point for isometric exercises of thumb flexing.

The walls 51-55 extend generally parallel and in a direction generally transversely to the remainder of the body 56. The sides of the walls are thickened towards their ends so that slots 61, 64 will extend fan-shaped, again to force the fingers of the hand into a fan-shaped configuration. The walls themselves also extend some-

5

what above and below the remainder of the body portion, so that the body 56 will project sufficiently between the walls to support the region of the fingers beyond (in the direction to the tip) the metacarpal-phalangeal joint with the tendon in proper alignment. The extent to which the hand, itself, can slip over and into the device is limited by the strap 57 and the reach of the thumb around the body 56, as seen in FIG. 11. The sides of the walls defining the slots may be straight, as shown, or arched, or oblique and converging to facilitate isometric exercise.

The device 50 of FIGS. 10 to 12 can be made small, and lightweight, readily portable to be carried along so that exercises can be carried out during spare time, or when not manually occupied. Any number of rubber bands 60, 60' can be secured to attachment 67; both devices 10 (FIGS. 2 to 9) and 50 (FIGS. 10 to 12) may be made in various sizes, as desired. The width of the slots, that is the separation between the inner sides of the walls is preferably in the order of about 2 cm., possibly slightly larger, so as to accommodate approximately the width of the finger. Again, the walls 51 to 55 should be sufficiently rigid and strong to resist lateral forces brought to bear thereagainst by lateral pressure of the fingers during isometric exercises; they may have holes 62 (one being shown in FIG. 10, only for simplicity) therethrough, for insertion of bearing pins similar to the embodiment of FIGS. 2-9. The termination of body 56, between the walls may be along a straight, or a bowed line; if bowed, holes 62 are preferably located aligned along a similarly bowed line 63 and the pins passing therethrough (for exercising extensor muscles) shaped to fit.

Various changes and modifications may be made in the device as necessary and desirable for particular applications and uses, within the inventive concept. The sizes of the devices, and the sizes of the slots between walls may be arranged suitably for different sizes of hands, for example for large, small, men's and women's sizes.

I claim:

1. Hand muscle exercising device comprising:

a support contacting simultaneously both the palmar side of the proximal phalanx of the second to fifth fingers in the region of the bone insertion of the intrinsic muscle and extending to the proximal interphalangeal joint of the second to fifth fingers;

a plurality of walls extending generally perpendicularly from a line interconnecting the support zone on the support contacting the proximal phalanx in the region of the bone insertion from the immediate proximity of said support zone, said walls defining therebetween a plurality of slots, said slots being of a depth to confine and separate the fingers therebetween, said slots being of a width in the order of the width of a finger,

the walls adjacent the slots being of a height, rigidity, and length sufficient to act as a counterbearing resistance for isometric exercise of finger abduction and adduction;

said walls locating the proximal interphalangeal joint adjacent the end of the support and the proximal phalanx in said slots, the support permitting the fingers from the proximal interphalangeal joint to curl about its end.

2. Device according to claim 1, wherein said support is a unitary molded body having a support zone for the palmar side of the proximal phalanx in said region of the bone insertion of the intrinsic muscle and the metacarpal-phalangeal joint;

and said walls are a plurality of fan-shaped extensions projecting from said body, said slots between said walls fanning out.

3. Device according to claim 2, including a groove molded in said body in the region thereof remote from said support region, said groove accommodating at least part of the thumb for isometric exercise of thumb muscles.

4. Device according to claim 2, wherein said body

6

includes smooth bearing extensions in said slots and extending a fraction of the length of said slots and having a thickness less than the height of said walls, said bearing extensions being adapted to be gripped by flexing of the proximal and distal interphalangeal joints.

5. Device according to claim 4, wherein the material of said extensions is resiliently compressible.

6. Device according to claim 2, including a holding strap adapted to pass over the wrist of the hand to be exercised and secured to said support region adjacent both lateral sides thereof.

7. Device according to claim 1, including a projecting stop element extending from a side of said body to provide a counter resistance for isometric exercise of the thumb.

8. Device according to claim 1, including means for the attachment of pendant rubber bands thereto.

9. Hand muscle exercising device comprising:

a support adapted to have the palmar side of the proximal phalanx in the region of the bone insertion of the intrinsic muscle and the metacarpal-phalangeal joint of the second to fifth fingers rest thereon;

and a plurality of walls comprising a plurality of essentially parallel plates extending in a direction generally perpendicularly from a line interconnecting said support regions and defining therebetween a plurality of slots, said slots extending between said plates and being adapted to confine and separate the fingers therebetween, said slots being of a width in the order of the width of a finger and the walls being of a rigidity sufficient to act as resistance for isometric exercise of finger abduction and adduction, said support comprising a connecting element extending essentially transversely of said plates and interconnecting said plates in spaced, essentially parallel relationship.

10. Device according to claim 9, wherein a pair of support elements are provided located at opposite sides of said plates and spaced from each other by a distance sufficient to permit simultaneous exercise of the muscles of both hands.

11. Device according to claim 9, wherein said interconnecting element is padded.

12. Device according to claim 9, wherein said walls are formed with at least one opening, each, therein, the openings of the walls being in alignment;

and transverse connecting rods are provided to removably fit into said holes, said rods forming bearing points for the fingers.

13. Device according to claim 12, including pendant rubber bands looped over said rods to provide resilient counter-resistance means during exercise of the fingers.

14. Device according to claim 12, wherein the alignment of said openings is along a bowed line; and said rods are bowed to fit said alignment.

15. Device according to claim 9, wherein the distance between the outside plate and the next adjacent plate at one side of the device, at least, is greater than the distance between the next two adjacent plates.

16. Device according to claim 14, including a thickening element located in contact with said next adjacent plate and providing a bearing surface for isometric exercise of adduction of the index finger.

17. Device according to claim 9, wherein the plates are polygonal;

and at least three interconnecting elements are provided holding said plates in spaced, essentially parallel position, at least one of said interconnecting elements forming said support.

18. Device according to claim 17, wherein said plates are triangular, and formed with a plurality of aligned holes therein;

and transverse connecting rods are provided removably fitting into said holes, said rods forming bearing points for the fingers.

7

19. Device according to claim 9, wherein said device has a base region adapted to be placed on a support base; and said interconnecting element is located a predetermined distance above said base region and spaced adjacent the edges of said plates.

5

References Cited

UNITED STATES PATENTS

1,472,906 11/1923 Gorrell ----- 272—67 10
2,271,164 1/1942 Sullivan ----- 272—68

8

2,461,695 2/1949 McMahon ----- 272—67
3,347,547 10/1967 Hynes ----- 272—67

FOREIGN PATENTS

27,934 1/1905 Great Britain ----- 272—68

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U.S. Cl. X.R.