March 19, 1968 C. W. OJA ET AL 3,373,993

RESISTANCE EXERCISER AND BRAKEABLE MOBILE CARRIAGE

Filed Oct. 26, 1964

2 Sheets-Sheet 1

FIG. 2

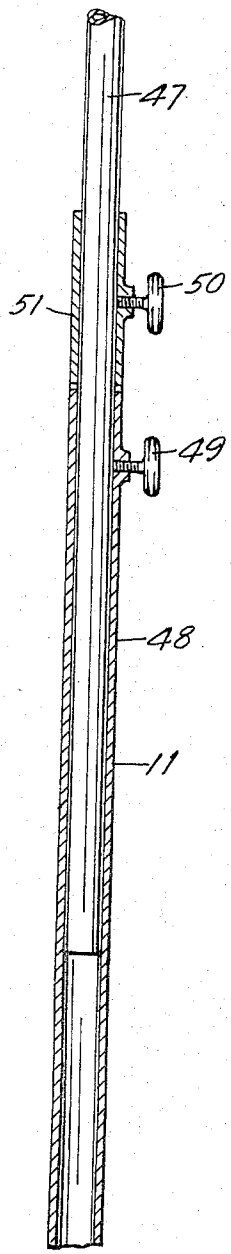
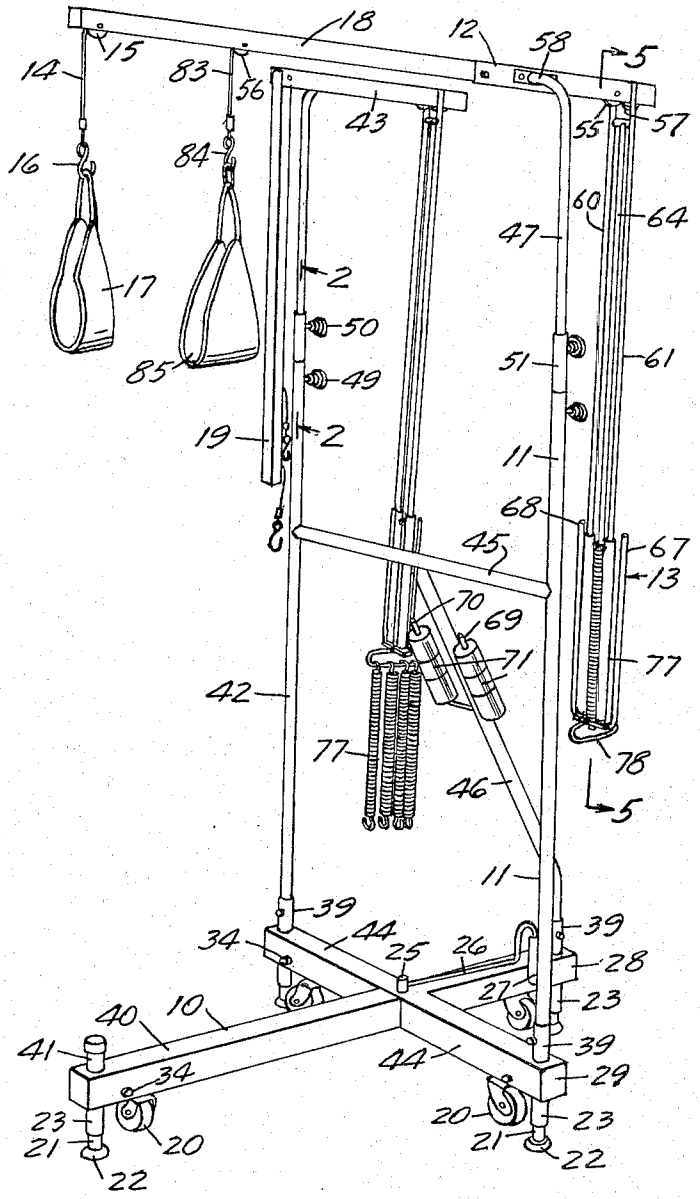



FIG. 1




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RESISTANCE EXERCISER AND BRAKEABLE MOBILE CARRIAGE

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FIG. 5

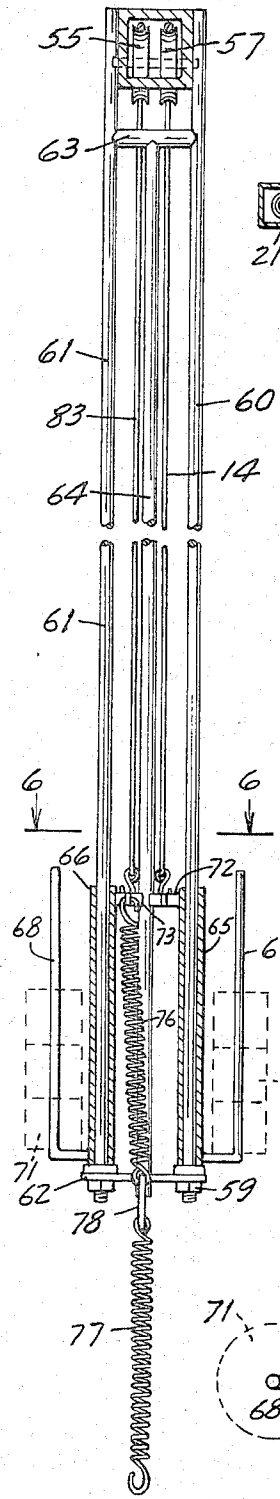



FIG. 3

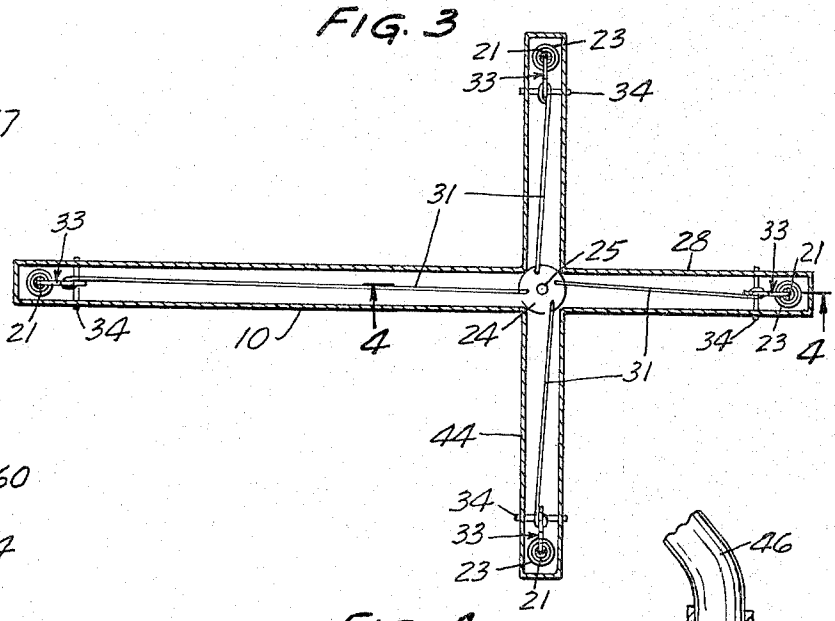



FIG. 4

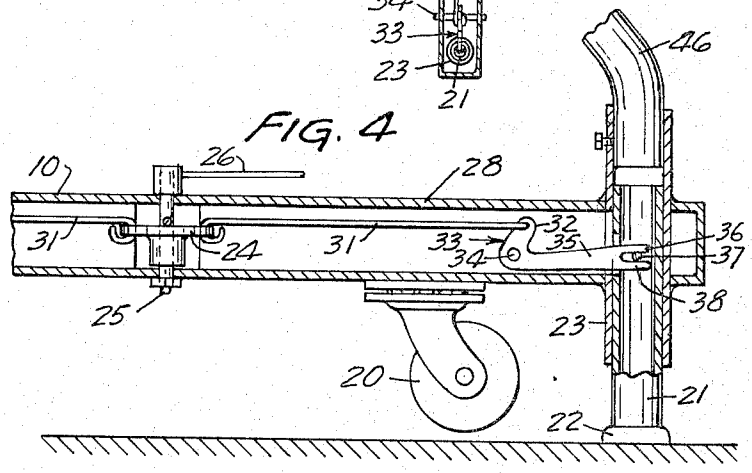



FIG. 7

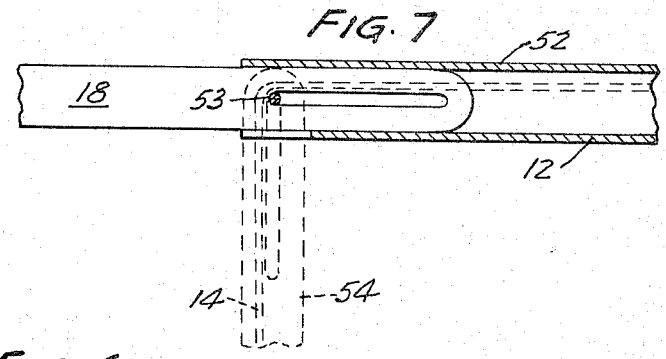
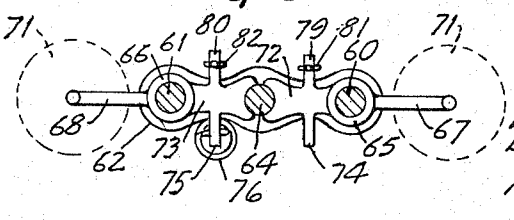



FIG. 6




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3,373,993

# RESISTANCE EXERCISER AND BRAKEABLE MOBILE CARRIAGE

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7 Claims. (Cl. 272—81)

This invention relates to a therapeutic exercise device. It particularly relates to composite apparatus for aiding the support of weak limbs during therapeutic exercise movement of the same, as well as to a novel carriage assembly useful as a part of such apparatus.

The apparatus is mobile and adapted to be moved into a position behind an upright individual whose arms require support during a period of use.

Many therapeutic exercise devices are known; however, none of the prior art devices, insofar as we are aware, possesses the essential combination of features characteristic of the device of this invention. It is the particular combination of features to be hereinafter discussed in detail which provides a convenient therapeutic rehabilitation or exercise device having great flexibility for use with different patients needing aid during exercises, particularly aid during exercise of their arm muscles. Whether the individual needing such aid is standing or is seated in a chair, such as an ordinary household chair or a wheel chair, the limb supporting device of this invention is useful as an aid to support the weight of the individual's arms.

Advantageously, by using the apparatus of this invention, an individual undergoing rehabilitation may engage in interesting tasks, such as painting or drawing a picture, carving, playing table games, eating a meal without the constant help of another individual, and turning pages of a book while reading without the help of another individual.

In a very real sense, the apparatus of the present invention serves to aid in supporting the weight of an individual's arms during movement of the same. Thus, the needed activity for weak muscles may be accomplished with attention to an interesting task at hand, without undue strain or expenditure of precious energy in lifting and moving the weight of one's own forearms. As an individual develops greater strength in his arms, the apparatus of the present invention may be adjusted to change of the degree of lift-support provided by it so that continual and progressive progress toward muscular tone and complete recovery may be expected.

In addition to providing the foregoing benefits, the apparatus of the present invention is readily collapsed, at least in part, to permit storage in a more compact form than that form in which elements of the apparatus are disposed for therapeutic use. In the preferred embodiment of the apparatus as illustrated, the assistance elements especially adapted for supporting a forearm or upper arm of an individual may be locked or secured against swivel movement or may be freely allowed to swivel.

The carriage for the apparatus, preferably supported upon casters, is provided with a forwardly extending portion which is extremely low and at least sufficiently low in height so as to clear the underneath portion of the seat of an ordinary chair, including even a child's chair, or wheel chair, or roller chair. Positive means are provided to brake the base of the apparatus against movement even though, when the brakes are released, the carriage is freely movable on its casters.

Of primary significance is the fact that the apparatus of this invention is extraordinarily simple and readily understood and used by therapists who are specialists in the field of rehabilitation.



Other advantages and benefits of the invention are explained below or will be evident as this description proceeds.

The invention will be described by reference to a drawing, made a part hereof, wherein:

FIGURE 1 is a perspective view of the apparatus showing one of the upper essentially horizontal supporting arms in collapsed downwardly folded position and the other of said arms in operating essentially horizontal cantilevered position;

FIGURE 2 is a cross-section taken on the line **2—2** of FIGURE 1, showing a locking mechanism for preventing swivel movement of an upper essentially horizontal supporting arm as well as a means for adjusting the height of such supporting arm and a means for allowing swivel movement of the supporting arm;

FIGURE 3 is a cross-section through the carriage base frame taken on a plane immediately below the top surface of the carriage and looking downwardly;

FIGURE 4 is a cross-section taken on line **4—4** of FIGURE 3;

FIGURE 5 is an enlarged cross-sectional view taken on line **5—5** of FIGURE 1, showing resistance means located at the rear or back portion of the essentially horizontal supporting arms of the apparatus;

FIGURE 6 is a cross-section taken on line **6—6** of FIGURE 5; and

FIGURE 7 is an enlargement of a vertical sectional view taken along the length of an essentially horizontal supporting arm and showing a detailed view of a means for collapsing the forwardly cantilevered end of the same.

Referring to the drawing, the apparatus broadly comprises a carriage **10**, at least one upright standard **11** supported from the rear portion of the carriage, an essentially horizontal supporting arm **12** mounted at the upper terminus of the upright standard **11**, a resistance means **13** (adjustable to provide varying degrees of resistance) carried on the back end of the supporting arm near its mounting to the standard **11**, and a rope or flexible connecting line **14** extending from the resistance means toward the outer cantilevered end of the horizontal supporting arm and then over guide means such as pulley **15** to a downwardly freely suspended terminal position **16**, from which position a sling **17** is suitably suspended.

Most frequently the apparatus will have two essentially horizontal supporting arms; and as illustrated in the drawing, the cantilevered end **18** of horizontal arm **12** is in operating position, whereas the outer end **19** of arm **43** is shown in illustratively collapsed inoperable condition. This showing is solely for the purpose of illustration; both arms may be placed in the illustrated operable or the illustrated inoperable collapsed position. Of course, a single cantilevered horizontal arm may be used for assisting in the movement of only one arm of an individual. In such cases, there is no need for the other cantilevered arm, and it may be collapsed as illustrated in the drawing.

The details of structure for the carriage will first be described; and in this connection, reference is made to the bottom part of FIGURE 1 and FIGURES 3 and 4. The carriage comprises a base frame **10** which most conveniently is in the over-all form of a cross or X. It is supported by casters **20**, suitably four in number and positioned near the terminal ends of the X beams of the frame. Braking means for the carriage is positive in its operation so as to prevent shifting of the apparatus in position during use by a patient; and for this purpose telescoping legs **21** equipped with friction pads **22** are provided preferably at the outer extremity of each cross beam of the base frame. Indeed, telescoping legs **21** are preferably provided at the extremity of each beam of the frame beyond the location of each of the casters **20**.

Detail for the telescoping legs **21** is shown in FIGURE 4, where it will be noted that the legs slidably telescope

and are contained within tubular braces 23 firmly affixed to the cross-beam members of the base frame. Each telescoping leg 21 is of hollow tubular character, at least in the portion thereof facing toward the cross point of the beams of the base frame.

Within the cross point of the beams of base frame is located a pivotable plate 24, mounted so as to be rotatably pivoted or shifted about pin 25. A rod 26 (see FIGURE 1) exterior to the base frame is connected rigidly to pin 25 and provided with a stop handle 27. Handle 27 extends sufficiently below the top surface of the cross beams of the base frame so that it abuts against the side of rear beam 28 when the apparatus is in braked position. In such position, telescoping plungers 21 and their friction pads 22 extend downwardly below the bottom of casters 20 and support the apparatus against movement. Handle 27 may be shifted toward base frame beam 29 to recess the telescoping plungers 21 within the tubular braces 23 (see FIGURES 1 and 4), and allow the apparatus to be supported on the casters 20 for mobility.

It will be observed that handle 27 will abut against the side of base beam 29 when it is shifted toward that beam; therefore, the sides of beams 28 and 29 serve as stops for the movement of handle 27, and simultaneously serve as stops for the extent of rotation permitted plate 25.

With handle 27 in position abutting against beam 28, each of the connecting points 30 for rods 31 within each hollow base beam of the base frame are slightly beyond the point at which they would be in closest proximity to the outer ends of the base frame beams. In essence, they are off center with respect to the center location within each hollow base beam. Each rod 31 extends through a base beam toward the outer portion thereof, and is connected to the upper part of an upright arm 32 of a crank 33 located in each base beam (see FIGURE 4). Each crank 33 is mounted on its respective shaft 34 firmly fixed between the side walls of each base beam near the outer end thereof. Further, each crank 33 pivots on a shaft 34 during braking and unbraking of the support frame. Rigidly connected to arm 32 of crank 33 is arm 35; and the end of arm 35 is forked with one fork 36 disposed above a cross pin 37 within plunger 21 and the other arm 38 below the cross pin 37. Cross pin 37 is lodged rigidly transversely within plunger 21.

In operation, movement of handle 27 toward beam 29 serves to rotate plate 24 approximately one-fourth of a full revolution; and this in turn draws connecting rods 31 toward the crossing point or center of the base beams, thereby pulling arms 32 in each base beam toward the crossing point and raising arms 35 upwardly. As arms 35 progress upwardly, cross pins 37 within plungers 21 are contacted by the lower fingers 38 of arms 35; and this action effects elevation of plungers 21 within tubular braces 23. The net result is that the plungers are recessed upwardly and the base frame of the apparatus is allowed to rest upon casters 20, permitting free rolling movement of the apparatus.

It should be observed at this point that the base frame has a forwardly projecting member 40 which is equipped with a capped tubular upward projection 41 at its outer end and immediately above the tubular brace 23 for the plunger 21 of that member 40. This capped tubular projection 41 may serve as a recessing element for the upper portion of plunger 21 when the braking means for the apparatus is released. Similar recesses for plungers 21 are provided in the upper collar attachments 39 above each of the other base beams; but this recess feature is not essential inasmuch as the full operation of the plunger may be contained below the upper extremity of the base beams.

Toward the rear portion of the base frame are supported two upright standards 11 and 42 for the two essentially-horizontal supporting arms 12 and 43 of the apparatus. As illustrated in the drawing, uprights 11 and 42 may extend upwardly directly from the outer portions of beams 44 of the base frame; but alternatively other specific means may be employed for supporting these upright standards from the rear portion of the base frame. The uprights are preferably tubular in character, at least in their upper extremity; and they are free of any brace therebetween at their upper extremity. This is for the reason that each is independently adjustable in height so as to be collapsible to a certain extent and also so as to permit ready adjustment of horizontal arms to different elevations. However, uprights 11 and 42 may be provided with a brace 45 extending therebetween at a level up to about 4 or 5 feet above the carriage; and from brace 45 a further brace 46 may extend to the rearmost base frame beam 28 of the apparatus. These braces may be of distinctly different design than that illustrated. They are for the purpose of lending rigidity to the uprights 11 and 42.

Instead of the upright standards extending as rigid pieces directly to the essentially horizontal supporting arms 12 and 43, provision is made for adjusting their height and therefore the height of the supporting arms 12 and 43. As illustrated in FIGURE 2, this is conveniently accomplished by employing a top or upper upright standard member 47 which is adapted to telescope slidably within a tubular bottom or lower upright member 48. A lock nut 49 or a detent or other suitable means may be employed for locking the upper and lower sections of the upright rigidly in position. As illustrated in FIGURE 2, however, a separate lock nut 50 is also useful for this purpose. However, lock nut 50 is carried on a collar or abutment sleeve 51; and when lock nut 50 is firmly secured against the internally telescoping upper portion 47 of the upright and lock nut 49 released, swivel movement of the upper portion 47 of the upright (and the horizontal arm on it) is permitted. Preferably, therefore, the upper portion 47 of each upright is rounded or circular in cross section, with a metal tube being preferred for strength with reduced weight (over a solid rod). Swivel movement is essential in the case of a patient undertaking advanced rehabilitation training. On the other hand, lock nut 49 may frequently be used to lock the upper portion of the standard and the essentially-horizontal support arm carried on it against swivel movement, particularly where an extremely weak patient is just beginning therapeutic exercise work.

The essentially horizontal supporting arms 12 and 43 at the upper extremity of each upright standard, as well as the associated elements of each, are in fundamental respects substantially identical. Each is mounted to the upper end of an upright; and while a swivel mounting may be employed at the juncture between the upright and essentially horizontal supporting arm, it is preferable to fixedly mount the supporting arm to a laterally displaced portion 58 of the upper extremity of an upright, and inwardly of the upright. In this manner, each supporting arm is displaced toward the other in relationship to the upright on which each is mounted. This permits a patient whose arm is in a sling to exercise a greater range of reaching movement than would be possible where the horizontal arms are mounted directly in line above the upright standards.

Each essentially horizontally supporting arm 12 and 43 is adapted to be collapsed, at least in the sense that the cantilevered end thereof may be placed in a storage position more compact than the horizontal arm is when it is in upright position. As illustrated in FIGURE 7, the cantilevered forward end 18 of the horizontal arm is telescoped within the back or rear end portion 52. Along the side of the forward arm 18, which preferably is of square tubular shape as also is the back or rear portion 52 of the horizontal arm, extends a slot. Within this slot is entrained a pin 53 which extends from one side to the other of the essentially square tubular member 52. As shown in FIGURE 7, the forward cantilevered end 18 of the arm may be withdrawn from its telescoped position within rear arm member 52, and then allowed to fall downwardly to assume the position 54 illustrated by the dash lines in FIGURE 7. Observe that a portion of the

bottom surface of square tubular member **52** is broken away to permit the forward cantilevered end member **18** to assume the position **54** illustrated in FIGURE 7.

Each horizontal supporting arm is equipped with at least two pulleys **15** and **55**, preferably four pulleys **15**, **55**, **56** and **57** (see FIGURE 1). Two of the pulleys, for example **15** and **55** are deposed toward one side wall of the horizontal arm; and the other two pulleys toward the opposite side wall of the horizontal arm. In this manner, a forward and rear pulley constitutes a pair and each pair is displaced laterally to the other. Thus less chance exists for binding by ropes extending through the hollow horizontal arm and entrained over the pulleys carried on that arm. An opening on the bottom side of the essentially-square tubular arm is provided for the connecting line entrained over the pulleys. In the illustrated embodiment, the pulleys are recessed within the tubular member of the horizontal arm, and are carried on shafts located horizontally and transversely to the length of the horizontal arm.

Carried at the rear extremity or back portion of each horizontal arm, rearwardly to the connection of the arm to an upright, is a resistance means. As illustrated in the drawing, particularly FIGURE 5, two resistance means are preferably provided for each horizontal arm, one operable for each of the slings (for holding an individual's forearm) on the cantilevered end of the arm.

The specific resistance means selected may vary; but in the illustrated embodiment the means comprises slide rods **60** and **61** depending from the rear portion of the horizontal arm and firmly affixed thereto. Each slide rod for the resistance elements at the rear of a horizontal arm is connected to an abutment plate **62** at its lower extremity. Nuts **59** secure the abutment plate in place. Between rods **60** and **61** is an upper horizontal brace **63** and a vertical guide brace **64**, the latter extending substantially the length of the slide rods **60** and **61** to, and just through, a central hole in the abutment plate **62**. On each slide rod **60** and **61** is mounted a slideable collar **65** and **66**, each collar being adapted to ride slidably up and down the length of the slide rod about which it is located. Projecting outwardly from the lower end of each collar and then upwardly is a weight holder rod **67** and **68**. Weights **71** are shown in broken lines on both of these holder rods in FIGURE 5; and the weights **71** on these rods may be removed and placed upon storage rods **69** and **70** mounted upon brace **46**.

At the upper end of each slidable collar **65** and **66** (see FIGURES 5 and 6) is affixed guide pieces **72** and **73** extend cooperatively about a portion (suitably one-third the diameter) of guide brace rod **64**, and are freely slidable thereagainst. The function of the bifurcated end or the fingers of guide pieces **72** and **73** is simply to maintain the weight holding rods **67** and **68** in laterally deposed positions so that they will not bump against each other during operation of the device. Alternatively, square slide rods **60** and **61** may be used for this purpose.

Off each guide piece **72** and **73** (or off each slidable collar **65** and **66**) is an ear **74** and **75** having a hole therein for the reception of one end of a spring **76** (see FIGURE 5), if a spring resistance function is desired. When spring **76** is considered unnecessary, it may be removed from the hole in ear **75** (or from the hole of ear **74**), and allowed to hang freely in the position illustrated by the spring **77**. Spring **77** is suspended from ring **78**, the latter being affixed to the abutment plate **62**. While possibly not readily apparent from the drawing, spring **76** is also affixed to ring **78** at one end and the other end it is connected to ear **75** of guide piece **73**.

Also affixed to guide pieces **72** and **73** are ear members **79** and **80** (opposite the ears **74** and **75** for reception of the spring resistance elements). Ears **79** and **80** are also each provided with a hole through which hooks **81** and **82** may be placed. From each hook extends a rope or other flexible connecting line **14** and **83** upwardly over its respective pulley element **55** or **57** in the horizontal arm, and then over its respective pulley at the cantilevered end of the arm to its respective depending freely swinging means **16** or **84** for affixing sling **17** or **85**. If desired, hook **81** or **82** may be removed from ear **79** or **80**, and spring **76** hooked directly to either hook **81** or hook **82** carried on a connecting line **14** or **83**. In this manner the weight of the slidable collars **65** and **66** is removed and the resistance limited to the spring means.

As aforenoted, the essentially-horizontal supporting arms **12** and **43**, as well as the elements in association therewith, are essentially similar.

In operation, this apparatus is rolled behind a patient needing assistance and positioned with the forward beam **40** of the base of the apparatus underneath a chair in which the patient is seated. Alternatively, if the patient is able and desires to stand, he may straddle the forward beam **40** with his legs. Then the height of the support arms **12** and **43** is adjusted (by means of the elements illustrated in FIGURE 2) to place the slings on the horizontal supporting arms **12** and **43** (suitably both being in cantilevered position) at the proper level for the patient. Next, the left arm of the patient is, for example, placed through both slings **85** and **17**, and the right arm placed through the slings off the right horizontal supporting arm extended in cantilevered position. Illustratively the upper part of the left arm of the patient would be supported by sling **85** and the left forearm of the patient supported by sling **17**. Alternatively, only the forearm or upper arm of the patient may be passed through and supported by a sling, depending on the assistance needed by the patient. Resistance elements (e.g., weights or springs or both) are, of course, added as needed for appropriate support of the slung limbs of the patient.

As so supported, the patient finds it possible to perform tasks with his arms as aforenoted, which would not be possible without the assistance provided by this apparatus. At the same time the recovery of the patient is accelerated since the interest of the tasks enhances emotional well-being and prompts movements which might otherwise not be made, or made only with reluctance and despair.

What is claimed is as follows:

**1.** Apparatus for aiding the support of weak limbs during thereapeutic exercise movement of the same, said apparatus being mobile and adapted to be moved into a position behind an upright individual whose forearms require said aid, the essential features of said apparatus, comprising, in combination, (1) a carriage comprising a base frame, having a forwardly extending portion sufficiently low for clearance underneath the seat of a chair for an adult, (2) at least one upright standard supported from the rear portion of said base frame, (3) an essentially horizontal supporting arm mounted at the upper terminus of said upright standard, with the forward end of said arm cantilevered in a general direction over the forwardly extending portion of said base frame, pivot joint means rendering a substantial portion of the cantilevered end of said arm adjustable from said operative essentially horizontal position to an inoperative collapsed position, (4) resistance means adjustable to provide varying degrees of resistance carried on the back end of said arm near its mounting to said standard, (5) a flexible connecting line extending from said resistance means toward the outer cantilevered end of said arm over guide means carried on said arm to a downwardly freely suspended terminal position, (6) means to adjust the height of said supporting arm, (7) means to permit free swivel movement of said supporting arm in the horizontal plane of its location, and (8) means to lock said supporting arm against said swivel movement.

**2.** Apparatus for aiding the support of weak limbs during therapeutic exercise movement of the same, said apparatus being mobile and adapted to be moved into a position behind an upright individual whose arms require said aid, the essential features of said apparatus,

comprising, in combination, (1) a carriage comprising a base frame having a forwardly extending portion sufficiently low for clearance underneath the seat of a chair for an adult, (2) two upright standards supported from the rear portion of said base frame, (3) an essentially horizontal supporting arm mounted at the upper terminus of each said upright standard, with the forward end of said each arm cantilevered in a general direction over the forwardly extending portion of said base frame, means to adjust a substantial portion of the cantilevered end of each said arm from said operative essentially horizontal position to an inoperative collapsed position, (4) resistance means adjustable to provide varying degrees of resistance carried on the back end of each said arm near its mounting to said standard, (5) a flexible connecting line extending from each respective resistance means carried on each said arm toward the outer cantilevered end thereof over guide means carried on said arm to a downwardly freely suspended terminal position, (6) sling means at said terminal position, (7) means to adjust the height of each said supporting arm, (8) means to permit free swivel movement of each said supporting arm in the horizontal plane of its location, and (9) means to lock each said supporting arm against said swivel movement.

3. The apparatus of claim 2 wherein the resistance means includes a slide rod on which is slidably carried means for holding various weights.

4. Apparatus for aiding the support of weak limbs during therapeutic exercise movement of the same, said apparatus being mobile and adapted to be moved into a position behind an upright individual whose arms require said aid, the essential features of said apparatus, comprising, in combination, (1) a carriage comprising a base frame, casters supporting said base frame, and brake means for said carriage, said base frame having a forwardly extending portion sufficiently low for clearance underneath the seat of a chair for an adult, (2) two upright standards supported from the rear portion of said base frame, each of said standards being adjustable in height, (3) an essentially horizontal supporting arm mounted at the upper terminus of each said upright standard and displaced laterally from each said standard toward the arm on the opposite standard, the forward end of each said arm being cantilevered in a general direction over the forwardly extending portion of said base frame, means to adjust a substantial portion of the cantilevered end of each said arm from said operative essentially horizontal position to an inoperative collapsed position, (4) resistance means adjustable to provide varying degrees of resistance carried on the back end of each said arm behind its mounting to said standard, each said resistance means including spring means adapted to provide said resistance, (5) a flexible connecting line extending from each respective resistance means carried on each said arm toward the outer cantilevered end thereof over guide means carried on said arm to a downwardly freely suspended terminal position, (6) sling means at said terminal position, (7) means to firmly fix the height of each said supporting arm, (8) means to permit free swivel movement of each said supporting arm in the horizontal plane of its location, and (9) means to lock each said supporting arm against said swivel movement.

5. A mobile carriage assembly capable of being braked against movement, said carriage assembly being useful for supporting a superstructure so that the superstructure may be moved about and also braked in position against movement, comprising a base frame having beams disposed from a central portion, casters supporting said base frame, said casters being located toward the outer end of said beams, brake means for said carriage, said brake means comprising plungers having friction-surfaced ends capable of elevating said carriage and supporting it and its superstructure in said elevated condition, said plungers being mounted near the location of said casters on said base beams to depend downwardly from said base beams and be movable slidably in an essentially vertical direction, crank means adapted to act upon said plungers to slidably elevate and lower the same, one of said crank means being mounted on each said base beam near the location of a plunger, a pivotable plate carried on a shaft within the central portion of said carriage, a connecting rod extending from said plate to each said crank means, and handle means connected to said plate for pivoting the same between one position causing the connection to said crank means to elevate said plungers and an opposite position causing said connection to said crank means to lower said plungers and brake said carriage against movement, said braked position being such as to remove the support for said carriage from said casters.

6. A mobile carriage assembly capable of being braked against movement, comprising a base frame, casters supporting said base frame, and brake means, said brake means comprising plungers having friction-surfaced ends capable of elevating said base frame and supporting it in said elevated condition with support removed from said casters, said plungers being mounted near the location of said casters on said base frame to depend downwardly from said base frame and be movable slidably in an essentially vertical direction, shiftable means adapted to act upon said plungers to slidably elevate and lower the same, pivotable means carried on said base frame in a position horizontally displaced from said shiftable means, said pivotable means being pivotable about a vertical axis, means extending horizontally from said pivotable means to said shiftable means and adapted to transfer motion from said pivotable means to said shiftable means, and handle means for pivoting said pivotable means between one position causing elevation of said plungers and another position causing lowering of said plungers to brake said carriage against movement.

7. Apparatus for aiding the support of weak limbs during therapeutic exercise movement of the same, said apparatus being mobile and adapted to be moved into a position behind an upright individual whose arms require said aid, the essential features of said apparatus, comprising, in combination, (1) a carriage comprising a base frame, (2) at least one upright standard supported from said base frame, (3) at least one essentially horizontal supporting arm mounted at the upper terminus of said upright standard, with the forward end of said arm cantilevered outwardly from said upright standard, pivot joint means rendering a substantial portion of the cantilevered end of said arm adjustable from said operative essentially horizontal position to an inoperative collapsed position, (4) resistance means mounted on said apparatus, said resistance means being adjustable to provide varying degrees of resistance as determined by an operator, (5) a flexible connecting line extending from said resistance means toward the forward cantilevered end of said arm over guide means carried on said arm to a downwardly freely suspended terminal position, and (6) means to adjust the height of said supporting arm.

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W. R. BROWNE, *Assistant Examiner.*

# UNITED STATES PATENT OFFICE

# CERTIFICATE OF CORRECTION

Patent No. 3,373,993 March 19, 1968

Carl W. Oja et al.

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 5, line 49, "guide pieces" should read -- a guide piece --; line 50, "73 extend" should read -- 73. The fingers of each guide piece extend --; line 68, after "and" insert -- at --.

Signed and sealed this 2nd day of December 1969.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents