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E. C. STUCKENSCHNEIDER ET AL

3,528,653

ROWING MACHINE AND BRAKE UNIT THEREFOR

Filed Oct. 13, 1967

3 Sheets-Sheet 1

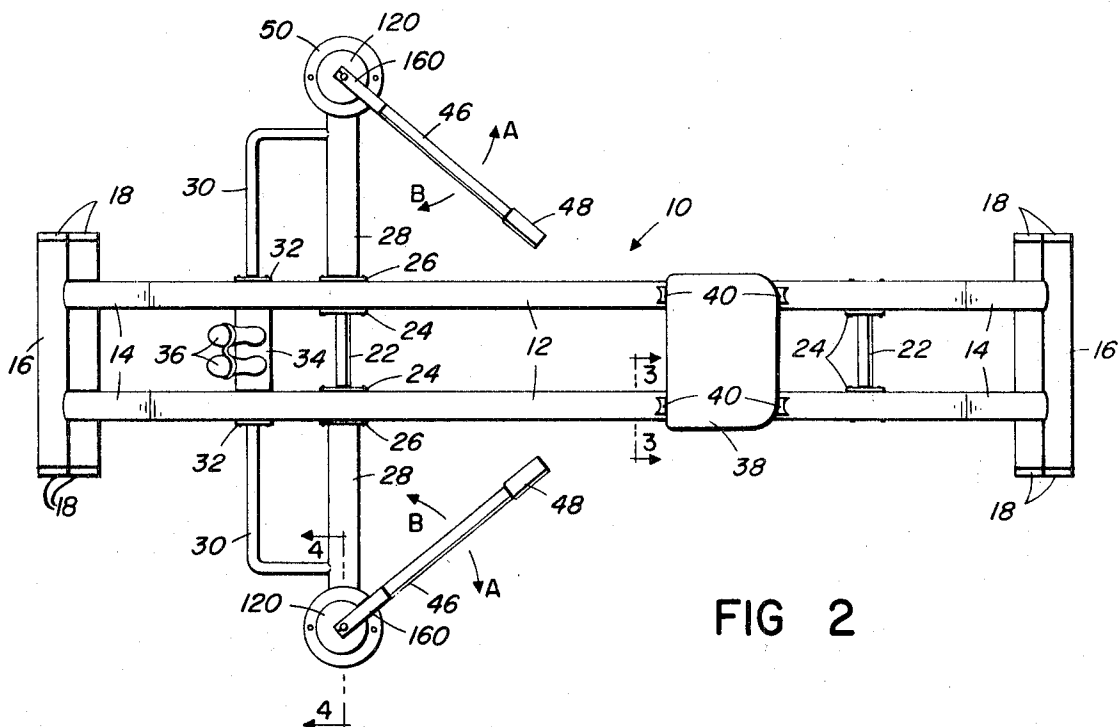
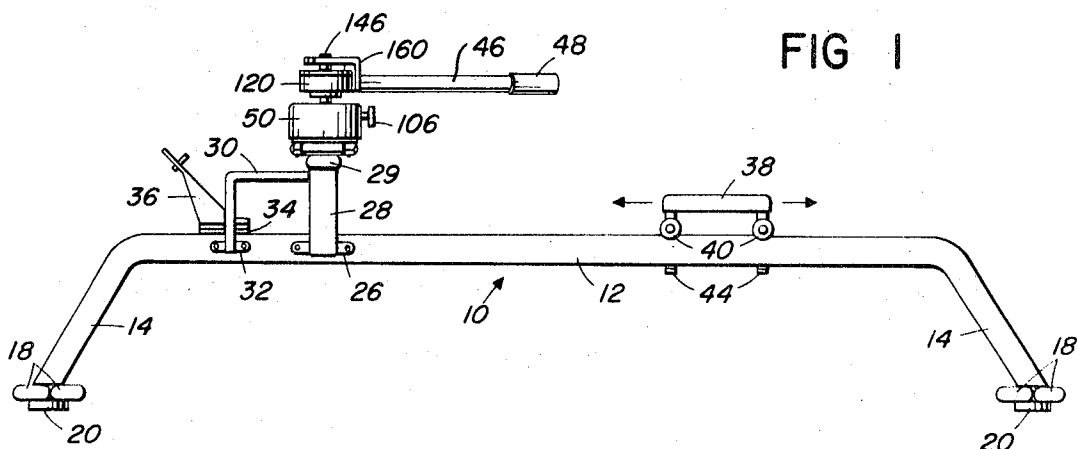


FIG 2

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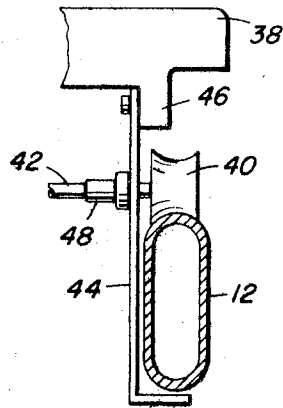


FIG 3

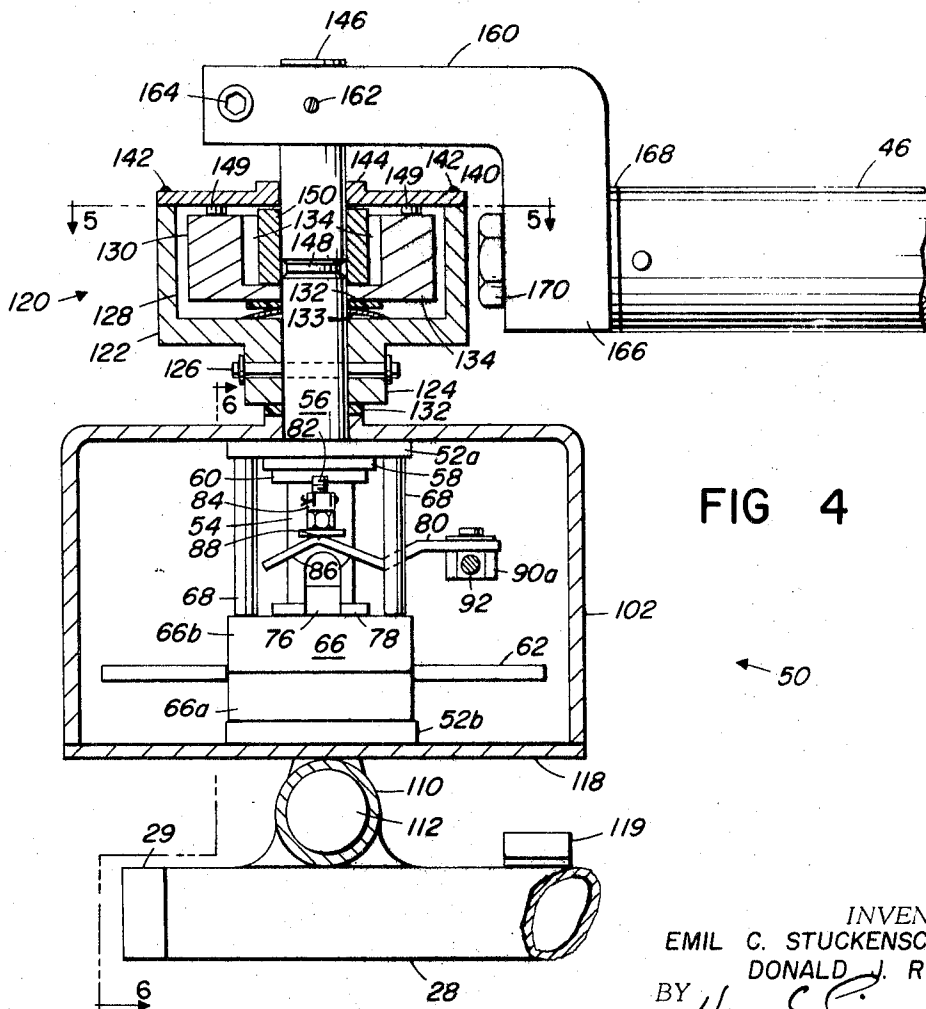


FIG 4

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3 Sheets-Sheet 3

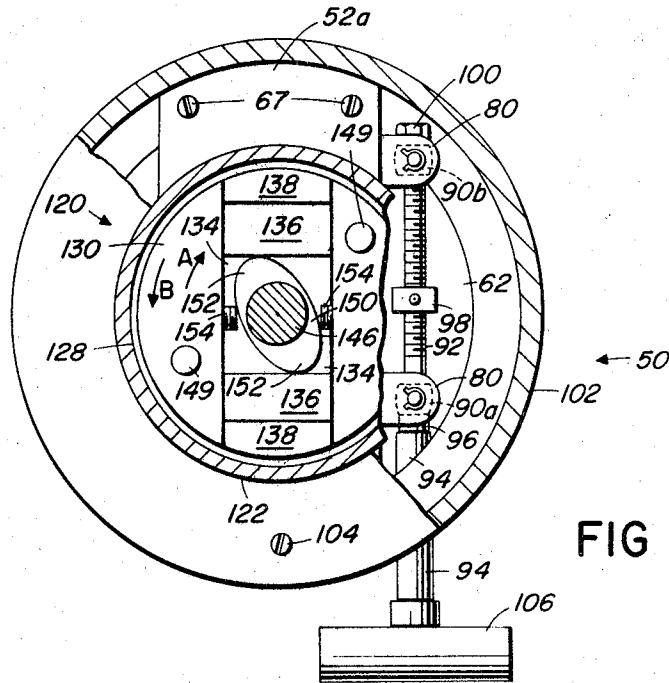


FIG 5

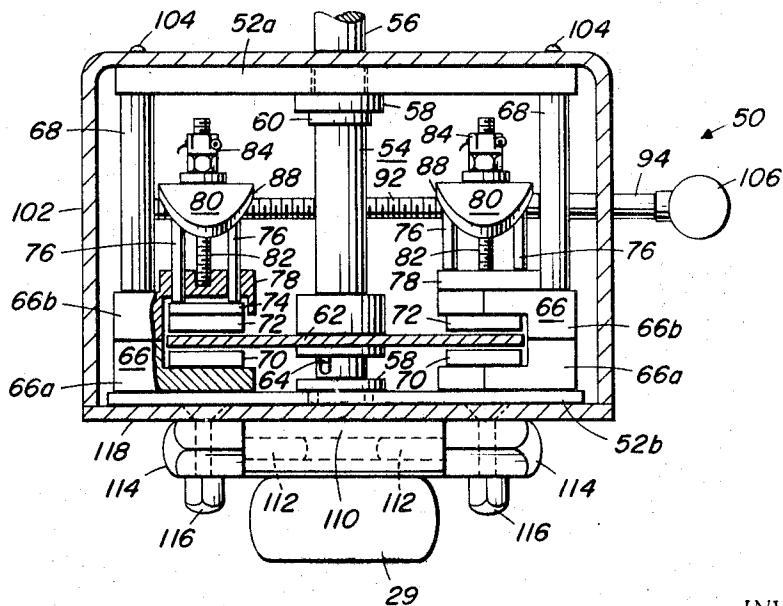


FIG 6

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ROWING MACHINE AND BRAKE UNIT THEREFOR

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5 Claims

ABSTRACT OF THE DISCLOSURE

An exerciser of the rowing type. One of the chief features is the fabrication of a non-hydraulic brake assembly for each oar as a self-contained unit separate from other mechanism which causes the brake assemblies to offer resistance only in one direction of oar movement. The latter mechanisms are also formed as self-contained units which are readily added to the brake units. In the preferred form of the invention each self-contained brake unit is of the caliper-disc type. To one end of the brake disc shaft is fitted one of the separate, self-contained unidirectional mechanisms to which in turn is attached one of the oars. Each of the latter mechanisms is preferably in the form of a silent, one-way frictional clutch which locks the oar to the brake disc shaft when the oar is pulled but releases it when the oar is pushed. The brake unit, because it is a separate self-contained unit, is readily adaptable to other forms of exercise equipment employing frictional apparatus.

BACKGROUND OF THE INVENTION

Resistance units employed in rowing machines have usually been chiefly of two types. Either they are of hydraulic or of dry, frictional nature. The hydraulic types encounter many problems such as fluid leakage, wear and sensitivity to adjustment; indeed, many can be adjusted so that the oars are for all practical purposes locked to the exerciser, whence extreme efforts to move the oars regardless often result in undue strain or damage to the apparatus. The dry, frictional types tend to be of relatively crude nature, often employing metal to metal contact whose mutual resistance is varied by a simple screw. Problems of rapid wear, noise and uneven performance abound. Furthermore, the dry frictional types almost invariably incorporate as an integral part thereof various kinds of ratchet mechanisms, sprag clutches and other similar devices to achieve unidirectional rotative resistance. Such mechanisms also tend to be noisy, and to require lubrication if excessive wear is to be avoided. Finally, neither type is suitable for application to other forms of exercisers, such as wrist circumductors, pronator-supinators and rolls, wrestling and shoulder wheels, arm machines and the like, which must offer resistance in both rotative directions. Instead, typically other and distinct frictional devices are used for these purposes and are usually even more crude in nature than those used for rowing machines. It is therefore the chief object of the present invention to reduce the foregoing deficiencies and particularly to devise a frictional mechanism which is suitable not only for rowing machines but for other exercising apparatus as well.

SUMMARY OF THE INVENTION

Basically, the present invention consists of providing each oar of a rowing machine with two separate, self-contained units, one a brake unit and the other a unidirectional clutch unit which may be readily attached or detached from the brake unit. In its preferred form, each brake unit employs a brake disc on a brake shaft and a

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pair of brake calipers adjustably engageable with the disc in order to provide the degree of resistance required. To each brake shaft in turn is removably attached the separate unidirectional clutch unit, the outer end of one of the two oars being secured to the latter. The clutch unit preferably employs an outer drum which is fixed to and rotates with the brake shaft. An inner shoe carrier fits within the drum and is rotatable with respect thereto, having a pair of frictional elements radially movable to engage the drum and lock the latter and the carrier to each other. The frictional elements are activated by means of a suitable cam formed on one end of a stub shaft to whose other end is fixed the outer end of one of the oars. When the oar is pulled, rotation of the cam both locks the stub shaft to the carrier and forces the frictional elements into engagement with the drum, thus causing the latter and the brake shaft fixed thereto to rotate against the frictional drag of the brake calipers on the brake disc. When the oar is pushed, on the other hand, the cam releases the frictional elements and permits the carrier to rotate with the oar independently of the drum and thus the brake unit. Since the brake and clutch units are separate, the brake unit alone is thus readily adaptable to other forms of exercise equipment which do not require a unidirectional clutch or other similar mechanism. At the same time, the brake and clutch are both quiet, require no lubrication and experience very little wear.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a rowing machine according to the present invention.

FIG. 2 is a top plan view of the rowing machine of FIG. 1.

FIG. 3 is a detail cross-sectional view taken along the lines 3—3 of FIG. 2.

FIG. 4 is a vertical cross-sectional view taken along the line 4—4 of FIG. 2 and illustrating the brake and clutch units for the left hand oar.

FIG. 5 is a sectioned top view of the clutch unit taken along the line 5—5 of FIG. 4, certain portions being further broken away.

FIG. 6 is a vertical sectional view of the brake unit alone and its mounting taken along the line 6—6 of FIG. 4 at a right angle to the view of the latter figure.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIGS. 1—3 illustrate a rowing machine employing a base assembly 10 fabricated essentially of flattened oval tubing, as best indicated in FIG. 3. The base assembly 10 principally comprises two longitudinal frame members 12, identical to each other and disposed in parallel spaced side-by-side relation. The respective ends of frames 12 are downwardly bent to provide supporting legs 14, those at each end being joined by transverse feet 16, each of which is formed of two short lengths of similar tubing welded side-to-side. The open ends of feet 16 are closed by end plugs 18 and their under faces are equipped with floor pads 20. The frame members 12 are further braced to each other by a pair of cross tubes 22 fitted with end plates 24 bolted to the inner opposed faces of frame members 12 somewhat inwardly from their forward and after ends. The same bolts which secure the end plates 24 of the forward cross tube 22 also secure a pair of end plates 26 to the outer faces of frame members 12 to which are fixed the inner ends of a pair of curved outriggers 28, also of flattened oval tubing, which extend first laterally outwardly and then upwardly above the upper level of frame members 12. The outer ends of outriggers 28 are closed by end plugs 29 and support the oar operating assemblies shortly to be described. The outriggers 28 are further fixed longitudinally of base 10 by means of tubular braces 30,

welded at their outer ends to the forward edges of outriggers 28, extending first forwardly therefrom and then cranked inboard, the inner ends being fitted with end plates 32 bolted to the outer faces of frame members 12 forward of end plates 24. The same bolts which secure end plates 32 also secure a platform 34 between the opposite inner faces of frame members 12 which carries a pair of fixed, inclined foot rests 36 of typical nature. The portions of frame members 12 aft of outriggers 28 support a traveling seat 38 of conventional nature carried upon two pairs of wheels 40 suitably journaled on a pair of axles 42 carried in turn between two pairs of depending strap plates 44 secured at their upper ends to bosses 46 below each corner of seat 38. The axles 42 are held against rotation by means of a pair of bushings 48 fixed both to axles 42 and to plates 44, and the periphery of each wheel 40 is formed concave in order to accord with the curvature of the frame members 12, as shown in FIG. 3. The latter thus serve as a kind of track for the seat 38, and in order to assure that the latter does not accidentally become derailed as it were, the plates 44 are extended downwardly closely along the inner faces of frame members 12, their lower ends being cranked outwardly in close spaced relation therebelow.

As mentioned, each oar operating assembly comprises two independent, self-contained units, a brake assembly and a unidirectional clutch assembly to which the outer ends of the oars 46, of tubular nature and fitted with wooden handles 48, are attached, the latter extending inboardly in conventional fashion. Each brake unit 50 incorporates a pair of horizontal, upper and lower frame plates 52a and 52b, respectively, of generally rectangular shape, which are centrally bored to receive a vertical brake shaft 54 having an upper extension 56 through the upper plate 52a. A pair of flanged nylon bushings 58 provide suitable bearings for shaft 54 in plates 52a and 52b and a snap ring 60 locates shaft 54 against upward axial movement. Just above the lower plate 52b a suitable brake disc 62 is fixed to shaft 54 by a key 64 for driven rotation thereby, and a pair of opposed brake calipers 66, which lie on the ends of the lower plate 52b on opposite sides of shaft 54, envelope the opposite faces of disc 62 in the usual fashion. The two plates 52a and 52b and the calipers 66 are rigidly tied together by two pairs of long screws, one pair of which is shown at 67 in FIG. 5, down through the ends of the top plate 52a and threadedly into the lower plate 52b through two pairs of tubular columns 68 disposed between the upper faces of calipers 66 and the lower face of the top plate 52a. Each brake caliper 66 is essentially conventional in structure and comprises a horizontally split casting, the lower half 66a carrying a lower fixed brake pad 70 and the upper half 66b an upper movable brake pad 72 below a brake shoe 74, the latter and pad 72 being axially movable in a suitable bore in the upper caliper half 66b.

Each movable pad 72 is activated by a pair of vertical dowel pins 76 which float in vertical bores in a boss 78 integral with the upper half 66b of its caliper 66. The upper ends of the dowel pins 76 are rounded and those of each caliper 66 are engaged by a horizontal cam lever 80 which swivels adjacent its inner end on a fixed vertical stud 82 between each pair of dowel pins 76 threaded into its respective boss 78. The two cam levers 80 are disposed initially in parallel spaced relation to each other and each is adjustably maintained on its stud 82 by means of a suitable washer and lock nut assembly 84. The swiveled inner end of each lever 80 is broadened and formed to provide a pair of ramps 86 on its under face which slope equally downwardly from an upper apex 88 transversely of lever 80 through which the stud 82 passes and which overlies the upper ends of dowel pins 76. The lock nut assembly 84 is adjusted so that when the upper ends of the dowel pins 76 seat in the apex 88 there is no force exerted upon the dowel pins 76, but when the lever 80 is horizontally rotated in either direction, each dowel pin

76 is engaged by one of the ramps 86 and forced downwardly, thus urging the movable brake pad 72 associated therewith into progressive engagement with the brake disc 62 and the latter in turn into engagement with the associated fixed brake pad 70. For this purpose, the key 64 is designed so as to permit some downward axial movement of disc 62 on shaft 64. The outer ends of cam levers 80 are fitted with a pair of vertically pivoted swivel blocks 90a and 90b, the latter only of which is fully shown in FIG. 4, each having a horizontal bore therethrough, that of the latter block 90b only being internally threaded. A horizontal hand screw 92, provided with an outer sleeve 94, is formed with an exposed threaded portion which threadedly engages the bore in block 90b and an exposed non-threaded portion which freely turns in the bore in block 90a, the inner end of sleeve 94 abutting the outboard face of block 90a through a nylon washer 96. Thus when the hand screw 92 is turned in one direction the two cam levers 80 swing progressively toward each other, whereby the force exerted by the screw 92 is divided equally between the levers 80, their associated ramps 86, dowel pins 76 and brake pads 72. Turning the hand screw 92 in the other direction, reverses the procedure and progressively releases the pressure of pads 72 upon disc 62. It will be observed that the foregoing linkage effectively obviates inequalities in the adjustments of the lock nut assemblies 84 and in wear of the pads 70 and 72, inasmuch as the forces imposed by hand screw 92 are always necessarily equally divided between the two brake pads 72. In order to prevent overtightening of the brake calipers 66, the hand screw 92 is fitted with a fixed stop collar 98 midway between swivel blocks 90a and 90b, and a lock nut 100 on its inner end prevents disengagement of block 90b. Finally, each brake assembly 50 is enclosed in a fitted cylindrical housing 102 having a closed top through which the upper end 56 of brake shaft 54 extends and secured to the upper frame plate 52a by screws 104, the ends of frame plates 52a and 52b being appropriately radiused to fit therewithin. The hand screw 92 and its sleeve 94 are extended outside of housing 102 through a suitable aperture in its side wall and is fitted at its outer end with a T-handle 106. A self-contained, adjustable brake assembly is thereby provided which may be mounted by its lower frame plate 52b in any manner, and to whose exposed brake shaft extension 56 may be attached whatever exercising apparatus is desired.

Each brake assembly 50, when incorporated in the rowing machine described above, is secured to the outer end of its respective outrigger 28 so that it swivels about an axis generally parallel to frame members 12. For this purpose the outer end of each outrigger 28 is equipped with a transverse sleeve 110 welded thereto. Each end of the latter receives a pintle 112, formed with a hexagonal head 114, which rotates therein. The pintle heads 114 are secured by screws and acorn nuts 116 to a circular mounting plate 118 thereabove which seats on a pair of the hexagonal faces of heads 114 and overlies the sleeve 110. The mounting plate 118 in turn is suitably fixed to the lower face of frame plate 52b, and a protective rubber bumper 19 is fitted on the upper face of outrigger 28 inboard of sleeve 110 and below plate 118. The brake units 50 can thus swivel with respect to the sleeves 110 about the axis of pintles 112, and are mounted so that the T-handles 106 are disposed to the rear of the inboard sides of the brake units 50 for easy access. In order to accomplish the latter, the hand screw 92 and the swivel blocks 90a and 90b of the right hand brake unit 50 (the left hand one being illustrated) are simply reversed with respect to its cam levers 80 so that the hand screw 92 extends in the opposite direction, its housing 102 being appropriately drilled to permit sleeve 94 to protrude therefrom in the other direction, all as will be readily apparent to those skilled in the art.

The exposed extension 56 of each brake shaft 54 receives a unidirectional clutch assembly 120 which, as

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already noted, is also a self-contained unit. Each of the clutch units 120 comprises a cylindrical drum 122 open at its top and having an integral hub 124 at its bottom which is removably fixed to the shaft extension 56 by a pin 126. The inner cylindrical wall of drum 122 provides a clutch face 128 which is closely opposed by the outer face of a cylindrical clutch shoe carrier 130 disposed within the drum 122 and axially journaled on the shaft extension 56 for rotation relative thereto and to the drum 122, the upper face of carrier 130 lying somewhat below the level of the upper face of drum 122. A pair of nylon washers 132 are disposed on shaft extension 56, one between the top of brake housing 102 and the hub 124 and the other between the drum 122 and the carrier 130, the latter having therebelow an axially effective spring washer 133. The upper face of carrier 130 is also provided with a deep diametrical passage or slot 134 thereacross which opens at each end upon the clutch face 128 and into which the uppermost portion of the shaft extension 56 protrudes a short distance. A pair of clutch shoes 136, having friction pads 138 mounted to their outer radial faces, are disposed in the slot 134 and slidably movable therein radially toward and away from clutch face 128, the outer radial faces of the pads 138 being radiused to fit the clutch face 128. Pads 138 are preferably formed from a mixture including natural rubber which mixture is sufficiently hard so that the pads 138 do not unduly spread laterally and bind in the slot 134, thus impairing their release from clutch face 128.

The top of each drum 122 is closed by a removable cover plate 140 secured thereto by screws 142 and formed with an integral upper hub 144 in which is journaled a vertical stub shaft 146 concentric with shaft extension 56 and extending above the cover plate 140, its lower end abutting the shaft 56 through a thin self-lubricated washer 148. A pair of nylon plugs 149 seated in the top face of carrier 130 adjacent its periphery protrude slightly thereabove and form steady bearings against the lower face of cover plate 140 (see FIG. 4). The stub shaft 146 extends down into the slot 134 and is rotatable in its hub 144 independently of both drum 122 and brake shaft 54. The portion of stub shaft 146 in slot 134 has formed integrally therewith a cam 150 of generally elliptical shape which rotates therewith. The cam 150 is formed so that, when stub shaft 146 is rotated slightly in the direction A shown in FIG. 5, the two lobes 152 of cam 150 contact the inner radial faces of clutch shoes 136 and progressively urge the latter and friction pads 138 radially outwardly in slot 134 into engagement with the clutch face 128, rotation of the stub shaft 146 in the other direction B shown in FIG. 5 serving to release the engagement between clutch face 128 and the pads 138. As a result, rotation of the stub shaft 146 in direction A, locks it by virtue of the action of cam 150 to the carrier 130 at the same time the latter becomes frictionally locked to the drum 122 by virtue of the engagement of friction pads 138 and the clutch face 128. Hence, since the drum 122 is fixed to the extension 56 of the brake shaft 54, the stub shaft 146 thereafter can turn only against the drag of the brake pads 70 and 72 upon the brake disc 62. Yet when the stub shaft 146 is rotated in direction B, it and carrier 130 can rotate freely on the shaft extension 56 with respect to the drum 122 and the brake shaft 54 owing to the release of clutch face 128 by the friction pads 138. In order to limit the rotation of the stub shaft 146 independently of carrier 130, a pair of stops 154, in the form of adjustable set screws, are appropriately located in the opposite side walls of slot 134 as shown in FIG. 5.

The exposed upper end of the stub shaft 146 of each clutch unit 120 receives the vertically bifurcated end of a horizontal crank arm 160 fixed thereto by a set screw 162 and a pinch bolt 164, the other end of arm 160 having a downwardly cranked portion 166 outboard of drum 122. The cranked end 166 receives therethrough in turn a suitable fitting 168 on the inner end of one of the two

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oars 46 and is secured thereto by a nut 170. Since, as will be observed from the arrows associated with the oars 46 in FIG. 2, the two rotative directions A and B of clutch unit 120 on one side are opposite to those of that on the other side of base 10, the two clutch units 120 must in effect be "mirror images" of each other in order that when the oars 46 are pulled or pushed by a person seated upon the apparatus, both stub shafts 146 of the clutch units 120 are rotated in direction A or B, respectively, thus alternately causing the movement of oars 46 to be imparted to and released from the brake shaft 54. For this purpose, the only required difference between the two clutch units 120, as will be apparent to those skilled in the art, is the relative positions of their cams 150, that illustrated in FIG. 5 being the position for the left hand clutch unit 120.

A most improved rowing machine is thereby provided. The self-contained brake units 50 are quiet, exhibit little wear, require no lubrication and are easily adjusted by the hand screws 92. At the same time, owing to the stop collar 98, the cam levers can never be moved far enough so that the brake disc 62 is fully locked against rotation, thus protecting the machine against overload. The self-contained clutch units 120 are also silent, wear little, require no lubrication and can be readily attached to the brake units 50, thus enabling the latter to be employed in other apparatus, as mentioned above. Finally, it should be realized that though the invention has been described in the form of a particular embodiment, being the best mode known of carrying it out, it is not limited thereto, and that accordingly the following claims are to be read as encompassing all adaptations and modifications of the invention falling within the spirit and scope thereof.

We claim:

1. In physical fitness apparatus having a base assembly effective to support a person in rowing position thereon and a pair of oars effective to be rowingly operated at one pair of their respective ends by a person in rowing position upon said base assembly, the combination therewith of a pair of improved oar operating assemblies secured to said base assembly and to the other pair of the respective ends of said oars, each of said operating assemblies comprising: an independent, self-contained brake assembly enclosed within a housing secured to said base assembly and adjustably effective to impart resistance to rowing operation of said oars, and an independent, self-contained clutch assembly enclosed within a housing separate from and disposed exteriorly of said brake housing and operatively connected to both said brake assembly and said other end of one of said oars effective to cause said brake assembly to impart said resistance when said oar is pulled but not when said oar is pushed by a person in rowing position upon said base assembly, said clutch assembly being removably mounted as a unit to said brake assembly.

2. The combination of claim 1 wherein said clutch housing includes a wall defining an inner circular clutch face, a carrier disposed in spaced relation to said clutch face and rotatable concentrically with respect thereto, said carrier having a pair of frictional means disposed therein and movable outwardly thereof effective to frictionally engage said clutch face and lock said carrier to said housing, a clutch shaft concentric with said clutch surface and journaled for rotation in said clutch housing independently thereof, said clutch shaft extending through a wall of said housing and having said other end of one of said oars fixed thereto effective so that rowing movement of said oar causes rotation of said clutch shaft, and camming means within said clutch housing activated by rotation of said clutch shaft effective both to lock said clutch shaft to said carrier and to urge both of said clutch shoes outwardly to engage said clutch friction means and said clutch face when said oar is pulled but not when said oar is pushed by a person in rowing position upon said base assembly.

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3. The combination of claim 1 wherein each of said brake assemblies comprises a brake housing immovably secured to said base assembly, a brake shaft journaled in said housing having one end exposed through a wall of said housing, a brake disc within said housing fixed to said shaft for driven rotation thereby, a pair of brake calipers fixed relative to said housing disposed about the periphery of said disc and embracing the opposite axial faces thereof, each of said calipers having a pair of brake pads movable effective to frictionally engage and disengage said disc faces, and means to adjust the amount of frictional engagement of said disc by said pads and to maintain said pads in said adjusted engagement.

4. The combination of claim 3 wherein said clutch assembly comprises a clutch housing removably fixed to the exposed end of said brake shaft for driving rotation thereof, said clutch housing having an inner wall surface defining an inner cylindrical clutch face concentric with said shaft, a cylindrical clutch shoe carrier disposed in close concentric relation to said clutch face and rotatable about said shaft with respect to said clutch face, said shoe carrier having a diametrical passage therein opening at each end upon said clutch face, a pair of clutch shoes movable in said passage radially only of said carrier and having friction means at their outer radial ends effective to frictionally engage said clutch face upon outward radial movement of said shoes, a clutch shaft axially aligned with said brake shaft and journaled for rotation in said clutch housing independently thereof, one end of said clutch shaft extending through a wall of said housing and having said other end of one of said oars fixed thereto effective so that rowing movement of said oar causes rotation of said clutch shaft, and a cam within said clutch housing fixed to the other end of said clutch shaft effective upon rotation of said shaft both to rotate said carrier therewith and to urge both of said clutch shoes radially outward in said passage to engage said clutch friction means and said clutch face when said

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oar is pulled but not when said oar is pushed by a person in rowing position upon said base assembly.

5. The combination of claim 4 wherein said adjusting means comprises a pair of adjusting levers in said brake housing disposed in spaced side-by-side relation, said levers being rotatable adjacent one pair of their respective ends about a pair of parallel axes transversely disposed with respect to said levers, an alteration in the distance between the other pair of the respective ends of said levers being effective to cause said lever rotation, each of said levers being associated with one of said calipers and having camming means adjacent said one of said lever ends effective to move at least one of said brake pads of said brake caliper from frictional disengagement with said disc into progressively increased frictional engagement therewith upon said lever rotation, and screw means interconnecting said other lever ends effective upon rotation of said screw means to vary the distance between said other lever ends and to cause said camming means to move both pairs of said brake pads from frictional disengagement with said disc into substantially equal frictional engagement therewith, said screw means having manual operating means disposed exteriorly of said brake housing.

References Cited

UNITED STATES PATENTS

218,736	8/1879	Heenan	272—72
298,392	5/1884	Laffin	272—72
1,752,901	4/1930	Falkenburg	272—72
2,199,955	5/1940	Kruck	272—72

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272—79