March 4, 1947. A. HICKS 2,416,753

COUNTERBALANCE FOR RAMPS AND LIKE PIVOTED MEMBERS

Filed June 22, 1945 2 Sheets-Sheet 1

FIG. 1

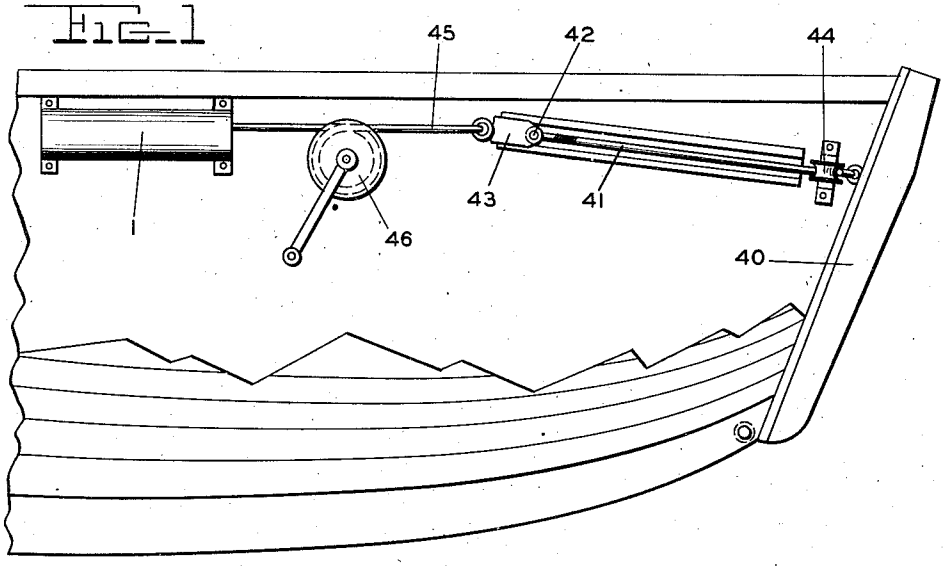


FIG. 2

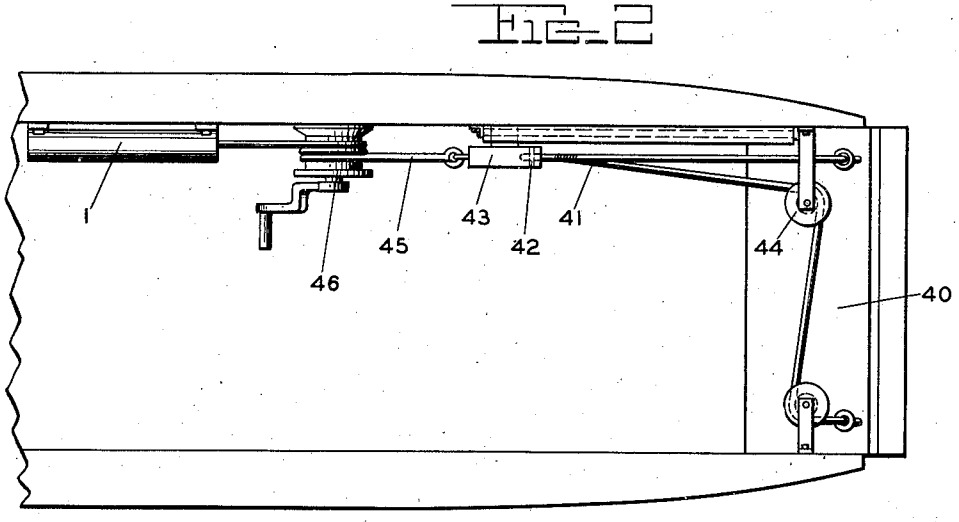
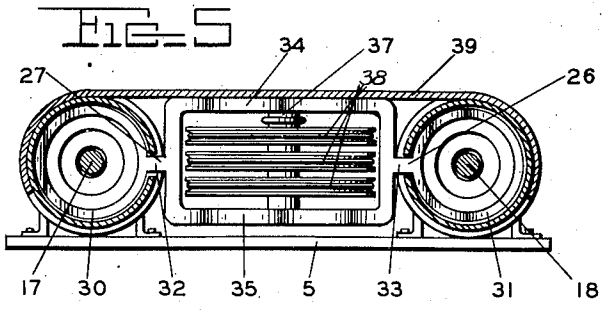


FIG. 5



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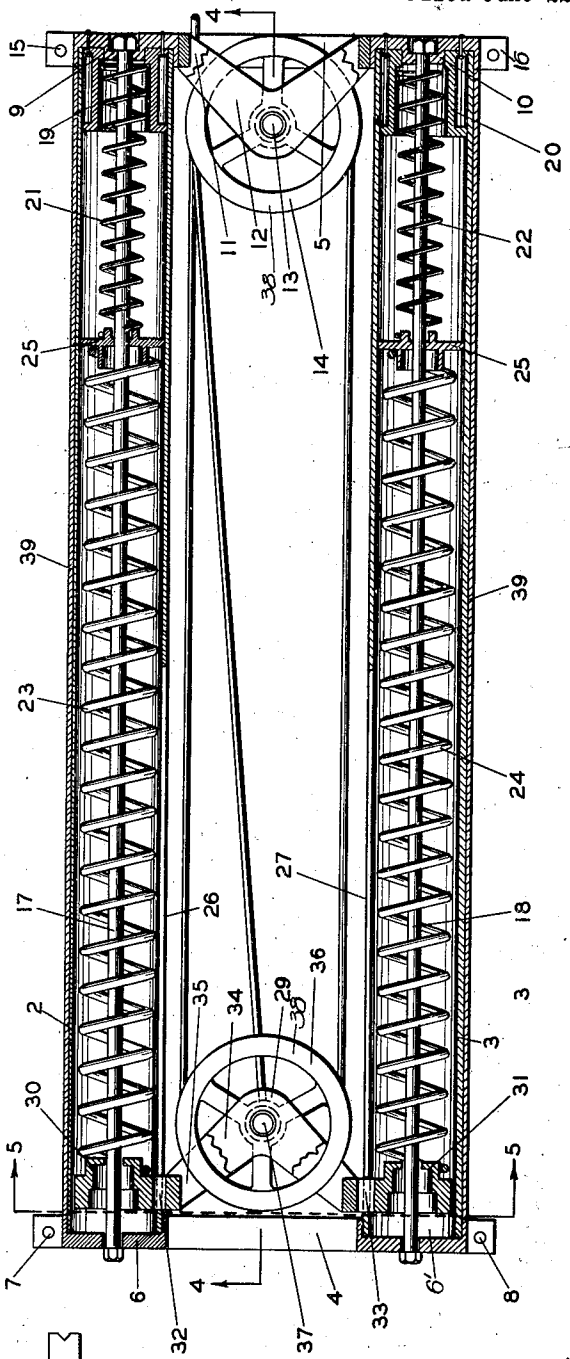


FIG. 3

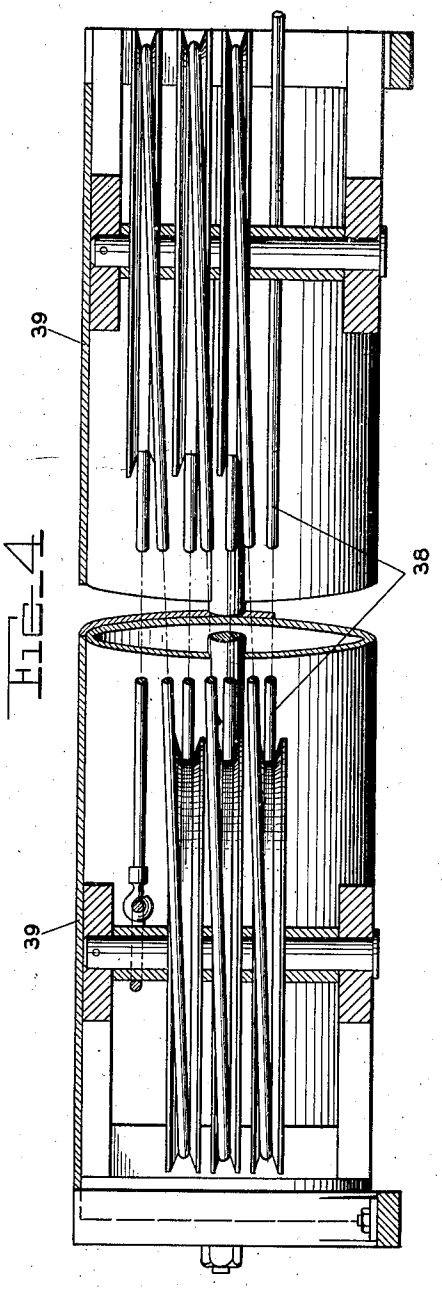


FIG. 4

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COUNTERBALANCE FOR RAMPS AND LIKE PIVOTED MEMBERS

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4 Claims. (Cl. 267—70)

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This invention relates to a spring counterbalance so associated with a horizontally pivoted member which swings gravitationally away from an upright position, as to yield to the weight of said member on the downward phase of its swing, but to sustain a part of the weight of said member on its upward phase of swing so as to make it easier for an operator to pull said member to its upright position.

Such a counterbalance has many useful applications, but is here disclosed and described in connection with the ramp of a landing boat. Such craft customarily are provided with a bow ramp for disembarking mechanized equipment, etc., upon a beach, horizontally pivoted to the craft at the bottom and normally held in substantially upright position by a cable, just enough off balance so that it falls outward and descends by gravity when the cable is payed out, until it rests upon the beach. Since the ramp is quite heavy, in the absence of a counterbalance to sustain part of the weight, the hauling up of the ramp is a relatively laborious and slow operation. Since it is generally expedient to leave the shore as soon as possible after landing, for making quick return trips, the counterbalance is an important adjunct to the operation of the ramp.

Counterbalances have been used in this relationship, consisting of a strong spring so arranged as to be compressed by the gravitational descent of the ramp, thus storing up potential energy which is expended in assisting to lift the ramp while it is being drawn up by the cable.

For reasons to be explained, it is desirable that the counterbalances be effective quite to the limit of upward swing of the ramp, but where solely a strong spring is employed, this is impracticable, for the vertical component of gravity acting to lower the ramp when it is in its uppermost position, is so small as to be equaled or exceeded by the pressure of the strong spring, with the result that the ramp will not begin to descend by gravity, but must be given a manual push to start it.

One of the objects of the present invention is to provide a counterbalance comprising a strong spring which reaches the limit of its expansion before completion of the upward swing of the ramp, supplemented by a relatively weak spring which assists in the completion of the upward swing of the ramp.

Another object of the invention is to provide a novel and simple frame construction for supporting the movable elements of the counterbalance.

Other objects of the invention will appear as

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the following description of a preferred and practical embodiment thereof proceeds.

In the drawings:

Figure 1 is a vertical longitudinal section showing the forward portion of a landing craft with the counterbalance in operative correlation to the ramp;

Figure 2 is a plan view of Figure 1;

Figure 3 is a longitudinal section through the counterbalance;

Figure 4 is a section taken along the line 4—4 of Figure 3;

Figure 5 is a cross-section taken along the line 5—5 of Figure 4.

Referring now in detail to the drawings, the numeral 1 designates generally the counterbalance, the frame of which comprises a pair of parallel tubular spaced spring housings 2 and 3, of equal length, secured respectively by the head plates 4 and 5. The head plate 4 bridges the space between the spring housings 2 and 3 and is formed with cup-like recesses 6 and 6', receiving the adjacent ends of the housings 2 and 3. The head plate 4 is also formed with the apertured supporting lugs 7 and 8, adapting the counterbalance to be mounted on a panel.

The head plate 5 comprises recessed portions 9 and 10, which fit over the opposite ends of the spring housings 2 and 3, said portions being connected by spaced side members 11 and 12 which bridge the space between the spring housings, and have bearing apertures which support the shaft 13 of the fixed sheave 14. The head plate 5 is also provided with the apertured supporting lugs 15 and 16.

The head plates 4 and 5 are apertured coaxially with the spring housings 2 and 3, to receive the through bolts 17 and 18, having nuts at their opposite ends, and forming therewith means for holding the head plates tightly against the ends of the spring housings. The axial recesses in the head plate 5 are countersunk to receive and hold against rotation the nuts on the adjacent ends of the bolts 17 and 18, so that adjustment is made from the nuts on the opposite ends of said through bolts.

The head plate 5 is provided, within the spring housings 2 and 3, with cylindrical cups 19 and 20, in which are seated the ends of light coil springs 21 and 22, said cups being deep enough to completely contain said light coil springs when said springs are fully compressed. Strong coil springs 23 and 24 have their ends abutting the sheave carriage 29 within the respective spring housings, their opposite ends meeting the adjacent ends of

the light coil springs through suitable spring retainers 25.

The adjacent sides of the spring housings 2 and 3 are provided with slots 26 and 27, extending from a point adjacent the head plate 4, and being of such length as to allow sufficient play for the operation of the counterbalance. The sheave carriage 29 comprises a frame having perforated circular end portions 30 and 31 within the spring housings 2 and 3 resting upon the ends of the strong springs 23 and 24. Said end portions are connected by narrow necks 32 and 33, which pass through the respective slots 26 and 27, with the spaced hanger arms 34 and 35, between which the sheave 36 is positioned, mounted upon a shaft 37 journaled in said hangers.

Each sheave comprises a plurality of pulleys 38, there being three on each sheave in the embodiment illustrated, as shown in Figure 4, the pulleys of the respective sheaves being offset, as shown, so as to avoid interference by the lifting rope which extends from the sliding sheave, with the adjacent pulley on the fixed sheave. With three pulleys on each sheave, as shown, an approach of twelve inches between the pulleys will result in a travel of seventy-two inches of the lifting rope.

A cover plate 39 is shaped to snap over the curved resilient outer surface of the spring housings.

Figures 1 and 2 show the application of the counterbalance to the ramp 40 of a landing craft. The counterbalance 1 is shown mounted on the side of the boat at a distance to the rear of the ramp 40. A cable 41 passes through a pulley 42 attached to the equalizing block 43, the ends of the cable being secured to opposite sides of the ramp, as shown. One limb of the cable passes about a direction changing pulley 44. A cable 45 is attached to the equalizing block, passes several times about the winding drum 46, and then continues to the movable sheave of the counterbalance. It is then passed about the several pulleys of the counterbalance and secured to an eye on the fixed sheave. The length of the cable 45 is such that when the ramp is in its fully upright position, the springs of the counterbalance are still under some compression. When the drum is turned in an unwinding direction, the ramp descends by gravity, first compressing the light springs 21 and 22 until the latter are completely within the cups 19 and 20. During this period of descent of the ramp, the gravitational component is very small, but the spring is light and yields to said component. When the ramp has reached the position at which the light spring is fully compressed, its gravitational component is sufficiently great to overcome the strong springs. Further downward movement of the ramp, therefore, compresses the strong springs, the ends of which abut against the ends of the cups 19 and 20. When it is desired to raise the ramp, the drum 46 is turned in a clockwise direction, referring to Figure 1. Rotation of the drum is assisted by the expansion of the springs, the strong springs expanding until the ramp has almost reached its upright position. The strong springs are of such length and tension as to become fully expanded, by the time this point is reached, whereupon, the light springs then begin to expand and assist in lifting the ramp to its fully upright position.

If the light springs were omitted so that the counterbalance were not under tension during the final part of the upward swing of the ramp,

it is obvious from Figure 1 that further operation of the drum in a clockwise direction would result in slackening of the cable between the drum and counterbalance and about the pulleys of the latter, which might result in snarling of the cable on the sheaves when it is attempted to lower the ramp.

While I have in the above description disclosed a preferred and practical embodiment of the invention, it will be understood to those skilled in the art that the details of construction and arrangement of parts are capable of variation without departing from the invention.

What I claim as my invention is:

1. Counterbalance for ramps and like pivoted members comprising a frame including spaced parallel cylindrical spring housings, a head plate at each end bridging the space between said housings and forming end closures therefor, and bolts extending between said head plates securing them rigidly to said housings, spring means within each of said housings comprising a relatively strong spring of major length and a relatively weak spring of minor length, serially arranged, a fixed multiple pulley sheave between said housings journaled in one of said head plates, the adjacent sides of said housings having longitudinal slots therethrough in the common plane of their axes through an extent remote from said fixed sheave, a movable multiple pulley sheave between said housings, a carriage in which said movable sheave is journaled having portions extending through said slots and resting against the adjacent ends of said spring means, and a cable threaded around the pulleys of said sheaves adapted to draw said sheaves together against the tension of said springs when the load end of said cable is pulled.

2. Counterbalance for ramps and like pivoted members comprising a frame, including spaced parallel cylindrical spring housings, a head plate at each end bridging the space between said housings and forming end closures therefor and bolts extending between said head plates securing them rigidly to said housings, spring means within each of said housings comprising a relatively strong spring of major length and a relatively weak spring of minor length, serially connected, having a spring aliner between their adjacent ends with portions fitting into each, a fixed multiple pulley sheave between said housings journaled in one of said head plates, the adjacent sides of said housings having longitudinal slots therethrough in the common plane of their axes through an extent remote from said fixed sheave, a movable multiple pulley sheave between said housings, a carriage in which said movable sheave is journaled having portions extending through said slots and resting against the adjacent ends of said spring means, and a cable threaded around the pulleys of said sheaves adapted to draw said sheaves together against the tension of said springs when the load end of said cable is pulled.

3. Counterbalance for ramps and like pivoted members comprising a frame, including spaced parallel cylindrical spring housings, a head plate at each end bridging the space between said housings and forming end closures therefor, and bolts extending between said head plates securing them rigidly to said housings, one of said head plates being provided with cups within said housings, spring means within each of said housings comprising a relatively strong spring of major length and a relatively weak spring of

minor length, serially arranged, with the end of said relatively weak spring seated in said cup, the latter being of a depth to contain said relatively weak spring when fully compressed, a fixed multiple pulley sheave between said housings journaled in one of said head plates, the adjacent sides of said housings having longitudinal slots therethrough in the common plane of their axes through an extent remote from said fixed sheave, a movable multiple pulley sheave between said housings, a carriage in which said movable sheave is journaled having portions extending through said slots and resting against the adjacent ends of said spring means, and a cable threaded around the pulleys of said sheaves adapted to draw said sheaves together against the tension of said springs when the load end of said cable is pulled.

4. Counterbalance comprising a frame including spaced parallel cylindrical spring housings, a head plate at each end bridging the space between said housings and forming end closures therefor, and means securing said head plates rigidly to said housings, one of said head plates being provided with cups within said housings, spring means within each of said housings comprising a relatively strong coil spring of major length and a relatively weak coil spring of minor length, serially arranged, an alining disk against which the adjacent ends of said relatively strong and relatively weak spring abut, said disc having portions fitting within each spring, the opposite end of said relatively weak spring being seated

within said cup, the latter being of a depth to contain said relatively weak spring, with said disk seated on the end of said cup, when said relatively weak spring is fully compressed, a fixed multiple pulley sheave between said housings journaled in one of said head plates, the adjacent sides of said housings having longitudinal slots therethrough in the common plane of their axes through an extent remote from said fixed sheave, a movable multiple pulley sheave between said housings, a carriage in which said movable sheave is journaled having portions extending through said slots and resting against the adjacent ends of said spring means, and a cable threaded around the periphery of said sheaves adapted to draw said sheaves together against the tension of said spring when the load end of said cable is pulled.

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