April 4, 1939. W. W. NASH 2,152,969

BALANCER

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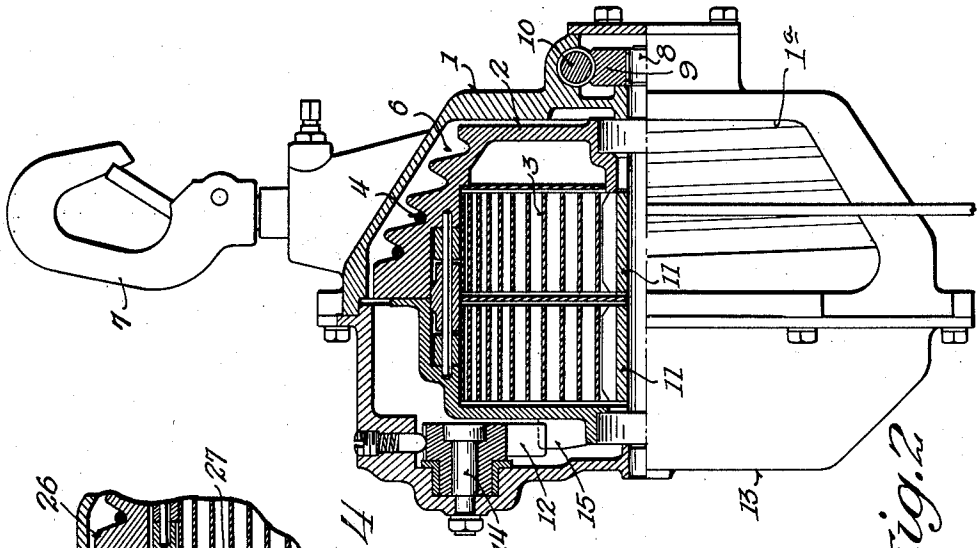


Fig. 2

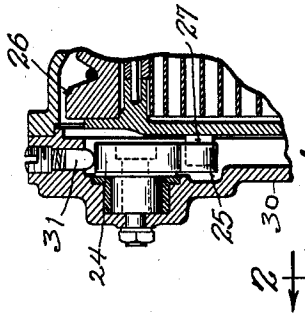


Fig. 4

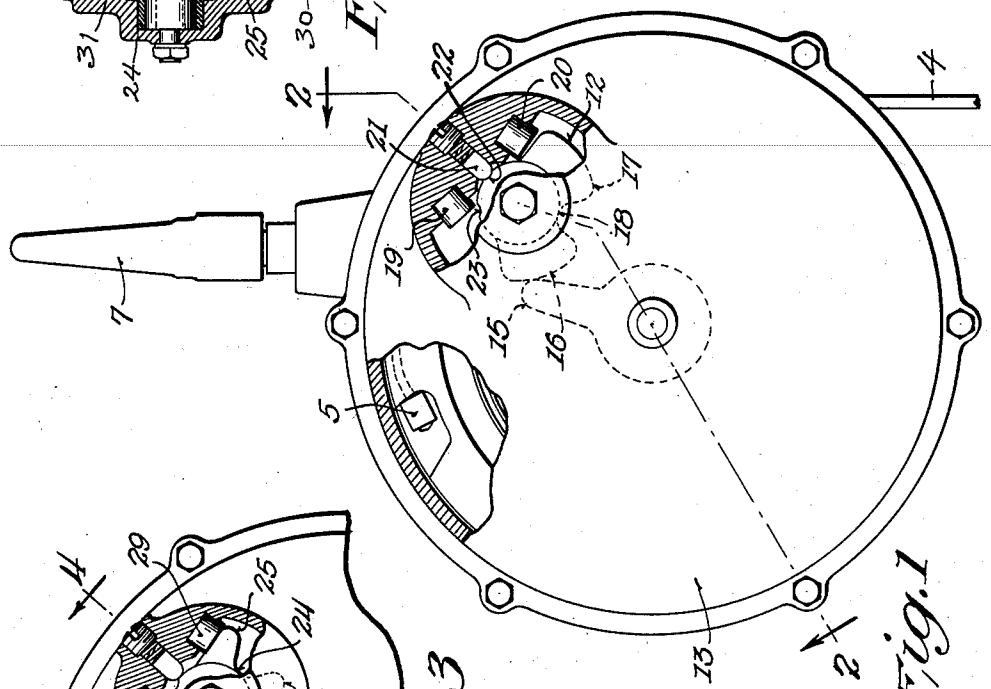


Fig. 1

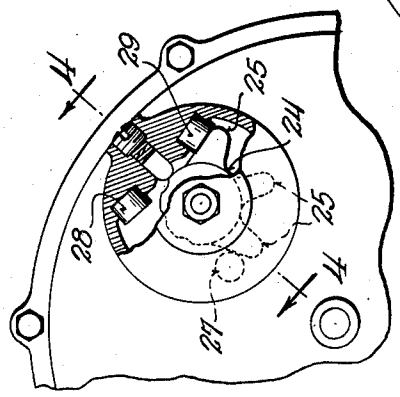


Fig. 3

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BALANCER

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7 Claims. (Cl. 242—107)

This invention relates to balancers and more particularly to spring counterbalances for suspending portable power operated tools such as drills, hammers, nut and screw setters and the like from overhead supports.

The principal purpose and object of my invention is to provide a two-way stop device for such balancers to automatically limit the rotation of the balancer drum or reel to a predetermined number of revolutions in opposite directions to prevent the drum making a larger number of revolutions than necessary in either direction to avoid straining of the drum spring in a winding-up direction when lifting a tool and over-tensioning of the drum spring in an unwinding direction when drawing the tool down to the place of work.

In carrying out the objects of my invention I provide co-acting means on the drum and the balancer housing which means functions on the rotation of the drum to stop the rotation of the drum after a predetermined number of revolutions in each direction and thus limit the travel of the cable on and off of the drum.

A further object of my invention is to provide one of the members of the stop device in the form of a rotative element mounted on the balancer housing and engageable alternately with said housing to limit the travel of the cable by stopping the rotation of the drum.

A further object of the invention is to provide the drum with an abutment or other projection to actuate the rotative member to turn it from one terminal position to the other in the rotation of the drum.

A further object of the invention is to employ resilient means to cushion the contact of the rotative member with the balancer housing and thus relieve the parts of shock when the rotative member stops the rotation of the drum.

The invention consists further in the features hereinafter described and claimed.

In the accompanying drawing—

Fig. 1 is an elevational view with parts broken away and in section, respectively, of a spring counterbalance embodying the two-way stop device of my invention;

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is a view showing a modified form of the stop device; and

Fig. 4 is a sectional view taken on line 4—4 of Fig. 3.

In the drawing, 1 indicates the balancer housing, 2 indicates the rotatable reel or drum, and 3 indicates the spiral spring assembly located in the drum for turning it in a direction to wind up the cable 4 on the drum. The inner end of the cable is attached to the drum as at 5. This connection is made at the larger end of the drum in the terminal convolution of the spiral groove 6 provided in the peripheral portion of the drum for the cable. Said portion is tapered as shown.

The cable extends out of and below the housing 1 through an opening 1a therein (shown in Fig. 2) and has its outer end equipped with a hook (not shown), by which the tool or other load to be lifted by the cable is attached thereto. The balancer has a hook 7 on the top side of the housing 1 and by which hook the balancer is suspended from an overhead support. The springs 3 are wound up to the tension desired through a shaft 8 journaled in the housing 1 and which shaft also provides a rotative support for the drum.

The spring tensioning means comprises a worm gear 9 keyed to the shaft 8 and a worm 10 rotatably mounted in the housing 1 at one side of the drum. The worm 10 meshes with the worm gear 9 and has one end arbored for engagement by a turning crank or other hand tool for adjusting the tension of the springs. The worm gear provides a check to hold the springs in tension. The inner ends of the springs 3 are anchored to sleeves 11, 11, one for each spring, and keyed to the shaft 8 as in devices of this character. The outer end of each spring is anchored to the drum in any desired manner.

The stop mechanism of my invention comprises a member 12 rotatably mounted in the balancer housing on the cover 13 by a stud 14. The latter is clamped to the cover 13 and is interconnected at its inner end with the member 12 for holding said member in operative position with respect to an actuating element 15 on the drum.

The rotative member 12 is in the from of a gear sector having in the instance shown a pair of equally spaced gear teeth in the form of spoke-like projections 16, 17 between which is a recess 18 to receive the radial lug 15 on the adjacent side of the drum casing. The member 12 is turned with the drum in the rotation thereof to alternately bring the teeth or spokes 16 and 17 against their respective stops 19, 20 on the balancer case cover. These stops are on opposite sides of the stud 14 and are preferably made of resilient material such as rubber, to cushion the contact of the element 12 with the drum housing 1. A spring pressed plunger 21 co-operates with notches 22, 23 in the member 12 to hold the latter against accidental rotation and thus keep the

member 12 in position for the lug 15 to act thereon in the rotation of the drum.

The construction shown is designed to restrict the rotation of the drum to two revolutions in each direction. This in the balancer shown limits the cable travel to approximately four feet. When the cable is wound up on the drum, that is, wound up to the extent to which the spring tension turns the drum to hold the load raised, the spoke 16 is against its stop 19 and further rotation of the drum in a winding-up direction is prevented. Hence, the drum is prevented from making a larger number of revolutions than necessary in a winding-up direction and straining of the drum springs is guarded against. It is essential in these balancer constructions to guard against winding up the last few layers of the springs otherwise an undue strain is placed on the springs and breakage occurs putting the balancer out of commission and requiring the installation of a new spring.

When the cable is unwound from the drum as when the tool attached to the cable is pulled down to the place of use, the lug 15 turns the member 12. In the first revolution the member 12 is turned by the lug 15 meshing with the recess 18 and on the next revolution the spoke 17 is brought into contact with its cushion 20. This stops the rotation of the drum in an unwinding direction and the cable can not be pulled out farther than necessary to lower the tool to the place of work. In stopping the drum, the cushions relieve the parts of shock and jar as the operator in raising and lowering the tool may cause the drum to rotate rapidly. This may occur in a lifting action by quickly releasing the spring action and allowing the tool to be lifted without restraint by the drum. In a lowering action, the operator may pull the tool down rapidly. In either case, the stop device functions, and both the spring means and the anchorage of the cable to the drum are relieved of undue strain.

The two-way stop shown in Figs. 3 and 4 provides for three revolutions of the drum before stopping its rotation. In this form the cable has a travel of approximately six feet. This form of stop is preferably employed for a balancer in which the drum has a single spring and which balancer has a capacity for lighter loads than the double spring type of Figs. 1 and 2.

The stop device in Figs. 3 and 4 comprises gear sector 24 the same as before except that this element has a larger number of gear teeth or spokes than in the previous construction. In the embodiment shown, the element 24 has three equally spaced gear teeth 25 and the drum 26 carries a laterally extending cylindrical lug 27 on its side adjacent the member 24. The lug 27 meshes with the teeth 25 in the rotation of the drum and rotates the member 24 to bring its end or terminal teeth alternately against stops 28, 29 carried by the balancer housing cover 30 as shown. The stops 28, 29 are resilient and cushion the contact of the member 24 with the balancer housing when stopping the rotation of the drum. The device is also equipped with a spring pressed plunger 31 and co-operating notches 22', 23' similar to the structure disclosed in Figs. 1 and 2.

It is to be understood, of course, that the rotative element may make direct contact with the balancer housing. This type of construction would be employed in the very smallest sizes of balancers which have the lightest load carrying capacity. The shocks in these latter forms are not particularly severe and thus cushions are not required as in the larger sizes of balancers. The smaller balancers sell for less than the larger ones and to reduce the manufacturing costs the cushions are omitted. The cable travel in these smaller balancers may be approximately six feet. The drum under these conditions will be limited to four revolutions.

The details of construction and arrangement of parts shown and described may be variously changed and modified without departing from the spirit and scope of my invention, except as pointed out in the annexed claims.

I claim as my invention:

1. In a balancer of the character described, a housing, a drum journaled in said housing and rotatable in opposite directions, a cable windable on the drum, a spring tension for turning the drum in a direction to wind up the cable on the drum, a gear sector rotatably mounted in the housing adjacent to the drum and having a number of gear teeth, means carried by the drum and engageable with said teeth for turning the gear sector on the rotation of the drum, and stops in the housing on opposite sides of the axis of the gear sector to be alternately engaged by the terminal teeth thereof for limiting the rotation of the drum to a predetermined number of revolutions in each direction.

2. In a balancer of the character described, a housing, a drum journaled in said housing and rotatable in opposite directions, a cable windable on the drum, a spring tension for turning the drum in a direction to wind up the cable on the drum, a gear sector rotatably mounted in the housing adjacent to the drum and having a number of gear teeth, means carried by the drum and engageable with said teeth for turning the gear sector on the rotation of the drum, stops in the housing on opposite sides of the axis of the gear sector to be alternately engaged by the terminal teeth thereof for limiting the rotation of the drum to a predetermined number of revolutions in each direction, and resilient means for cushioning the contact of the sector with the stops.

3. In a balancer of the character described, a housing, a drum journaled in said housing and rotatable in opposite directions, a cable windable on the drum, a spring tension for turning the drum in a direction to wind up the cable on the drum, a gear sector rotatably mounted in the housing adjacent to the drum and having a number of gear teeth, means carried by the drum and engageable with said teeth for turning the gear sector on the rotation of the drum, and stops in the housing on opposite sides of the axis of the gear sector to be alternately engaged by the terminal teeth thereof to limit the rotation of the drum to a predetermined number of revolutions in each direction, the number of teeth of the gear sector equaling the number of revolutions to which the drum is limited by the gear sector.

4. In a balancer of the character described, a housing, a drum journaled in said housing and rotatable in opposite directions, a cable windable on the drum, a spring tension for turning the drum in a direction to wind up the cable on the drum, a gear sector rotatably mounted in the housing adjacent to the drum and having a number of gear teeth, means carried by the drum and engageable with said teeth for turning the gear sector on the rotation of the drum, stops in the housing on opposite sides of the axis of the gear sector to be alternately engaged by the terminal teeth of the gear sector to limit the rotation of the drum to a predetermined number of revolutions

in each direction, and a spring detent co-acting with the gear sector for holding it against accidental rotation.

5. In a balancer of the character described, a housing, a drum journaled in said housing and rotatable in opposite directions, a cable windable on the drum, a spring tension for turning the drum in a direction to wind up the cable on the drum, a gear sector rotatably mounted in the housing at one side of the drum and having a number of gear teeth disposed towards the axis of the drum, a projection carried by the drum on its side adjacent the gear sector and engageable with the teeth thereof for turning the gear sector on the rotation of the drum, and stops carried by the housing on opposite sides of the sector axis to be alternately engaged by the terminal teeth of the gear sector for limiting the rotation of the drum to a predetermined number of revolutions in each direction.

6. In a balancer of the character described, a drum rotatable in opposite directions, a housing enclosing the drum and having connected body and cover sections, the cover sector being disposed at one side of the drum, a cable windable on the drum, a spring tension disposed within the drum for turning the same in a direction to wind up the cable on the drum, a gear sector mounted within the housing on the cover section and having a number of gear teeth, means carried by the drum at its side adjacent the cover section and engageable with the gear teeth of the gear sector for turning the same on the rotation of the drum, and stops carried by the cover section on opposite sides of the sector axis to be alternately engaged by the terminal teeth of the gear sector to limit the rotation of the drum to a predetermined number of revolutions in each direction.

7. In a balancer of the character described, a drum rotatable in opposite directions, a housing enclosing the drum, a cable windable on the drum, a spring tension for turning the drum in a direction to wind up the cable on the drum, a gear sector mounted within the housing at one side of the drum and having gear teeth disposed toward the axis of the drum, means carried by the drum and engageable with said gear teeth for turning the gear sector on the rotation of the drum, and stops carried by the housing on opposite sides of the sector axis to be alternately engaged by the terminal teeth of the gear sector for limiting the rotation of the drum to a predetermined number of revolutions in each direction, said stops constituting resilient elements carried by the housing to cushion the contact of the sector therewith.

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