United States Patent [19]

Huber

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[54] STRAP ADJUSTER DEVICES

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[73] Assignee: **Eastern Rotorcraft Corporation**, Doylestown, Pa.

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[52] **U.S. Cl.** **254/164,** 74/142

[51] **Int. Cl.** **A63b 21/04**

[58] **Field of Search** 254/163, 164, 167; 74/142

[56] **References Cited**

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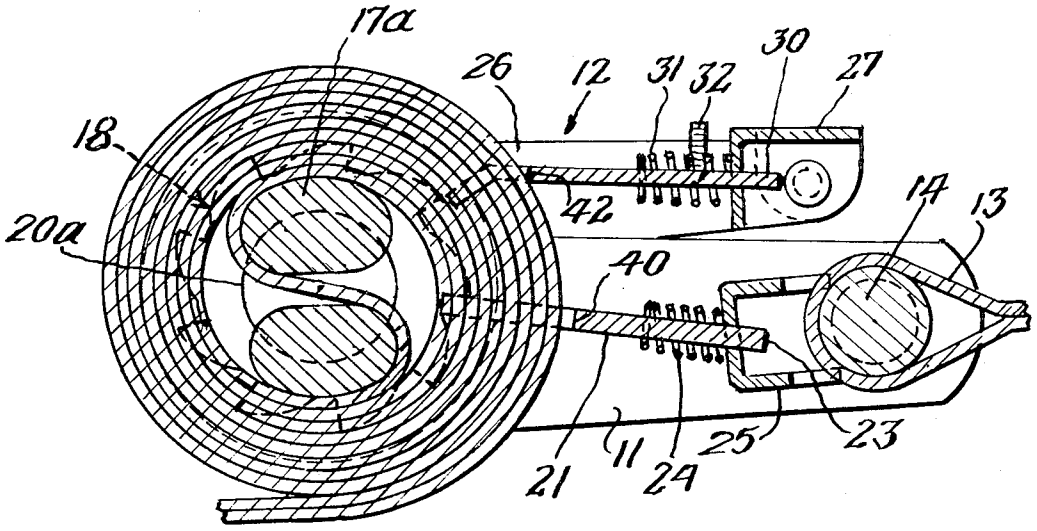
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Assistant Examiner—Merle F. Maffei
Attorney—Harris S. Campbell

[57] **ABSTRACT**

A strap adjusting and tensioning assembly includes a frame or body portion carrying a drum for holding the adjusted portion of the strap. Ratchet wheels are connected to the drum and a holding pawl member is mounted in the frame and is engageable with the ratchet teeth. A movable handle having a second pawl member mounted thereon is supported on the body for movement therewith. The handle pawl is formed with a portion which engages the wrapped strap when the strap is wrapped up to give a predetermined diameter after take up by movement of the handle. The frame pawl is shaped to be clear of the wrapped strap surface to provide a condition where the wrapped strap diameter causes the handle pawl to disengage from the ratchet teeth while the frame pawl member remains in holding engagement with the teeth.

1 Claim, 6 Drawing Figures



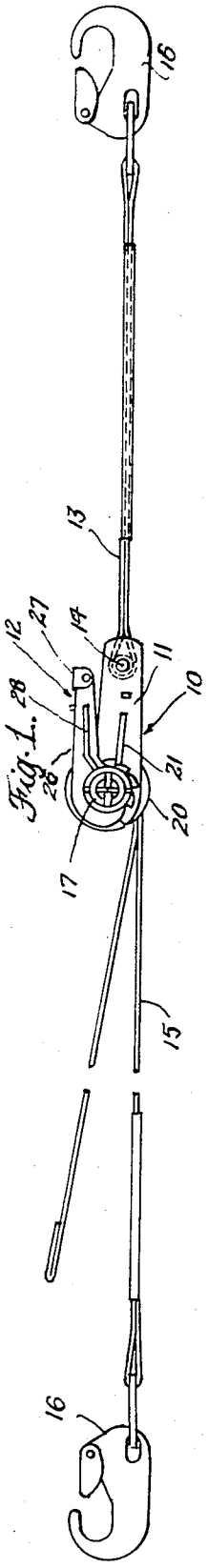


Fig. 1.

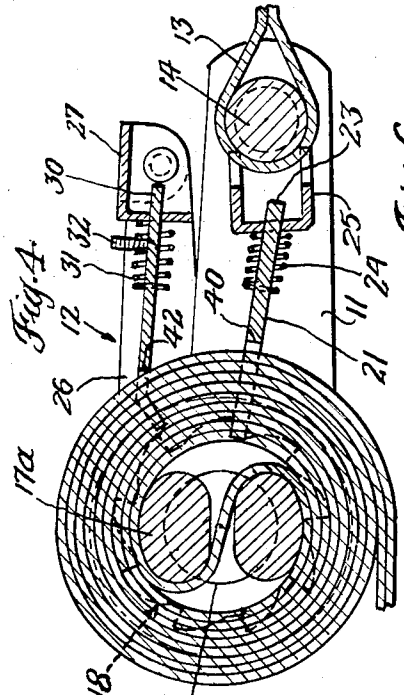


Fig. 4.

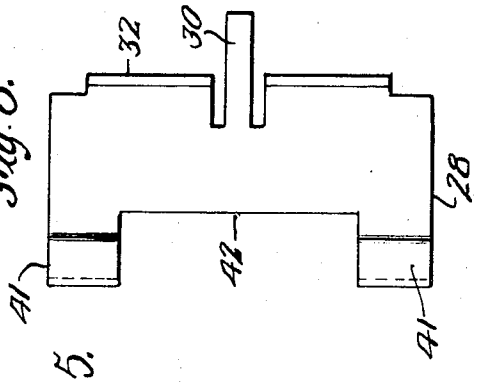


Fig. 6.

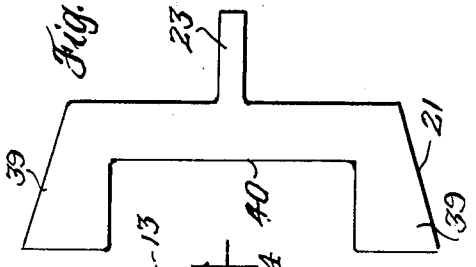


Fig. 5.

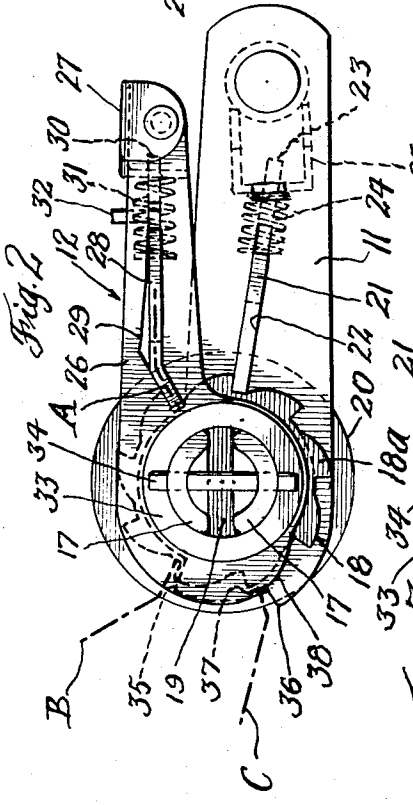


Fig. 2.

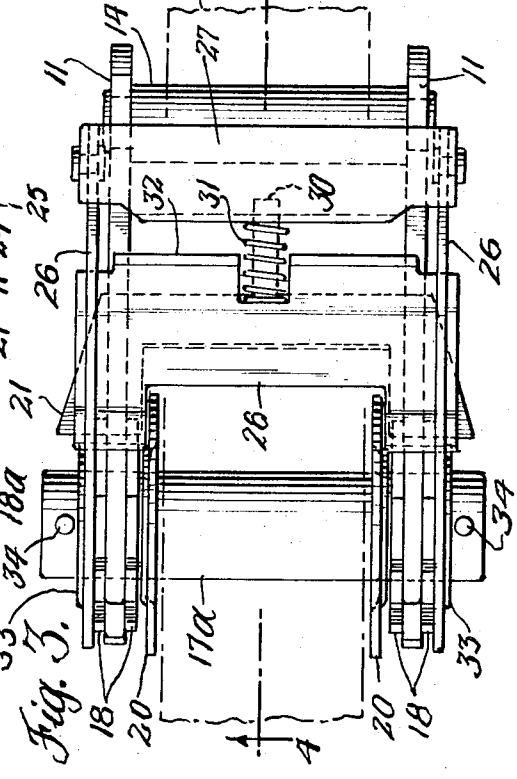


Fig. 3.

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STRAP ADJUSTER DEVICES

BACKGROUND OF THE INVENTION

This invention relates to strap holding devices and is more particularly concerned with improvements in strap devices utilizing a ratchet type mechanism for slack take-up and tensioning.

An example of the general construction of a strap device of this nature is shown in applicant's U.S. Pat. No. 3.180,623, where tensioning is accomplished by handle movement causing rotation of the ratchet device to wrap up the excess strap around a drum, With this prior construction an unskilled operator can wrap excess strap on the drum to an extent that it can contact the holding pawl to cause partial disengagement from the ratchet teeth. Thus the strap device may not be able to transmit its rated load and an inadvertent release may result. The present construction precludes this condition by proportioning the handle adjustment pawl and the frame holding pawl to cause the handle pawl to be disengaged from the ratchet teeth by the excess strap wrap up on the drum before the holding pawl is lifted from its holding position.

In some prior constructions a limit to the diameter of the wrapped webbing was provided by placing a fixed bar across the frame. This could cause a jamming action due to the operator trying to continue to take-up the webbing after it engaged the bar with consequent difficulty in releasing the strap.

SUMMARY OF THE INVENTION

The present construction includes the particular geometric relationship of the adjusting pawl member and the holding pawl member which provides longer legs on the holding pawl member than on the adjusting pawl member. This construction has as its object the provision of a device having improved operating characteristics and increased safety because it prevents the possibility of slippage of the holding pawl under load due to improper adjustment. Excessive strap take up is prevented and if the handle wrap up operation reaches its limit before proper tensioning in the device has been accomplished, the operator is alerted to the need for releasing the mechanism and starting the take up from a shortened strap position so that less wrap up of the strap is needed to accomplished the desired tension.

Combined with this safety pawl throwout is a previously used releasing feature wherein the handle may be moved to an extreme position beyond the normal operating range of movement. When moved to this position the cam shape of the handle acts to release the holding pawl to allow unwrapping the strap. A notch is provided in the frame at this extreme position to hold the handle pawl so that the handle will stay in this position thus leaving both hands available for releasing and unwinding the strap. This feature combined with the limited wrap feature provides for easy release of the strap even from maximum diameter wrapped position.

BRIEF DESCRIPTION OF THE DRAWING

How the objects are accomplished will be clear from the drawings in which

FIG. 1 is an elevational view of a complete strap tiedown assembly which incorporates the present invention.

FIG. 2 is an elevational view to an enlarged scale of the adjustable buckle unit of the tiedown.

FIG. 3 is a plan view of the buckle of FIG. 2.

FIG. 4 is a sectional elevation taken along the line 4—4 FIG. 3 showing the strap in wrapped adjusted position.

FIG. 5 is a plan view showing the shape of the frame mounted holding pawl.

FIG. 6 is a plan view showing the shape of the handle mounted pawl.

DESCRIPTION OF THE PREFERRED EMBODIMENT:

Referring to FIG. 1 there is shown a buckle assembly **10** which includes the frame plates **11** and the handle assembly **12**. A fixed length strap **13** is attached to the frame plates **11** by cross member **14** and an adjustable strap **15** is attached to the frame plates **11** through the adjustment mechanism which will be described later. Terminal hooks **16** at each end of the strap members provide for attachment of the tiedown to anchor rings or other suitable attachment elements.

The detail construction of the adjustable buckle mechanism will be more clearly understood by reference to FIGS 2 and 3. Here it will be seen that the frame plates **11** are spaced apart a distance to accommodate the width of the webbing being used. A split drum structure consists of two arcuate sections **17**. The side plates **11** of the frame have suitable circular openings to fit over the arcuate sectors **17**. Each ratchet wheel **18**, one of which is located at each side of each frame plate **11**, is shaped with a circular opening to fit around the surface of the arcuate drum shape. Each ratchet wheel **18** is further constructed with a bar **19** across the circular opening to fit between the pair of arcuate members **17** and retain them in proper spaced relationship. Thus the ratchet wheels **18** and the arcuate shaped drum assembly fit each other in a fashion which assures rotation of the drum with respect to the frame plates **11** upon rotation of the ratchet wheel. This construction provides that the drum is supported at each end with space between the frame plates **11** to accommodate the width of the strap being used in the tiedown assembly. Inside the inner ratchet wheels **18**, is supported a plate washer **20** having a circular opening to fit over the trunnion ends of the drum. It will be understood that the center portion of the split drum structure lying between the washers **20, 20**, has a larger diameter than the end trunnion portions, there being a shoulder inside the washers **20** to retain the operating parts associated with the frame in proper spaced relationship. The nature of this split drum will be more clearly understood by reference to FIG. **4**, where the strap **15** is wrapped around the outer periphery of the drum, the center portion **17*a*** of which is shown by the sectioned outline. The outboard portions of the arcuate sections are reduced in dimension as will be observed by the circular opening **20*a*** in the washer **20**.

The frame plates **11** support a ratchet holding pawl **21**, suitable slots **22** being provided for this purpose. An extension **23** supports a spring **24** which in turn reacts against a cross member **25** in a fashion which causes spring loading of the pawl urging it into engaged position with the ratchet teeth **28*a***.

The handle assembly **12** includes a pair of side plates **26** which are located outboard of the outer ratchet

wheels 18 and are maintained in this spaced relationship by handle cross member 27. The handle supports a second pawl device 28, which is mounted in handle slots 29. An extension 30 supports a spring 31 which reacts against the cross member 27 to cause the pawl member 28 to be urged into engagement with the ratchet teeth 18a of the ratchet wheels 18. A flange 32 on pawl member 28 provides a convenient handle for lifting the pawl member out of engagement with the ratchet teeth when this is required during the operation of the device.

To maintain the handle and other parts in proper assembled relationship on the trunnion of the drum, a washer 33 and a pin 34 are provided at each end of the assembly.

The handle normally moves in an arc from the position A shown in FIG. 2 to position B where the pawl engages a stop 35 formed in the frame plates 11. Under certain circumstances as when it is desired to disengage the holding ratchet mechanism to release the tension in the strap, the handle can be released by disengaging pawl 28 from stop 35 and can be moved to a further position as indicated by pawl position C where a further stop 36 is provided in the side plate 11 to limit the handle movement to position C. A notch 37 is provided at this location to retain the handle in position C until released by the operator. It will be noted that the handle plate 26 is shaped with an extending cam lobe 38 which is located at the opposite side of the handle from the handle extension portion. Thus when the handle is moved to location C the cam portion 38 will engage the frame holding pawl 21 and disengage it from the ratchet teeth 18*a* to allow the drum to rotate freely in the frame.

It will be noted in FIGs. 5 and 6 that the frame holding pawl 21 has long legs 39 extending from the body of the pawl with surface 40 extending from the insides of the legs 39 to form the bottom portion of the body of the pawl. Likewise, handle mounted pawl 28 is formed with legs 41 which are shorter than the legs 39 of the holding pawl 21. Thus, surface 42 extending between the legs 41 will be closer to the center of rotation of the drum structure 17 than the surface 40 inasmuch as both the pawl legs are mounted in the same ratchet wheels. This difference in radial clearance will be seen more clearly in FIG. 4 where the diameter of the wrapped strap is engaging the surface 42 of the handle pawl 28 while the surface 40 of the pawl 21 is clear of the wrapped strap.

To operate the tiedown device, the terminal hooks are first connected into the load attachment points and the strap 15 extended over the load to be restrained with some slack in the strap 15. To remove the slack from the strap 15, the handle is moved in a counterclockwise direction from the full line closed position shown in FIG. 2 to position B. Since the handle pawl 28 drives when rotating in this direction, it turns the ratchet wheel which disengages the pawl 22 under counterclockwise rotation but engages and holds when rotation is stopped. When the handle is moved from position B back to position A it disengages and rides over the teeth as it moves in the clockwise direction. Continued oscillation of the handle between positions A and B winds up the slack strap on the drum 17 as illustrated in FIG. 4. If sufficient slack strap is wound up the diameter of the wrapped strap increases until it reaches the condition shown in FIG. 4 where the exterior surface of the strap has reached a diameter which engages the surface 42 of the handle pawl 28. It can move the handle pawl 28 so that it lifts the pawl out of engagement with the ratchet teeth 18*a*, thereby making the handle movement ineffective for further wind-up of the strap. It will be noted that at this position for the handle pawl 28 the holding pawl 21 has its surface 40 clear of the wound up strap while the pawl is engaged in its holding position with the ratchet teeth 18*a*. This construction therefore creates the condition that no further wind-up can be accomplished and thus the strap is prevented from jamming as might occur in a fixed frame contact element. In the case where the wound up strap might engage the holding pawl 21 before the handle pawl 28 the ratchet wheels could be released with consequent loss of strap tension.

In the event that the operation of the device has reached a stage shown in FIG. 4 before all the slack has been removed from strap 15, it will be necessary to release the mechanism and unwind the strap to move to a new strap position. This is done by pulling the strap through the drum parts to remove some of the excess slack so that the tightening operation can be accomplished without requiring so much wind up. To release the strap for unwinding, the handle is moved to position C by disengaging the pawl 28 from the stop 35 permitting it to rotate further into the C position. Here the pawl is restrained by stop 36 and engages the small notch 37 to hold it in this position thus leaving the operator free to use both hands in unwinding the strap. When the strap has been completely unwrapped, the handle may be disengaged from position C and moved back to position A. The strap is then pulled through the space between the arcuate portions of the drum until most of the slack has been removed and the handle is operated to rewind the slack and induce the desired tension by oscillating the handle between position A and position B.

With this improved mechanism it will be readily understood that a device having improved operating characteristics has been provided by having the operating pawl disengageable automatically before the amount of wrapped strap reaches a condition where it will jam the release operation. With the proportioning of the pawl legs as described, the amount of wrapped strap never reaches the condition where it is difficult to disengage for release of the tension or unwinding the strap.

I claim:

1. In a strap adjusting and tensioning device having a frame assembly and a handle assembly swingably supported on said frame assembly,

a. said frame assembly including,

1. a frame structure having a pair of frame side members spaced to accommodate a strap member between them,
2. a wind-up drum rotatably mounted on said side members, said drum providing for holding several wraps of strap for length adjustment and tensioning purposes,
3. a pair of ratchet wheels each having a plurality of teeth, one of which wheels is connected near each end of said drum for rotational movement

and positioned generally adjacent a side member,

4. a frame supported holding pawl member slidably movable with respect to said frame structure in a generally radial direction relative to said ratchet wheels and spring loaded to bear against the ratchet, said frame pawl member having a body section and a pair of spaced legs extending therefrom, said legs extending respectively along each of the frame slide members to engage the teeth of a ratchet wheel, and said body section spanning the strap holding portion of the wind-up drum;

b. said handle assembly including:

1. a pair of handle side members, one located adjacent each of said frame side members, said handle side members being pivotally supported for rotation about the axis of the drum,

2. A handle supported adjusting pawl member slidably movable with respect to the handle in a generally radial direction relative to said ratchet wheels, and spring-loaded to bear against the ratchet, said handle pawl member having a body section and a pair of spaced legs extending therefrom, said legs extending respectively along each of the handle side members to engage the teeth of a ratchet wheel, and said body section spanning the strap holding portion of the wind-up drum;

The improvement characterized in that the radially innermost edge portion of the frame pawl body section spanning the wind-up drum is offset on a larger radius from the drum axis than the radially innermost edge portion of the handle pawl body section spanning the wind-up drum, whereby when a strap wound about the drum builds up to a diameter such that it engages the radially innermost edge portion of the handle pawl body section it will cause the handle pawl to move out of engagement with the ratchet teeth, thereby making handle movement ineffective for further wind-up of the strap but without simultaneously causing disengagement of the frame pawl from the ratchet wheels and consequent loss of strap tension.

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