

[54] RATCHET BUCKLE

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[51] Int. Cl. **F16g 11/12**

[58] Field of Search **254/51, 55, 56, 161, 254/164; 248/361; 24/68 D, 68 E**

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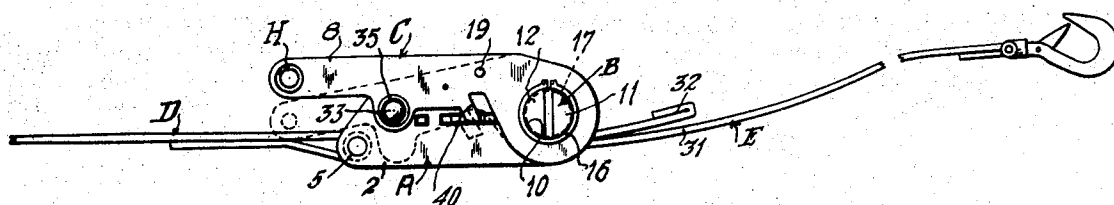
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[57] ABSTRACT

A web-tensioning device has a body in which is journaled a drum having a ratchet with which coacts a pawl pivoted on an oscillatable operating lever which is connected to the frame coaxially with the drum to tension the web and is swung into a rest position when the web is taut where it is held by a positive, quick releasable latch which is protected against accidental release. A back-stop or locking pawl coacts with the ratchet to hold the web taut and is released upon manual movement of the lever beyond its said rest position so the angle of web-tensioning swing of the lever may be greater than is generally possible with prior art devices.

11 Claims, 7 Drawing Figures



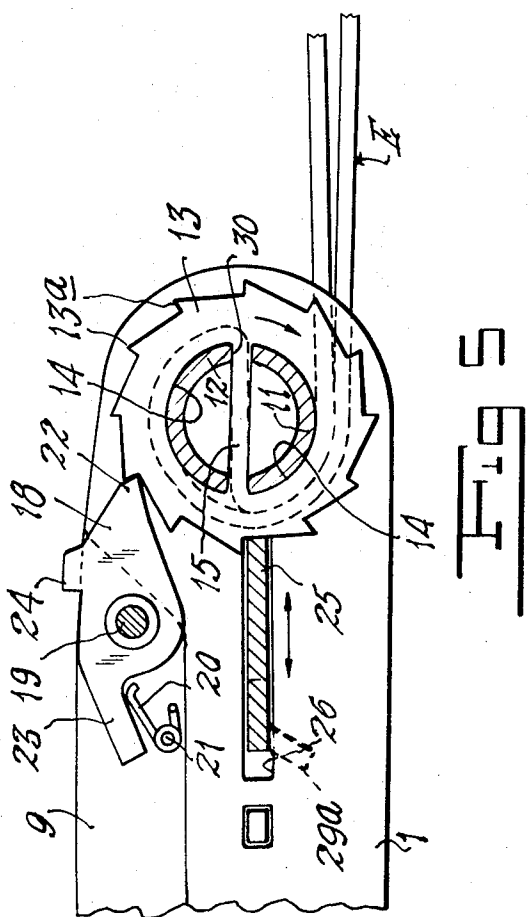
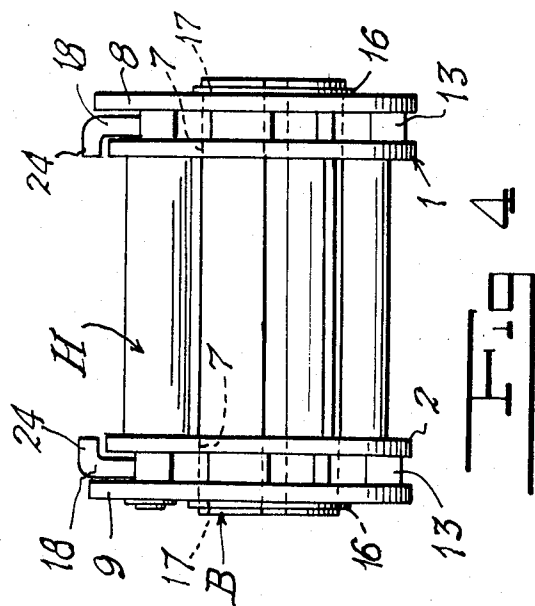
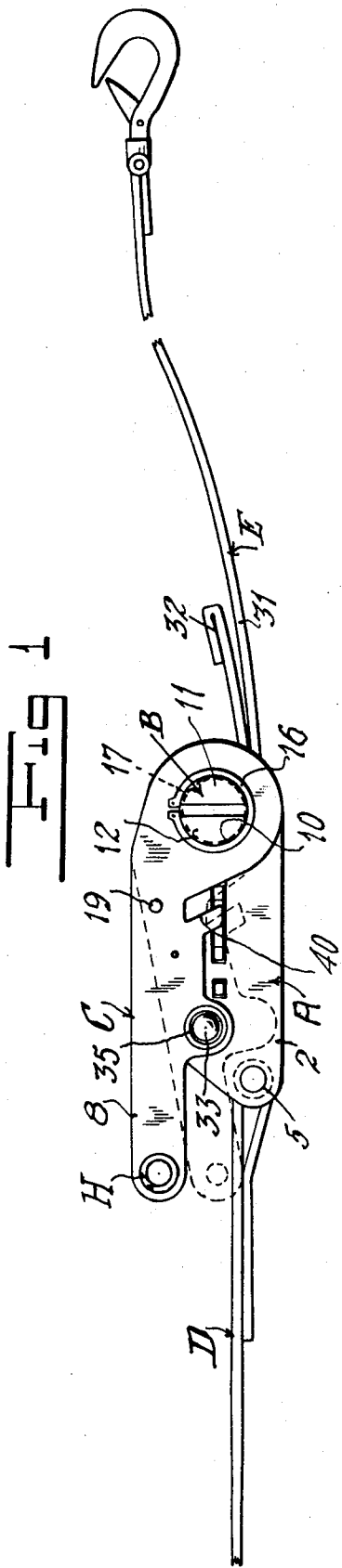


FIG 2

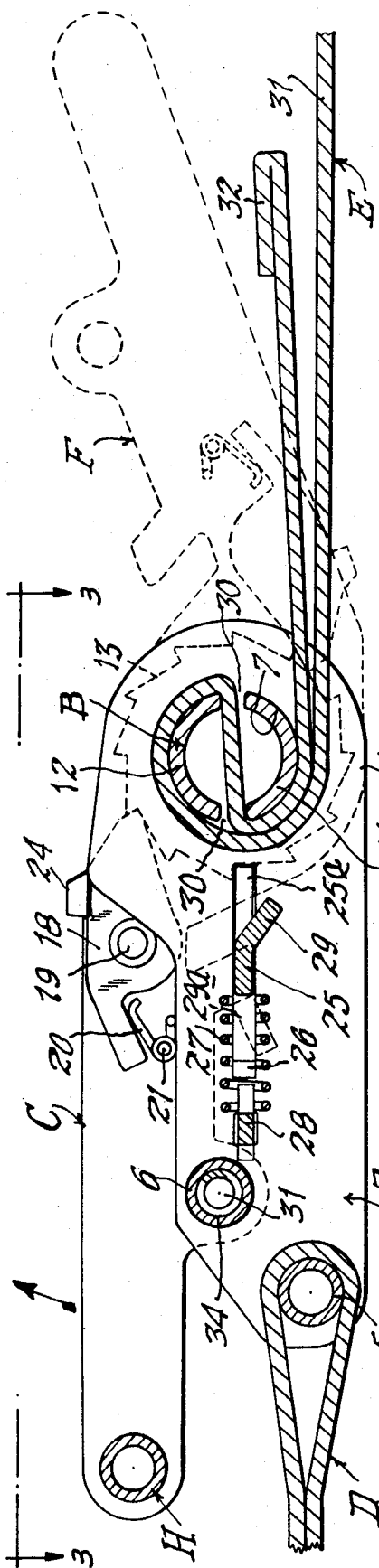


FIG 3

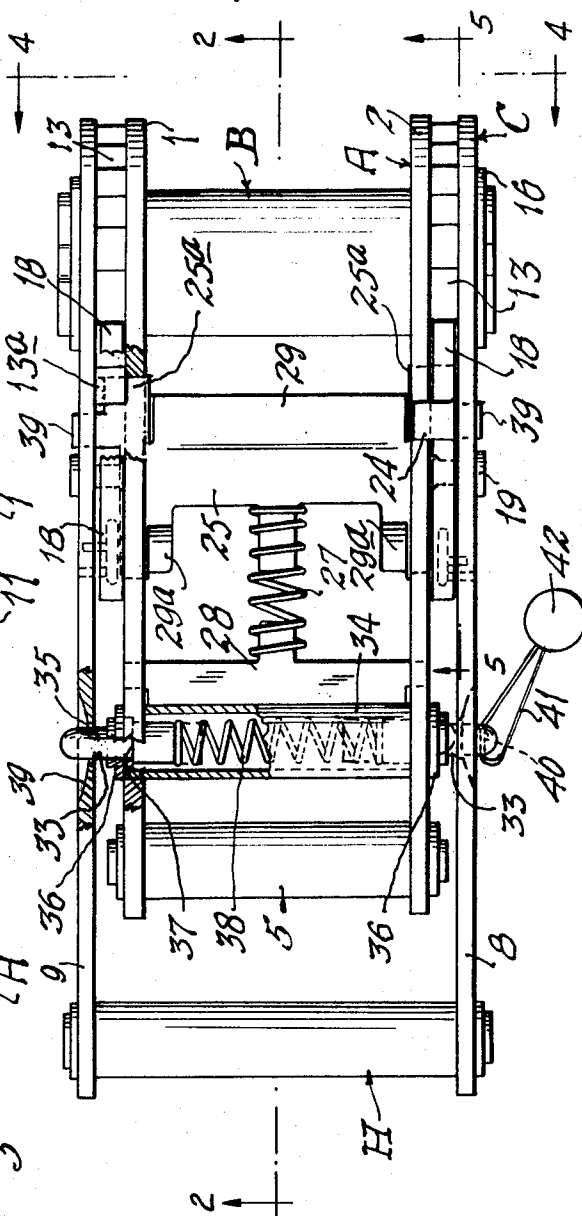


FIG 6

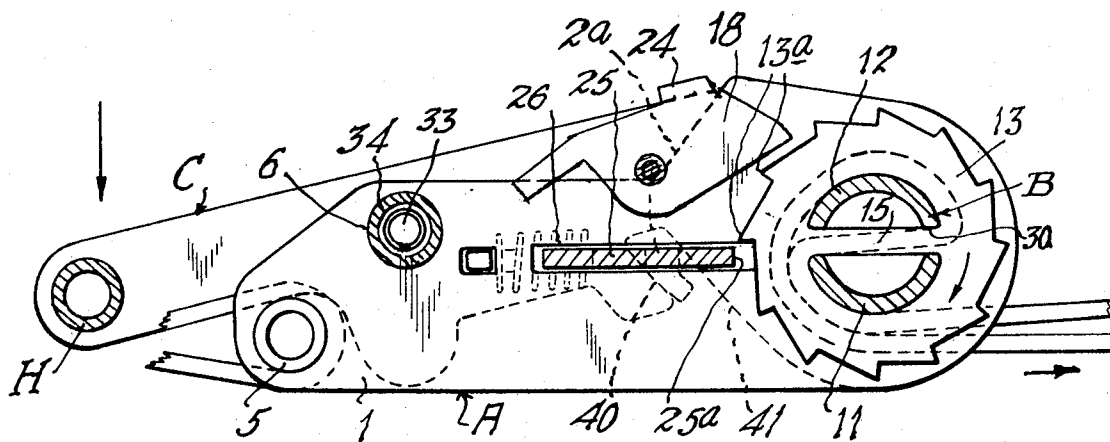
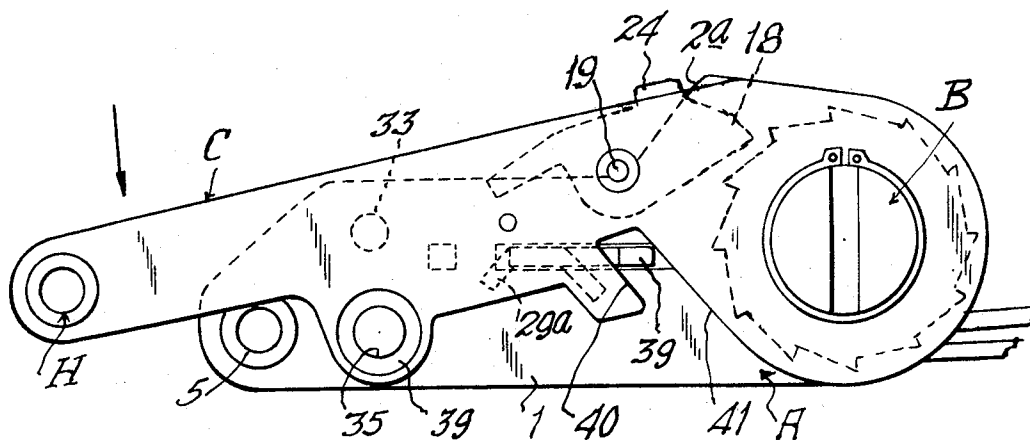


FIG 7

RATCHET BUCKLE

BACKGROUND OF THE INVENTION

The present invention relates to buckles which include means for increasing and releasing the tension or tautness of a web, for example, a cargo hold-down strap, comprising a drum on a frame having a ratchet with which is coactive a pawl carried by a hand-operated lever pivotally mounted on the frame coaxially with the drum for tensioning the strap upon swinging of the lever alternately in opposite directions, and there being a back-stop plate or lock pawl engageable with the ratchet to prevent backward rotation of the drum and thereby lock the drum with the strap in tensioned condition. Means is provided to release the back-stop plate from the ratchet when it is desired to loosen the strap.

The prior art buckles leave much to be desired in that either the angle or swing of the lever during strap-tightening oscillation is objectionally small so that the tightening of the strap requires too much time or too many manipulations of the lever, or the construction and operation of the back-stop pawl are disadvantageous in that to release the pawl for loosening the strap they require the swinging of the operating lever beyond its normal strap-tightening movement.

SUMMARY OF THE INVENTION

A primary object of the invention is to provide a ratchet buckle which overcomes the objections to and disadvantages of the prior art buckles and wherein the operating lever may swing through an angle of the order of 150° to 170° so the strap can be quickly lightened and held by the back-stop pawl, and the lever can be securely but easily releasable locked in rest position with a minimum of danger of accidental or unintentional release.

The invention also provides for release of the back-stop pawl for loosening of the strap easily and quickly by simple movement of the operating lever from its rest position in the direction opposite that of its strap-tensioning movement while the lever is free from strap tension.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the invention reference should be had to the following description in conjunction with the accompanying drawings in which

FIG. 1 is a side elevational view of a ratchet buckle embodying the invention and showing the manner of attaching straps thereto, with the drum operating lever shown in its rest position in solid lines;

FIG. 2 is an enlarged central vertical longitudinal sectional view through the buckle and the straps approximately on the plane of the line 2—2 of FIG. 3, with the drum operating lever shown in its normal rest position in solid lines and at the end of its strap-tensioning movement in broken lines;

FIG. 3 is a top plan view of the buckle itself as illustrated in FIG. 2 but with the straps removed and with portions broken away and shown in section;

FIG. 4 is an end elevational view of the buckle approximately from the plane of the line 4—4 of FIG. 3;

FIG. 5 is a fragmentary longitudinal vertical sectional view approximately on the plane of the line 5—5 of FIG. 3;

FIG. 6 is a side elevational view of the buckle showing the operating lever in the position disengaging the back-stop pawl plate from the drum ratchet to permit backward rotation of the drum for loosening the strap, and

FIG. 7 is a vertical longitudinal sectional view in general similar to FIG. 5 but showing the operating lever and back-stop pawl in drum-releasing position as shown in FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Specifically describing the illustrated embodiment of the invention, the reference character A designates the body of the buckle in which is journaled a strap-winding cylindrical drum B which is rotated by an operating lever C. As shown, the frame comprises two spaced and parallel side plates 1 and 2 rigidly secured together by tie rods or elongated tubular rivets 5 and 6, and having axially aligned openings 7 in which the drum is journaled.

The operating lever comprises two side plates 8 and 9 which are rigidly connected at one end by a hand bar H and have axially aligned openings 10 through each of which rotatably extends one end of the drum B which is shown as comprising two identical sections 11 and 12 in the form of cylindrical segments whose chordal planes are spaced and parallel and whose outer diameter is slightly less than the diameter of the openings 7 in the body side plates 1 and 2. The two sections of the drum are rigidly connected together by ratchet disks 13 each of which has openings 14 separated by a cross bar 15 that extends diametrically of the disc and each of which has the end of one of the sections 11 and 12 snugly fitted therein so the bar extends between the two sections of the drum as best shown in FIGS. 5 and 7 to drivingly connect the drum and ratchets. The ratchet disks are disposed between the side plates of the body A and the side plates of the operating lever C and are rigidly connected to the drum and held against longitudinal movement relatively to the drum. The side plates of the lever C are held against movement longitudinally of the drum by split spring rings 16 seated in peripheral grooves 17 in the respective ends of the drum that extend outwardly beyond the side plates of the lever as best shown in FIGS. 1, 3 and 4.

The peripheries of the ratchet disks have ratchet teeth 13a with which coact pawls 18 that are pivotally mounted at 19 on the inner sides of the respective side plates of the lever C and are normally biased into engagement with the ratchet teeth by springs 20 mounted on pins 21 on the lever side plates. The pawls are pivotally mounted between their ends and have chisel-shaped nose portions 22 to engage the ratchet teeth and tail portions 23 engaged by the springs 20; and desirably stop lugs 24 are provided on the pawls to coact with inclined cam surfaces 2a on the side plates 2 of the body for disengaging the pawls from the ratchets when it is desired to loosen the strap, as will be hereinafter described.

With this construction when the lever C is swung in one direction as indicated by the arrow in FIG. 2 the driving pawls engage the ratchets and the drum is rotated in one direction, here clockwise, for winding a strap on the drum. To prevent backward rotation of the ratchets and drum, a back-stop pawl plate 25 is slidably mounted in slots 26 in the side plates of the body and

has the end portions of its front edge normally biased into engagement with the ratchet teeth by a compression spring 27 interposed between the plate and an abutment bar 28 fixed in the side plates of the body as best shown in FIGS. 2 and 3. The pawl plate has at its front edge and at its rear edge respective portions 29 and 29a bent downwardly out of the general plane of the plate and in slidable engagement with the inner surfaces of the body side plates to space the body plates and to hold the pawl plate against displacement from the slots and to guide it into and out of engagement with the ratchets.

In use of the buckle, generally the strap D, or one end of a strap, is connected to the tie rod 5 at one end of the buckle body, and the other end of said strap or the end of another strap E is threaded through slots 30 between the drum sections to provide a free end portion 31 and a main portion 32; and after the straps have been applied to the article or load to be strapped or held down, the free end 31 is pulled through the slots to apply a pre-tension to the main portion of the strap. Then the operating lever is swung from its normal rest position shown in solid lines in FIGS. 1 and 2, in a clockwise direction as shown in the drawings into a strap-tightening position as indicated in broken lines in FIG. 2 by the reference character F. With this construction, the lever may be swung through an angle of the order of 150°-170° so that a large portion of the strap may be wound on the drum to tension the strap in one swinging or "pumping" movement of the lever. Obviously, if desired, the lever may be oscillated back and forth as many times as may be necessary to provide the desired tension, but generally only one movement of the lever from its rest position to its strap-tensioning position as shown in FIG. 2 is required. At the completion of the tensioning operation, the back-stop pawl plate is pressed by the spring 27 into engagement with the ratchets to hold the strap in taut condition and the lever is swung backwardly to its rest position.

Other features of the invention are quickly and easily operable means for holding the operating lever in its rest position with the strap under tension, and for at will actuating the stop pawl plate out of engagement with the ratchets to loosen the strap.

As shown, a latch pin 33 is slidably mounted in each end of a guide tube 34 on the body A and projects beyond the outer surface of the corresponding side plate 1 or 2 a distance sufficient to project through a corresponding keeper opening 35 in one of said side plates 8 or 9 of the operating lever. The guide tube 34 is rigidly secured to and between the side plates 1 and 2 and each end of the tube has an end wall 36 abutted by a shoulder 37 on the corresponding latch pin for limiting outward movement of the latch pin under the influence of a compression spring 38 interposed between the pins inside the tube as best shown in FIG. 3. Preferably the outer ends of the latch pins are segmentally spherical so that when the operating lever is swung into its rest position, the plates 8 and 9 will slidably engage the rounded ends of the pins and push the pins inwardly momentarily until the pins register with the openings 35, whereupon the spring 38 will snap the pins outwardly and through the openings 35 to releasably lock the lever in its rest position. Desirably, the outer surfaces of the plates 8 and 9 are dish or countersunk at 39 around the corresponding openings 35 and when it is desired to release the lever for operation, the oper-

ator presses the latch pins simultaneously inwardly, for example, by the thumb and middle finger of his hand, until the pins clear the openings 35 as the lever is swung in its strap-tensioning direction.

In accordance with the invention, movement of the operating lever beyond its rest position shown in FIGS. 1, 2 and 5 in the direction opposite the strap-tensioning direction, serves to actuate the stop-pawl plate and both of the drive pawls 18 out of the engagement with the ratchets when it is desired to loosen the strap. For this purpose, the stop-pawl plate has a lug 39 at each side thereof projecting through the corresponding slot 26 in the side plate of the body A, and the side plates 8 and 9 of the operating lever have corresponding cam notches 40 in their lower edges each to embrace one of the lugs 39 when the lever is in its rest position. As best shown in FIG. 1, each notch has an inclined side or cam 41 to frictionally and slidably engage the corresponding lug 39 as the lever is swung beyond its rest position as shown by broken lines in FIG. 1, in the direction of the arrows on FIGS. 6 and 7 so as to actuate the stop-pawl plate out of engagement with the ratchets as shown in FIGS. 6 and 7, and at the same time the lugs 24 are moved along the cam surfaces 2a so as to swing the pawls 18 out of engagement with the ratchets as shown in FIGS. 6 and 7, thereby permitting the strap to be loosened by pulling thereon in the direction of the arrow in FIG. 7 which causes backward rotation of the drum as indicated by the arrow in FIG. 7. In practice, when the buckle is out of use, normally the operating lever will be held in its rest position against accidental or unintentional swinging, by the latch pins 33 projecting through the openings 35 in the side plates of the operating lever as shown in FIGS. 1, 2 and 3. Also, the back stop pawl plate is held against manual manipulation out of engagement with the ratchets by engagement of lugs 39 with the rear or outer side of cam notches 40.

The invention also provides a tamper-proof seal to seal the buckle lever in its operative strap-tightening position, so as to prevent unauthorized loosening of the buckle. As shown, the end of either or both of the locking pins 33 that projects beyond the lever plate 8 when the lever is in its tightened rest position has a transverse hole 40 through which is threaded a seal wire 41 the ends of which are sealed together in known manner as by a disc of lead 42.

From the foregoing, it will be seen that the invention provides a simple, strong, quick-acting buckle the construction of which permits easy replacement of parts.

It will be observed also that when the lever is in rest position, (FIGS. 1 and 2) the backstop pawl plate is held by contact of the lugs 39 with the rear sides of the notches 40 against manual disengagement from the ratchets.

It will be understood by those skilled in the art, that the now preferred embodiment of the invention has been disclosed but that modifications and changes in the construction of the buckle may be made within the spirit of the invention and the scope of the appended claims.

I claim:

1. A ratchet buckle comprising a body, a winding drum journaled therein having means to attach a strap thereto, a ratchet on said drum, an operating lever journaled coaxially with said drum to swing alternately in opposite directions and having a driving pawl normally

biased into engagement with the ratchet teeth to wind a strap under tension upon the drum upon swinging of the lever in one direction from a rest position, a back-stop pawl normally biased into engagement with the ratchet to prevent backward rotation of the drum, and means including coacting parts on said lever, said back-stop pawl, said body and said driving pawls to disengage the back-stop pawl and the driving pawls from the ratchet upon swinging of the lever in the opposite direction past said rest position to release the drum for loosening of the strap.

2. A ratchet buckle comprising a body including spaced apart side plates rigidly connected together at one end and having aligned openings adjacent its other end in each of which is journaled one end portion of a winding drum having a web passage therethrough, a ratchet disk rigidly connected to said drum at each end thereof, an operating lever having rigidly connected side plates straddling said body and rotatably mounted on said drum and adapted to assume a normal rest position with each side plate in spaced relation to the corresponding body side plate, ratchet driving pawls each pivotally mounted on one of the lever side plates and normally biased into engagement with the teeth of one ratchet to drive the drum upon swinging of said lever in one direction from its rest position to tighten a web attached to said drum, a back-stop pawl plate slidably mounted in said body side plates and normally biased into engagement with the ratchet teeth to prevent backward rotation of the drum, said lever side plates and said back-stop pawl plate having coacting portions to actuate said back-stop pawl plate out of engagement with the ratchet teeth and said body and said driving pawls having coacting portions to disengage said driving pawls from the ratchets upon swinging of the lever from its said rest position in the direction opposite that of its strap-tensioning movement, thereby to release the drum and loosen the strap.

3. A ratchet buckle as defined in claim 2 wherein said coacting portions of the back-stop pawl and the lever side plates are lugs on the back-stop pawl and cam slots in the lever side plates each having an inclined side slid-

ably engageable with one of said lugs.

4. A ratchet buckle as defined in claim 2 wherein said coacting portions on said body and said driving pawls comprise a lug on each pawl slidably engageable with an inclined cam surface on the adjacent body side plate.

5. A ratchet buckle as defined in claim 2, with the addition of manually operable means releasably locking the operating lever in its rest position.

6. A ratchet buckle as defined in claim 5 wherein the addition of manually operable means releasably locking the operating lever in its rest position and comprising a hole in at least one lever side plate, and a locking pin slidably mounted on said body and normally biased to snap into said hole when the hole registers with the pin.

7. A ratchet buckle as defined in claim 5 wherein the free end of said locking pin normally projects beyond the lever side plate when the lever is in its rest position and is engageable by the operator's finger and thumb to press the pin out of said hole to release the lever.

8. A ratchet buckle as defined in claim 6, with the addition of means for sealing said pin against unauthorized disengagement from said hole.

9. A ratchet buckle as defined in claim 6, wherein the projecting end of said locking pin has a hole therethrough and with the addition of a wire threaded through said hole and having its ends sealed together.

10. A ratchet buckle as defined in claim 6, wherein there is a hole in each lever side plate in axial alignment with the hole in the other side plate, and there is a locking pin coactive with each hole.

11. A ratchet buckle as defined in claim 2 wherein said lever side plates are rigidly connected at their swinging ends by a hand-hold tie bar, the ends of said drum project beyond the corresponding lever side plates and have circumferential grooves in each of which is a split spring ring to hold the corresponding lever plate on said drum, and said back-stop pawl plate has portions slidably engaging the inner surfaces of said body side plates to hold said plates in spaced relation to each other.

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