

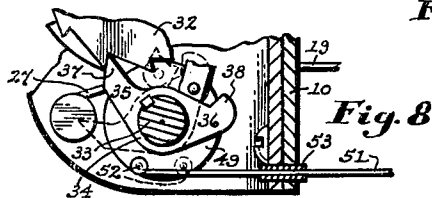
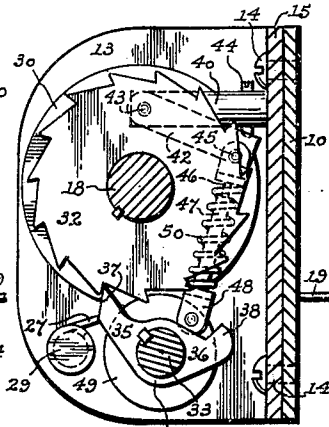
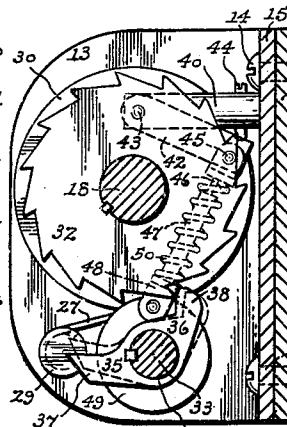
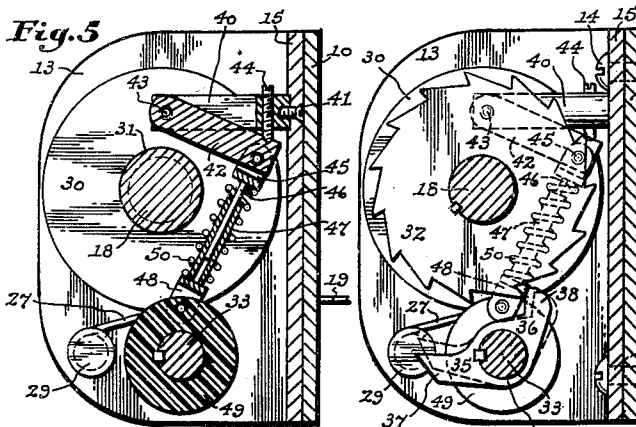
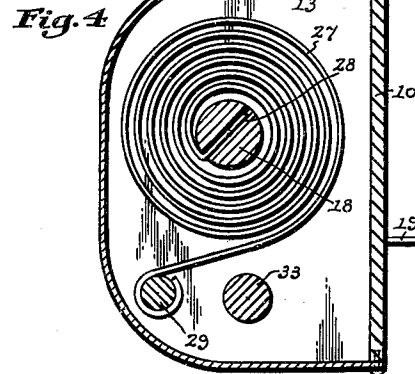
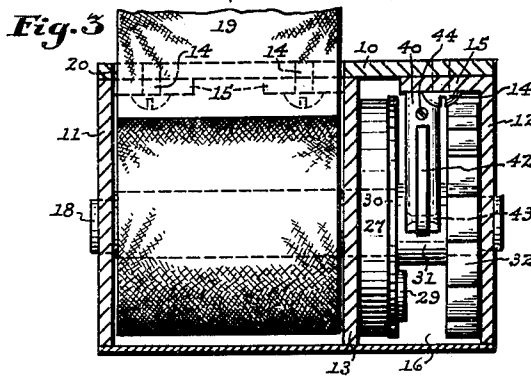
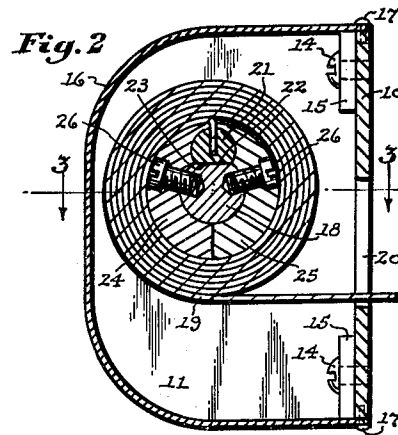
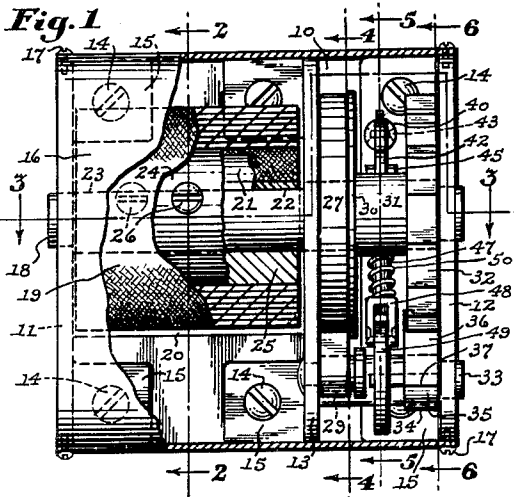
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2,979,282

AUTOMATIC REEL

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2,979,282

AUTOMATIC REEL

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The present invention relates to automatic reels of the type particularly adapted for taking up slack in safety belts and harnesses for vehicle occupants and which are adapted to lock in the event of a crash so as to restrain the occupant against being thrown forwardly into contact with parts of the vehicle and thus possibly being injured or killed.

The primary objects of the invention are to provide an improved reel which normally winds in any slack in a strap, cable or similar elongated flexible element such as might be attached to or be a part of a safety shoulder harness or other restraining device for a vehicle occupant, and the reel being such as to readily pay out said elements during normal conditions of operation of the vehicle so as to permit freedom of movement of the occupant; to provide such a reel which automatically locks the restraining element against paying out when the element is suddenly jerked, as would occur in the event of a crash due to the sudden deceleration of the vehicle and the forward inertia of the occupant's body; to provide such a reel which operates by new and improved means and in a new and different manner; and in general to provide such a reel which is very simple in construction, effective in use, and reasonably economical in manufacture.

Illustrative embodiments of the invention are shown in the accompanying drawings, wherein:

Figure 1 is a front elevational view of the new reel, with portions of certain parts thereof broken away to better reveal other parts;

Figure 2 is a vertical sectional view of the reel taken on line 2—2 of Figure 1;

Figure 3 is a horizontal sectional view thereof taken on lines 3—3 of Figures 1 and 2;

Figure 4 is a vertical sectional view of parts of the reel taken on line 4—4 of Figure 1;

Figure 5 is a vertical sectional view of other parts of the reel taken on line 5—5 of Figure 1;

Figure 6 is a vertical sectional view taken on line 6—6 of Figure 1 and showing still other parts of the reel;

Figure 7 is a vertical sectional view thereof similar to Figure 6 but showing certain parts of the reel in different moved positions; and

Figure 8 is a fragmentary vertical sectional view similar to the lower portion of Figure 7 and showing a modified form of the reel in which is incorporated a manual control device.

Referring now in detail to these drawings, the improved automatic reel there shown is mounted in a housing comprising a base plate 10 to which are secured end walls 11 and 12 and an intermediate wall 13 all secured to the base plate 10 by means of screws 14 passing through flanges 15 on said walls. A cover 16 is provided for the device and is secured to the base plate 10 by means of screws 17, said cover 16 being shown fragmentarily in Figure 1 and being omitted in Figures 5—8.

A horizontally disposed main shaft 18 is journaled in aligned bearing apertures in the end walls 11, 12 and the

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intermediate wall 13. An elongated, flexible, non-stretchable element, here shown a strap 19, has one end thereof secured to the main shaft 18 between the end wall 11 and the intermediate wall 13 so that the strap may be wound onto the main shaft and unwound therefrom. It is contemplated that the base plate 10 might be secured to the rear surface of the back of an airplane pilot's seat by suitable means (not shown), and that the strap would then extend through a slot 20 in the base plate, through a registering slot in the seat back and the strap would have its other end connected to a shoulder harness or other restraining element for the chair occupant.

The inner end of the strap 19 is secured to the main shaft 18 by means best seen in Figures 1 and 2. To this end of the strap 19 is secured a pin 21, which may be of pressed-on metal but is preferably of molded-on plastic, and the pin 21 has a flattened face 22 which engages with a corresponding flattened face 23 on that portion of the main shaft 18 which lies between end wall 11 and intermediate wall 13. Complementary clamping members 24, 25 are then applied on opposite sides of the shaft 18 and pin 21, and secured to the shaft 18 by means of screws 26, preferably three such screws for each clamping member. These parts are thus all secured in tight assembly so that the strap 19 is firmly anchored to the main shaft 18.

A spiral spring 27 (see Figures 1, 3 and 4) is mounted adjacent the opposite side of the intermediate wall 13 from the strap 19, and has its inner end secured in a slot 28 in the main shaft 18 and its outer end secured around a stud 29 riveted to the intermediate wall 13. This spiral spring 27 serves to normally urge the main shaft 18 in the direction for winding the strap 19 thereon so as to take up any slack in the strap as the chair occupant moves about, but this spring is not strong enough to interfere with the occupant's freedom of movement. A circular plate 30 has a circular central opening through which passes the main shaft 18, said plate 30 being interposed between the spiral spring 27 and a portion 31 of shaft 18 which is enlarged in diameter. The plate 30 thus serves to confine the spiral spring 27 in its intended position as shown.

A ratchet wheel 32 is keyed on the main shaft 18 for turning movement therewith, adjacent the end wall 12 of the housing. A secondary shaft 33 is rotatably mounted in the housing parallel to the main shaft 18 and outside the toothed periphery of the ratchet wheel 32, said secondary shaft having its opposite ends journaled in bearing apertures in the intermediate wall 13 and the end wall 12 of the housing. A lever 34 is keyed on the secondary shaft 33 for turning movement therewith, and said lever 34 has a pair of oppositely outwardly extending arms 35, 36 and is turnable to positions wherein only one or the other of said arms engages the toothed periphery of the ratchet wheel.

The lever's arm 35 has a pawl 37 at its outer end adapted to engage the teeth of the ratchet wheel 32 to prevent unwinding movement of the main shaft 18 while permitting winding movement thereof. The lever's other arm 36 has a follower 38 at its outer end which is adapted to ride over the successive ratchet teeth of the ratchet wheel 32 during normal rotation of the main shaft 18 in both directions below a predetermined velocity. However, in the event of sudden deceleration of the vehicle as in a crash, a sudden outward jerk on the strap 19 caused by the inertia of the occupant's body, suddenly increases the velocity of the ratchet wheel 32 at or above said predetermined velocity, and this sudden movement of the toothed ratchet wheel results in the follower's being impelled outwardly from the wheel by one of the projections or teeth of said ratchet wheel. This movement of the lever 34 causes the lever's pawl 37 to en-

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gage the teeth of the ratchet wheel and thus lock the ratchet wheel and the main shaft 18 against movement in the direction for paying out the strap 19, and thus restraining the occupant of the chair against movement in any direction except rearwardly with respect to the vehicle.

A toggle joint is provided for maintaining the lever 34 in either of its turned positions, i.e. with the follower 38 in engagement with the toothed periphery of the ratchet wheel 32 so as to ride over the teeth of the wheel during normal movements of the vehicle and the chair occupant, or with the pawl 37 in engagement with the toothed periphery of the ratchet wheel 32 so as to positively lock the ratchet wheel and main shaft 18 against movement in the strap unwinding direction. This toggle joint is interposed between the secondary shaft 33 and the housing. A bifurcated post 40 secured to the flange 15 of the end wall 12 by means of a screw 41 (see Figures 3 and 5), has an adjustment arm 42 pivotally mounted at 43 on the outer end of the post 40 between its bifurcations. This adjustment arm 42 may be set in angularly adjusted position by means of an adjustment screw 44 threaded through the post's inner end.

A clevis 45 pivotally connected to the adjustment arm 42 has a pin 46 which extends in the general direction of the secondary shaft 33 and is telescopically received in a tube 47 on a clevis 48 pivotally connected to a disc 49 keyed on the secondary shaft 33 for turning movement therewith. A helical compression spring 50 circumscribes the tube 47 and pin 46 and bears at its opposite ends against the two clevises 45 and 48, thus to urge the secondary shaft 33 and lever 34 on either side of the toggle joint's center toward a position wherein one or the other of the lever's arms engages the periphery of the ratchet wheel. The disc 49 actually constitutes one leg of the toggle joint and is desirably made of nylon to reduce the friction at the pivotal connection between the disc and the clevis 48 and prevent the toggle from stopping on "dead center".

Figure 8 discloses an arrangement whereby the reel may be manually "locked" against paying out the strap 19 or "unlocked" to permit free movement of the strap in either direction. A wire or cable 51 has one end thereof connected at 52 to the disc 49 inside the reel's housing, and this wire or cable extends exteriorly of the housing through a sleeve 53 in the base plate 10 and may have its other end connected to a suitable lever (not shown) accessible to the chair occupant whereby the seated occupant may lock or unlock the reel at will.

It will thus be seen that the invention provides a simple and efficient automatic reel of the type indicated which operates in an entirely different manner than previous reels of this type, and while but two specific embodiments of the invention have been herein shown and described it will be understood that numerous details thereof may be altered or omitted without departing from the spirit of the invention as the same is defined by the following claims.

I claim:

1. A safety device for mounting in a vehicle to restrain the movement of a body within the vehicle when the body is subjected to relatively high velocity relative to the vehicle, comprising: an elongated, flexible, non-stretchable element adapted to be coupled to the body; a rotatably mounted shaft having said element secured thereto; resilient means coupled to said shaft for rotating said shaft in a direction to wind said element thereon, said shaft rotating in the opposite direction to unwind said element therefrom due to forces exerted on the element by the body; an actuating member having a projection thereon mounted for rotation with said shaft; a follower bearing against said actuating member during normal rotation of the shaft below a predetermined velocity, said follower being impelled radially outwardly from said actuating member by said projection upon ro-

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tation of the shaft at or above said predetermined velocity; means operating automatically to maintain said follower in outwardly impelled position; and locking means associated with the follower for locking the shaft against rotation in the unwind direction when said follower is in said outwardly impelled position.

2. A safety device according to claim 1 in which the actuating member is in the form of a toothed wheel mounted for rotation with the shaft.

3. A safety device according to claim 1 in which the actuating member is in the form of a ratchet wheel mounted for rotation with the shaft, and in which the locking means associated with the follower includes a pawl adapted to engage with the teeth of said ratchet wheel.

4. In an automatic reel: a housing; a shaft rotatably mounted on the housing; an elongated, flexible, non-stretchable element connected to the shaft and adapted to be wound thereon and unwound therefrom; means for normally yieldingly urging the shaft in the winding direction; an actuating member having a projection thereon mounted on the shaft rotatably therewith; a follower pivotally mounted in the housing and adapted to bear against the actuating member during said member's rotation with the shaft, said follower riding over said projection during normal rotation of the shaft below a predetermined velocity, and said follower being impelled radially outwardly from the actuating member by said projection upon rotation of the shaft at or above said predetermined velocity; means operating automatically to maintain said follower in outwardly impelled position; and locking means associated with the follower for locking the shaft against rotation in the unwind direction when said follower is in said outwardly impelled position.

5. An automatic reel according to claim 4 in which the actuating member is in the form of a peripherally toothed wheel against the periphery of which said follower is adapted to bear.

6. An automatic reel according to claim 4 in which the actuating member is in the form of a ratchet wheel, and in which the locking means associated with the follower includes a pawl pivotally mounted in the housing and adapted to engage with the teeth of said ratchet wheel.

7. An automatic reel according to claim 6 in which the follower and the pawl are incorporated in a single lever pivotally mounted in the housing and having oppositely extending arms one of which carries the pawl and the other of which carries the follower, said lever being turnable to positions wherein only one or the other of said arms engages the toothed periphery of said ratchet wheel.

8. An automatic reel according to claim 7 in which a toggle joint is interposed between the lever and the housing whereby the lever is urged on either side of center to a position wherein one or the other of its arms engages the toothed periphery of the ratchet wheel.

9. An automatic reel according to claim 8 including means whereby the force exerted by the toggle joint on the lever may be adjusted.

10. An automatic reel according to claim 8 in which a control device connected to said lever extends exteriorly of the housing whereby the position of the lever may be manually shifted.

11. In an automatic reel: a housing; a main shaft rotatably mounted on the housing; a flexible, non-stretchable strap connected to said main shaft and adapted to be wound thereon and unwound therefrom; a spiral spring having its inner end connected to the main shaft and its outer end connected to the housing whereby to normally yieldingly urge the main shaft in the winding direction; a ratchet wheel mounted on the main shaft rotatably therewith and having peripheral ratchet teeth thereon; a secondary shaft rotatably mounted on the housing parallel to the main shaft and outside the toothed periphery of said ratchet wheel; a lever mounted on said secondary shaft turnably therewith and having a pair of arms extending outwardly from the secondary shaft on opposite

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sides thereof, said lever being turnable to positions wherein only one or the other of said arms engages the toothed periphery of said ratchet wheel, one of said arms having a pawl at its outer end adapted to engage said ratchet teeth to prevent unwinding movement of the main shaft while permitting winding movement thereof, and the other of said arms having a follower at its outer end adapted to ride over the successive ratchet teeth of the ratchet wheel during normal rotation of the main shaft in both directions below a predetermined velocity, and said follower being impelled outwardly from the ratchet wheel by one of said ratchet teeth upon rotation of the main shaft at or above said predetermined velocity thus to turn the lever to its position wherein the pawl arm thereof engages the toothed periphery of said ratchet wheel; and means operating automatically to maintain said follower in outwardly impelled position.

12. An automatic reel according to claim 11 in which

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a toggle joint is interposed between the secondary shaft and the housing whereby the lever is urged on either side of center to a position wherein one or the other of its arms engages the periphery of the ratchet wheel.

13. An automatic reel according to claim 12 including means whereby the force exerted by said toggle joint on the secondary shaft may be adjusted.

14. An automatic reel according to claim 12 in which a control device connected to said secondary shaft extends exteriorly of the housing whereby the position of the lever may be manually shifted.

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