United States Patent

[11] **3,588,173**

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[45] Patented **June 28, 1971**

[54] **MOMENTUM-ACTUATED HARNESS**
10 Claims, 13 Drawing Figs.

[52] **U.S. Cl.** **297/386, 297/389**
[51] **Int. Cl.** **A62b 35/60**
[50] **Field of Search** ..... 280/150 (SB); 297/385, 388, 389; 242/107.4, 107.2

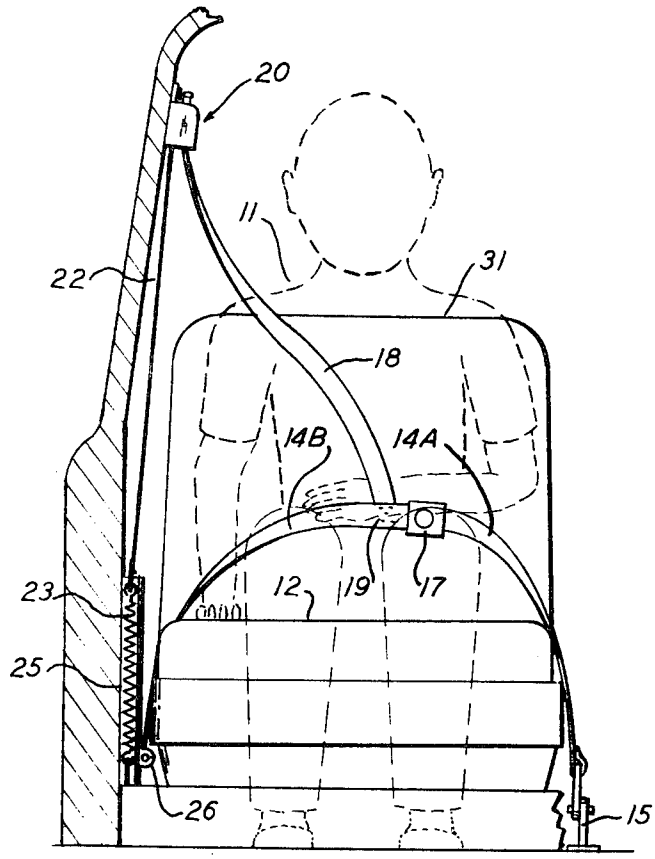
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Primary Examiner—James T. McCall
Attorney—WM. Jacquet Gribble

ABSTRACT: The harness apparatus discriminates between moderately accelerated and rapidly accelerated displacement of the harness with respect to a belt-traverse control by means of the relationship between a sensing roller with pivot points free to move in one direction and a parallel friction bar or surface. The sensing roller is springloaded away from the friction bar. Latches are commonly biased to bear against axle ends of the sensing roller. The harness belt path is from a resilient anchor, between the friction bar and the sensing roller, and around the roller to an anchored harness component. Under moderate belt acceleration the roller rotates freely, held in axial place by the balance between the latches and the roller spring load. Rapid belt acceleration overcomes the roller spring load and belt motion pulls the roller into proximity with the friction bar, binding the harness belt between them. The latches lock the roller against withdrawal.



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SHEET 1 OF 4

FIG. 1.

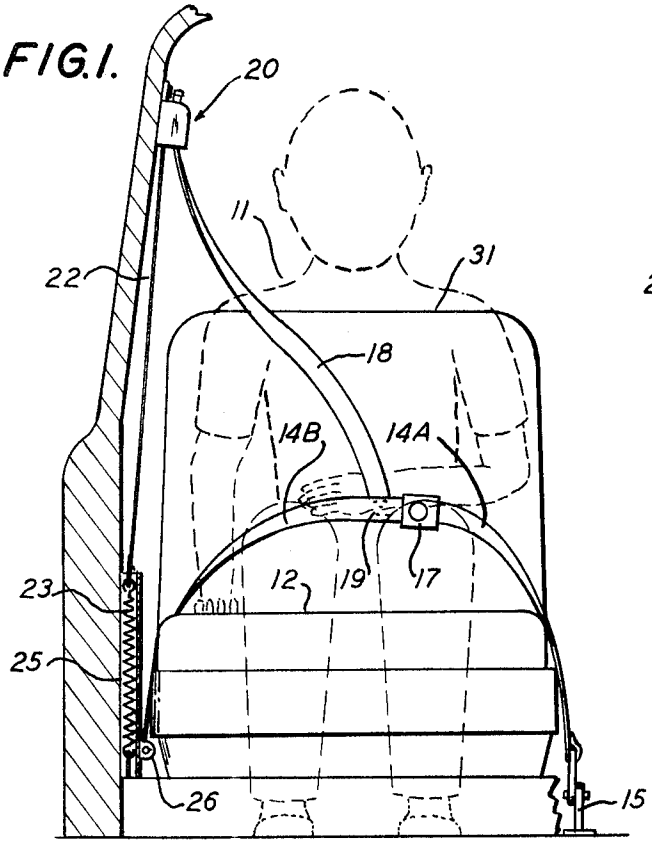
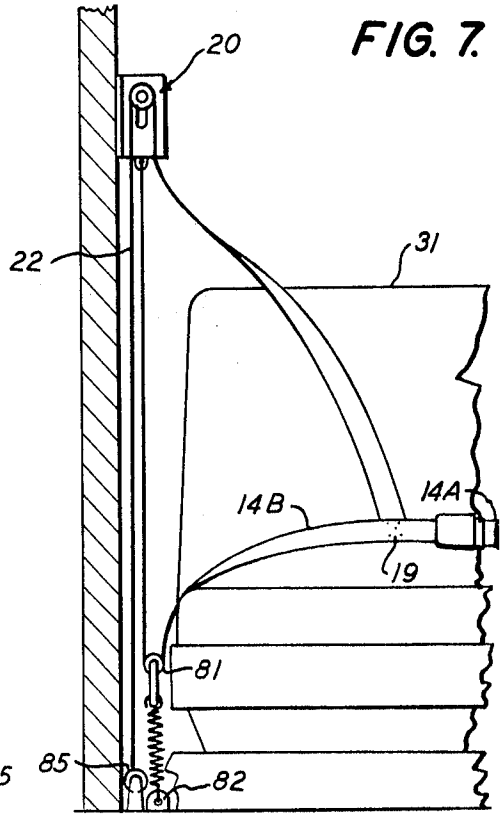


FIG. 7.



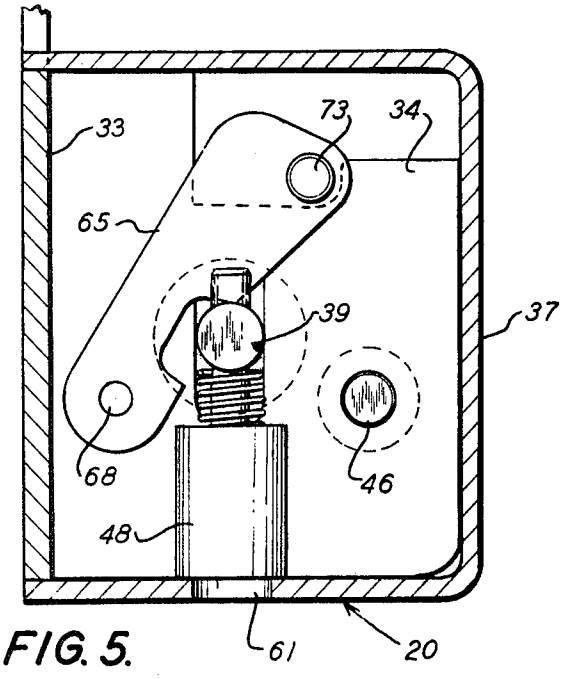
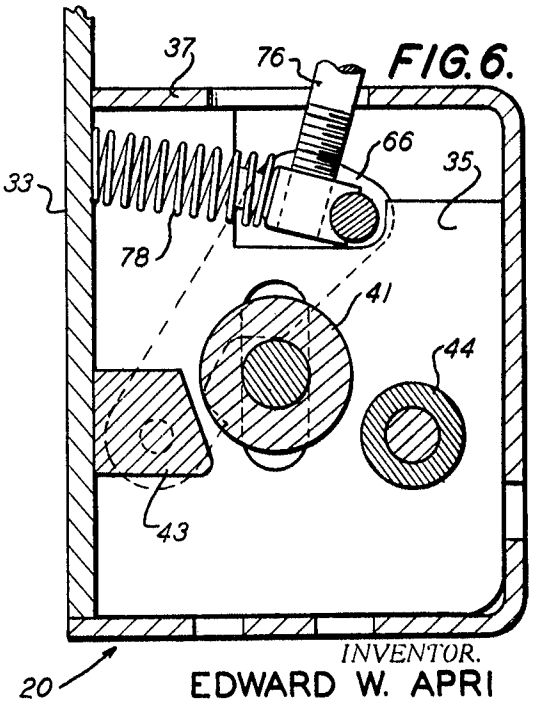


FIG. 5.

FIG. 6.



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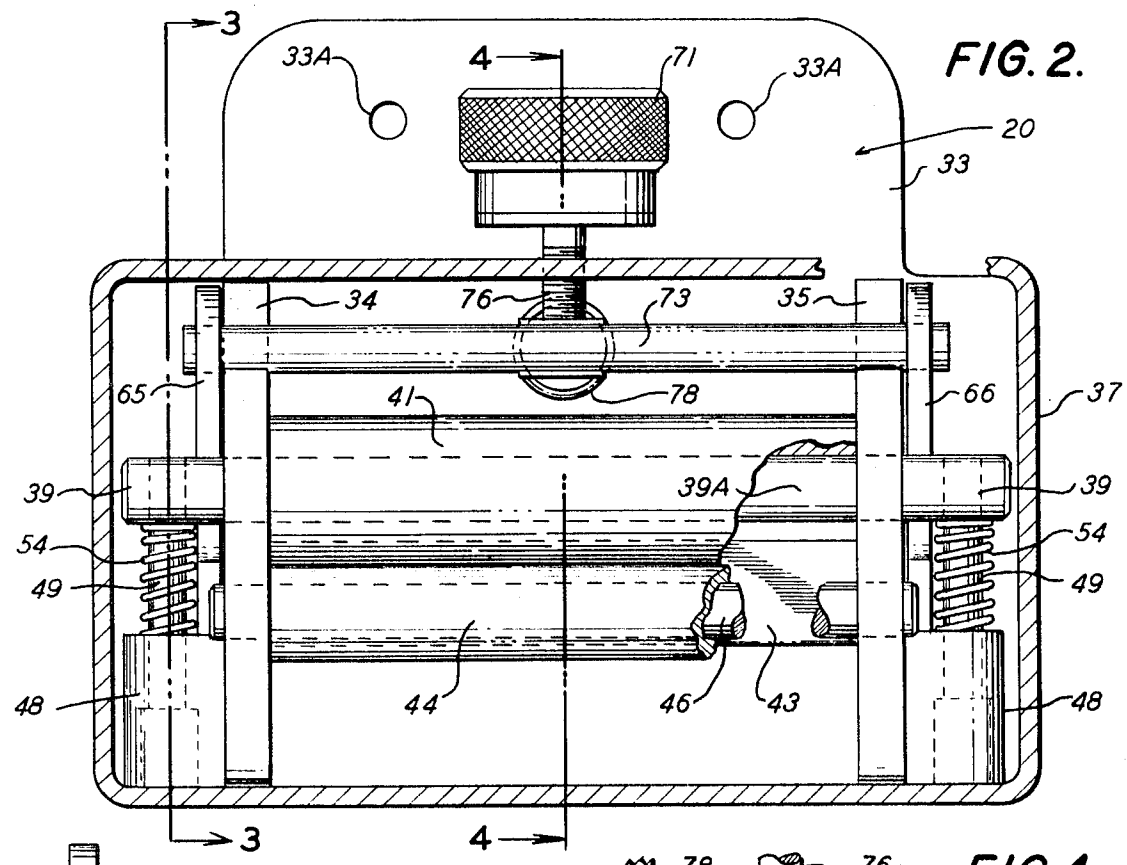


FIG. 2.

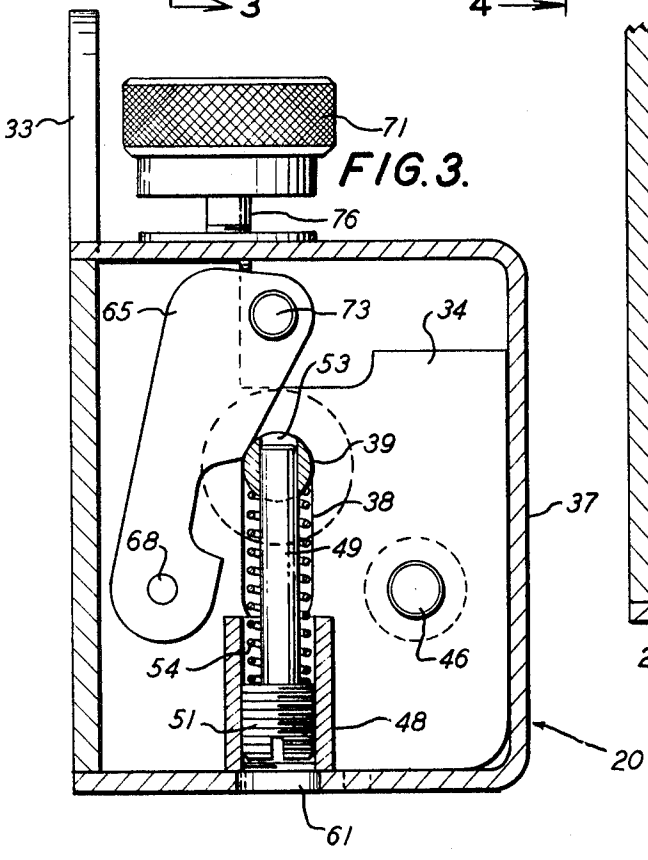


FIG. 3.

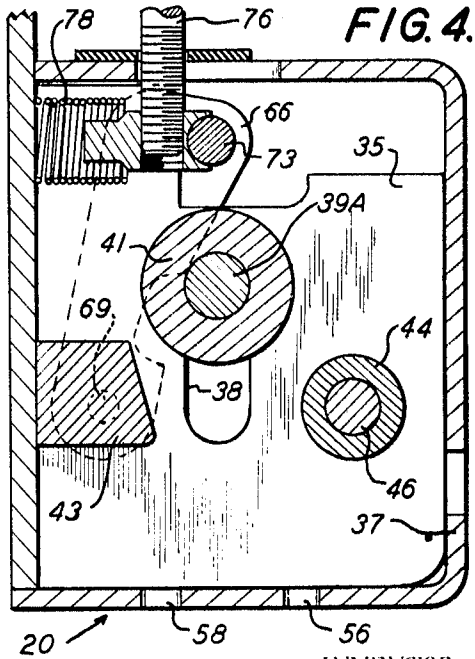
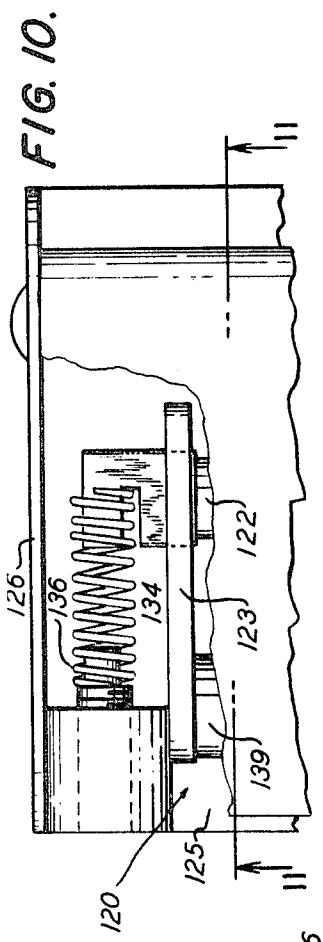


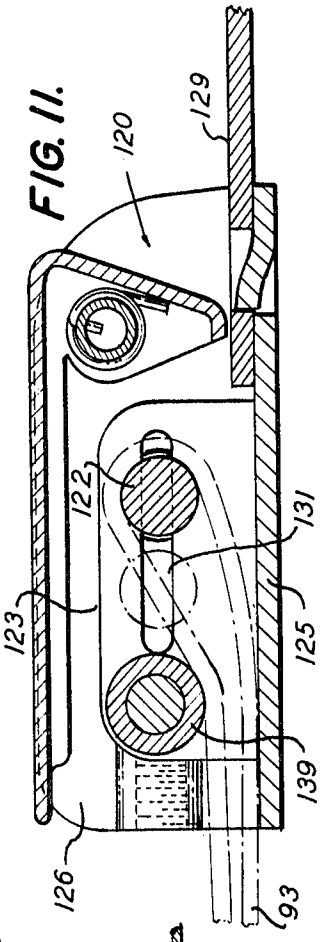
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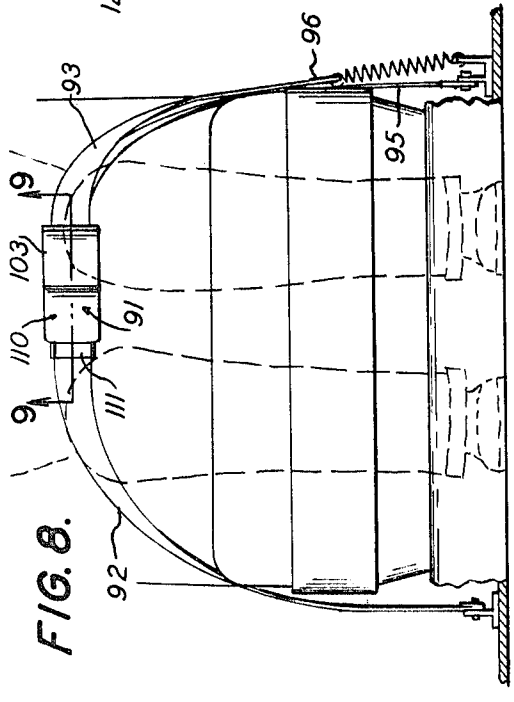
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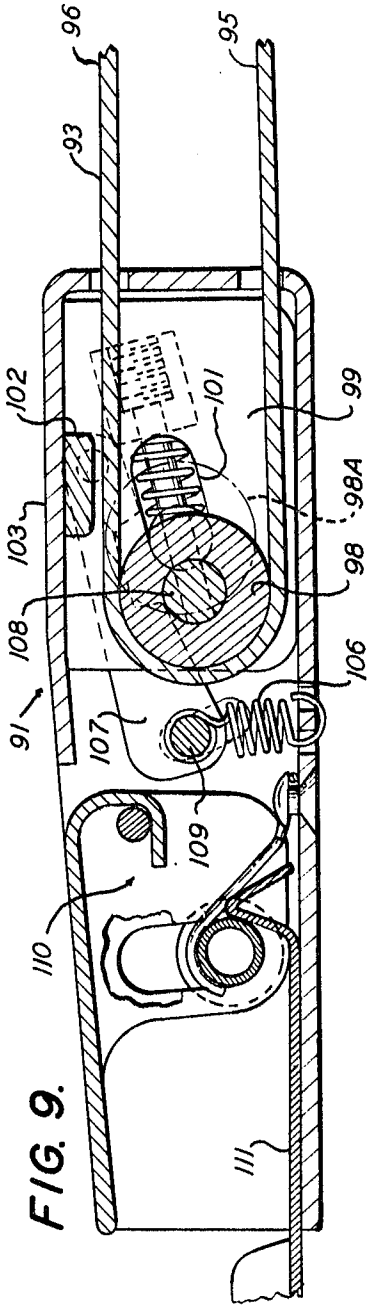
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FIG. 12.

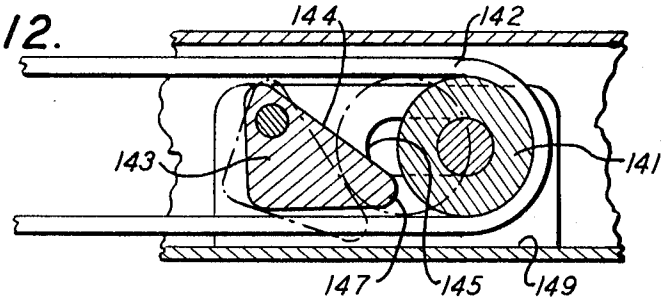
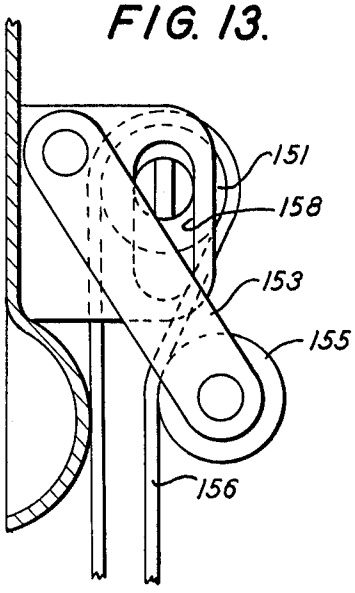


FIG. 13.



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MOMENTUM-ACTUATED HARNESS

An object of the invention is to provide simple means whereby harnesses such as those used in automobiles, aircraft and other vehicles can give the wearer freedom of motion under normal movement situations but which lock the harness tightly when the wearer is subjected to severe changes in momentum. A second object of the invention is to provide a mechanism which can be adjusted to give the wearer freedom of motion desired up to a determined point of change in momentum. Another object of the invention is to provide a device in which the locked or unlocked condition of the harness can be maintained at the discretion of the user.

The belt-traverse-control apparatus of the invention may be mounted to the vehicle adjacent the wearer of the associated harness or may be embodied in a harness buckle on the wearer. The momentum-actuated harness of the invention is adaptable to any of the conventional harness configurations used for passengers or on cargo strapped in place within the vehicles.

The invention contemplates a momentum-actuated harness for use with a conventional harness array and comprises a belt-traverse-control housing with spaced wings, a sensing roller extends between the wings, and vertical slots in the wings receive axle ends of the roller. Biasing means such as compression springs may urge the axle ends into contact with latches. The housing carries a friction bar parallel in extent to the roller. A second roller may be mounted parallel to the first with fixed points in the wings to accommodate changes in direction of the harness belt. The path of the harness belt is into the housing, between the friction bar and the sensing roller, over said roller and then down out of the housing between the sensing roller and the second roller. One end of the harness is preferably anchored but the bight between the point of anchor and the control housing may pass over guides or guide rollers along its path. The second end of the harness may pass over pulleys and be attached to a biasing extension spring, or, under certain circumstances, to a biasing weight. It is from this biased end of the harness that slack is drawn to permit passage of the harness through the control housing under moderate changes in velocity. Rapid changes in velocity cause the harness to "lock up" within the housing, thus defeating any motion of the person or thing restrained by the harness away from the anchor point. In the preferred embodiment of the invention means are provided for adjusting the load on the sensing roller such that the amount of acceleration of the belt causing lockup can be closely calibrated.

These and other advantages of the invention are apparent from the following detailed description and drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a schematic front elevation of a passenger in a vehicle employing the momentum-actuated harness of the invention;

FIG. 2 is an elevational view with the cover broken away of the belt-traverse-control device;

FIG. 3 is a sectional elevation taken along line 3—3 of FIG. 2;

FIG. 4 is a sectional elevation taken along line 4—4 of FIG. 2;

FIG. 5 is a sectional elevation similar to FIG. 3 showing the elements in locked condition;

FIG. 6 is a sectional elevation similar to FIG. 4 showing the elements in locked condition;

FIG. 7 is a schematic elevation of an alternate embodiment of the invention;

FIG. 8 is a schematic elevation of a further alternate embodiment of the invention;

FIG. 9 is a sectional view taken along line 9—9 of FIG. 8;

FIG. 10 is a fragmentary front elevation of a still further alternate embodiment;

FIG. 11 is a sectional view taken along line 11—11 of FIG. 10;

FIG. 12 is a further alternate embodiment of the invention shown in schematic section; and

FIG. 13 is a further alternate embodiment of the invention shown in schematic section.

In FIG. 1 passenger 11 is shown in dotted lines seated upon a conventional vehicle seat 12. An anchor 13 secures one end of a conventional lap belt 14 to the vehicle floor. A release buckle 17 secures an anchored portion 14A of the belt to a bight 14B of the harness.

A shoulder restraint harness 18 is secured to bight 14B at 19. Shoulder harness 18 extends through a belt-traverse-control device 20 of the invention. Shoulder harness 18 extends downwardly in a slack portion 22 which terminates in an extension spring 23 housed in a sheath 25 and anchored to the vehicle floor.

Bight 14B of the lap belt extends downwardly across the side of the seat to anchor 26, which may be of any conventional type.

Traverse control 20 is secured to the frame of the vehicle above the passenger, as illustrated. When the passenger moves slowly against the shoulder harness portion 18, the harness traverse control permits slack to be drawn from harness portion 22 through the control such that the passenger has freedom of movement away from back 31 of the seat 12. The passenger need only exert force necessary to overcome spring 23 to gain limited freedom of motion, while still retained in the harness.

Traverse control 20 is shown in detail in FIGS. 2 through 6, without the harness belt. In FIGS. 1—3 the control is seen to have a mounting plate 33 with convenient mounting holes 33A. Spaced parallel wings 34, 35 extend from the inner face of the plate. A housing cover 37 surrounds the wings, being spaced horizontally from the wings outboard of the wings.

Each wing has a vertical slot 38. Axle ends 39 of a sensing roller 41 reside in the slots, such that the sensing roller extends from wing to wing, free to move vertically, guided by the slot walls.

A friction bar 43 extends from the plate parallel to the sensing roller and below it. The wings also journal a second fixed roller 44 in parallel relationship to the sensing roller.

Sensing roller 41 is free to rotate on axle 39A whose ends 39 reside in the slots. Axle 46 supports second roller 44.

Each wing carries a low boss 48 that is internally threaded. A vertical guide pin 49 with a threaded head 51 is adjustably engaged within each boss and with the walls of a hole 53 in each sensing roller axle end 39. A compression spring 54 about each guide pin rests in the boss and thrusts against the roller axle, biasing the sensing roller away from friction bar 43.

Shoulder harness 18 passes into the housing through lower opening 56 (FIG. 4), upwardly between the rollers 44 and 41, over roller 41, downwardly past bar 43 and out of the housing to anchor spring 23 (FIG. 1), by way of opening 57. An alternate entry opening 59 in the front side of the cover provides for a different harness path to the fixed anchor represented in FIG. 1 at 15.

The control device of FIGS. 2—6 operates effectively with the elements described above, the sensing roller rotating to advance slack for body motion under slow acceleration conditions, and binding the harness between itself and the friction bar to lock the harness when the acceleration is great enough to overcome the bias of springs 54.

The rate of acceleration which causes the harness to be locked is determined largely by the spring load against the sensing roller. The spring load may be adjusted by turning the threaded heads of the guide pins 49 within the bosses. An aperture 61 in the bottom of the cover adjacent each boss gives access to the threaded heads for such adjustment.

In addition to the above-described elements, the instant embodiment comprises latch means operative to permit selection of different control states. Latches 65, 66 mounted on pivot pins 68, 69 respectively in wings 34, 35 afford means for latching the control device in locked condition, with no further harness traverse with respect to the control until the latches are released by manipulation of release knob 71.

Without the latches and release knob, the control device arrests the harness and then returns to free motion condition when the force is released. With the latches the harness may be locked in arrested position until released as desired.

The latches 65, 66 are connected by a rod 73. An internally threaded lug 75 central of the rod receives a threaded knob stem 76. A compression spring 78 mounted between the lug and the inner face of the plate 33 loads the latches into contact with axle ends 39 of the sensing roller. Under rapid acceleration the roller bias is overcome, the belt motion moves the roller downwardly and the latches pivot so that the axle ends are latched in a notch 79 of each pivoted latch. The roller is thereby held in locked condition until knob 71 is moved. The locked condition of the control device is shown in FIGS. 5 and 6.

The harness control may be set to defeat the latches by threading the knob into contact with the housing while the knob is withdrawn leftwardly, as in FIG. 3, against the pressure of spring 78.

An alternate harness arrangement is shown in FIG. 7, with lap belt 14B being wound about a conventional belt takeup reel 81 which is resiliently anchored to the vehicle floor at 82. The lap belt continues from the reel to an anchor 83 on harness traverse control 20.

Shoulder harness 18 passes through the control and slack portion 22 continues downwardly from the control to a second takeup reel 85, of conventional design. The second reel is also anchored to the vehicle floor, as is lap belt portion 14A extending from buckle 17.

A wearer of the device of FIG. 7 is free to move slowly against the restraint of the harness, gaining freedom of motion first from the yielding of the first reel, which preferably has a lesser spring loading than second reel 85. If motion freedom greater in degree than afforded by reel 81 is desired, then further displacement of the wearer draws the harness through control 20 from slack portion 22, wound on reel 85. However, if the wearer's momentum is rapidly changed, the harness-traverse control locks to preclude traverse of the harness therethrough, restraining the wearer against seat 31 by harness portion 18.

When the harness is not in use the reels act to draw elements 18 and 14B away from the seat parallel to vertical side 87 of the vehicle.

FIGS. 8 and 9 illustrate an alternate embodiment of the invention wherein the harness-traverse-control element is embodied in a harness buckle 91. The buckle connects a fixedly anchored belt portion 92 and a doubled harness portion 93. Portion 93 has an end 95 fixedly anchored and an end 96 resiliently anchored.

The doubled harness portion loops about a sensing roller 98 articulately mounted between spaced, parallel buckle walls such as wall 99 of FIG. 9. Each wall 99 has a slot 101 that slopes from the normal position of the sensing roller toward a friction bar 102 which is fixed on a wall 103 of the buckle. The axle ends of the roller are spring loaded as in the previously described embodiment normally to be spaced from the friction bar.

An extension spring 106 biases a pair of latches such as latch 107 into contact with the ends of axle 108. The latches are notches to engage the axle ends when sensing roller 98 is urged into the dotted position 98A because of rapid acceleration of belt 93. The roller is held by the latches in that condition binding the harness belt against the friction bar such that no slack traverses the control, fixing the position of the wearer with respect to the seat.

The latches may be released by manipulating latch connecting rod 109 which may have an exteriorly protruding end (not shown) for that purpose.

A conventional buckle assembly 110 may afford means for grasping and releasing the metallic end fitting 111 of belt portion 92.

In FIGS. 10 and 11 a harness control device 120 is also embodied in a harness buckle, to be combined with the other elements of a restraint harness as shown in FIG. 9. In the embodiment of FIGS. 10 and 11 a sensing roller 122 extends between tabs such as tab 123 situated within wall 125 and ends 126 of the buckle housing. A buckle lock lever 128 covers the inner elements and restrains a metallic end fitting 129 of anchored belt portion 92.

Sensing roller 122 has no axle, but has flattened ends that reside in guide slots such as slot 131 in the tabs 123. Each flatted end has a notch 134 that receives one end of a biasing spring 136 which loads the sensing roller away from a binding roller 139.

Roller 139 is journaled between tabs 123 parallel to sensing roller 122. The doubled belt passes over roller 122, but both portions of the belt pass on the same side of the binding roller. Thus, when the sensing roller is impelled toward the binding roller by rapid acceleration of the harness, the two portions of the belt are forced together between the binding roller and wall 125, creating a large friction force preventing traverse of the harness component with respect to the control device.

Each of the embodiments of FIGS. 9 through 11 may have means for adjusting the bias of the sensing element with respect to the acceleration rate at which the device locks. The means shown in FIGS. 9 through 11 is similar to that illustrated and described with respect to the embodiment of FIGS. 1 through 6.

FIG. 12 schematically illustrates a further alternate embodiment of the invention wherein the motion of the sensing element actuates a friction element, causing it to move into frictional relationship with that portion of the harness traversing the control device. In FIG. 12 a sensing roller 141, which may be similar in mounting and biasing to those previously described, has a harness portion 142 passing around it. A prism-shaped binding bar 143 is pivotally mounted adjacent the roller. A face 144 of the bar slopes across the path of freedom of the roller defined by guide slots such as slot 145. As roller 141 is impelled by excessive acceleration of the harness portion along that path, it contacts bar face 144, urging point 147 of the bar into frictional engagement with the harness, locking it against a wall 149 of the control-device housing, precluding displacement of the harness with respect to the device.

FIG. 13 shows schematically a further alternate embodiment of the invention wherein the sensing element, in this case a roller 151, bears against an edge of a pivoted lever arm 153 to force the friction roller 155 carried by the lever arm into arresting contact with a harness portion 156 that passes around roller 151. The roller is guided by slots such as slot 158, and may be spring biased away from the friction roller as in previously described embodiments.

I claim:

1. A momentum-actuated harness comprising a harness belt, a fixed harness anchor, a resilient harness anchor, a plate, spaced wings extending from the plate, a guide slot in each wing, a sensing roller extending between the wings having ends residing in the slots in the wings, a friction bar on the housing adjacent the roller and sensing-roller-biasing means urging the roller away from the friction bar, the path of the harness belt being from the resilient harness anchor between the friction bar and the sensing roller, over that surface of the roller in the direction of the biasing force and thence to the fixed anchor, such that moderate belt acceleration causes the belt to pass over the sensing roller while rapidly increasing belt acceleration displaces the sensing roller to bind the belt between the sensing roller and the friction bar.

2. A harness in accordance with claim 1 wherein the guide slots in the wings diverge from the friction bar in the direction of sensing roller bias.

3. A harness in accordance with claim 1 further comprising means for adjusting the load of the roller-biasing means on the sensing roller axle ends.

4. A harness in accordance with claim 1 further comprising sensing roller latches, means for biasing the latches into contact with the roller ends, and means for defeating the latch-

biasing means such that the latches are inoperative to latch the sensing rollers in locked position.

5. A momentum-actuated harness traverse control for use with a harness belt and comprising a plate, spaced wings extending from the plate, a guide slot in each wing, a sensing roller mounted between the wings, a friction bar on the housing adjacent the sensing roller, sensing roller ends residing in the guide slots in the wings, and roller-biasing means urging the roller away from the friction bar, the path of the harness belt being between the friction bar and the sensing roller and over the surface of the roller in the direction of the biasing force such that moderate belt acceleration causes the belt to pass over the sensing roller while rapidly increasing belt acceleration displaces the sensing roller to bind the belt between the sensing roller and the friction bar.

6. A harness-traverse control in accordance with claim 5 wherein the guide slots in the wings diverge from the friction bar in the direction of sensing roller bias.

7. A harness-traverse control in accordance with claim 6 further comprising means for adjusting the load of the roller-biasing means on the sensing roller ends.

8. A harness-traverse control in accordance with claim 5 further comprising sensing roller latches, means for biasing the latches into contact with the roller ends, and means for defeating the latch-biasing means such that the latches are inoperative to latch the sensing roller in locked position.

9. A momentum-actuated harness-traverse control for use with a harness belt and comprising a housing having a back plate, spaced wings extending from the plate, a first articulated pivot-sensing roller extending between the wings, a second fixed pivot roller extending between the wings, a latch on each wing pivoted thereto for motion toward and away from the axis of the first roller, said first roller having an axle extending through the roller and adapted for contact with the latches adjacent each wing, means biasing the latches toward the first sensing roller axle, means biasing the first roller away from the second roller, means guiding the path of the first roller pivot, a binding bar adjacent the periphery of the first roller, and means adapted to attach the housing to an anchor point, the path of the harness belt being into the housing between the binding bar and the first roller, over the first roller on that surface of said roller in the direction of roller bias, and thence between the second roller and the first roller out of the housing.

10. Apparatus in accordance with claim 9 wherein the latch-biasing means comprises a rod extending between latches and a compression spring based on the housing and bearing on the rod.