July 8, 1969 R. H. SMITH ETAL 3,453,699

SAFETY BELT ASSEMBLY

Filed June 9, 1966 Sheet 1 of 4

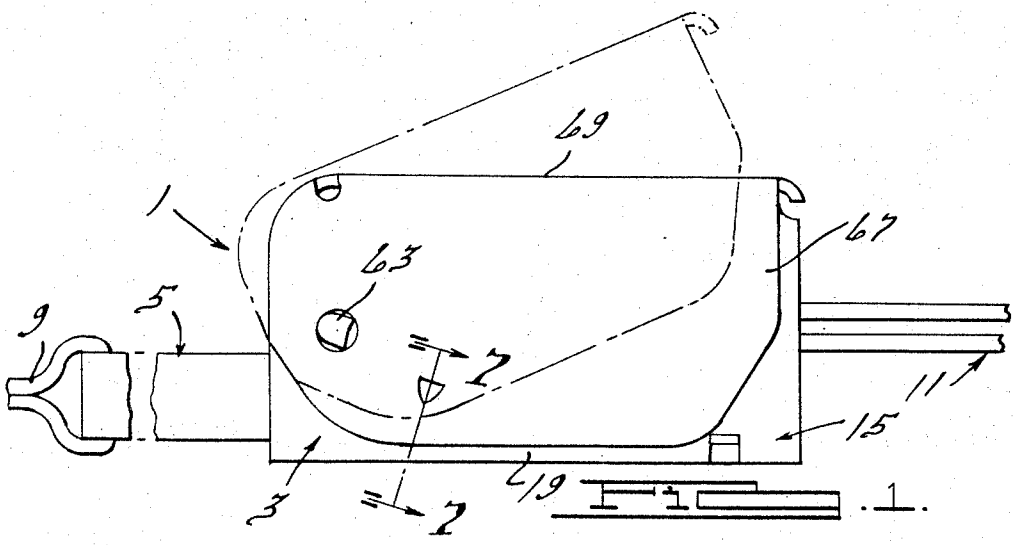


Fig. 1.

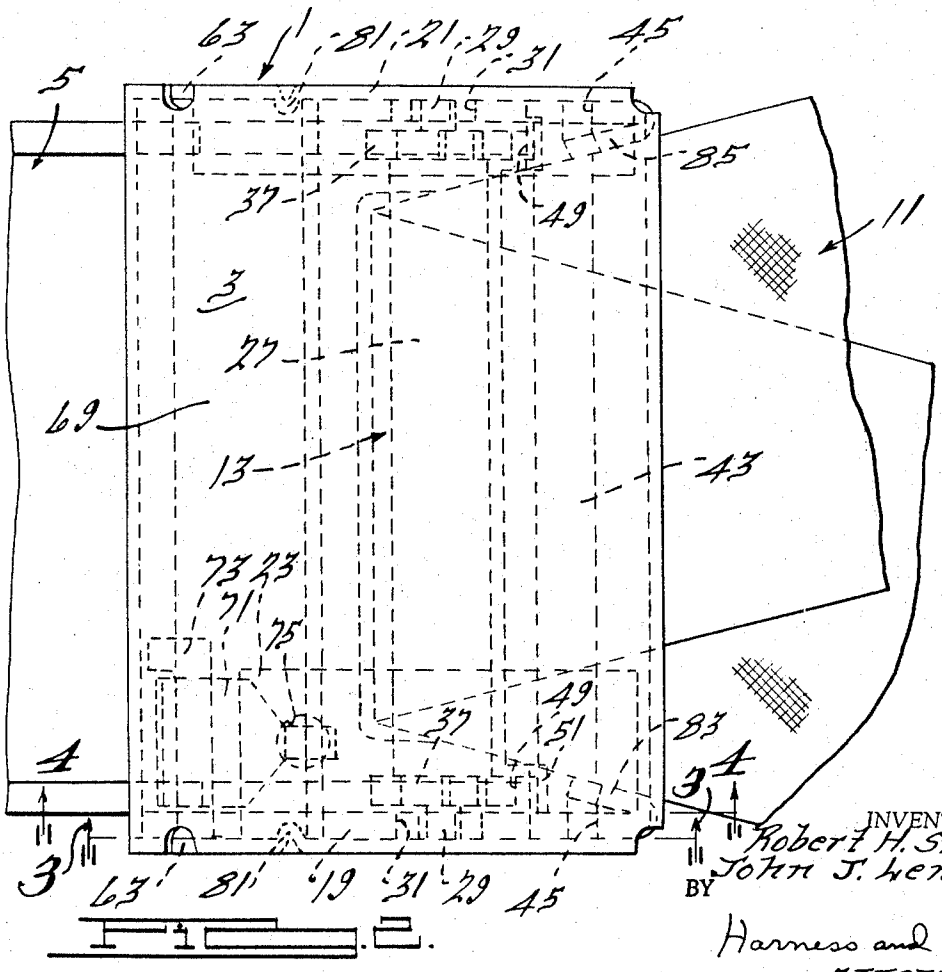


Fig. 2.

INVENTORS
Robert H. Smith
John J. Henosky
BY
Harness and Harris
ATTORNEYS

July 8, 1969 R. H. SMITH ETAL 3,453,699

SAFETY BELT ASSEMBLY

Filed June 9, 1966 Sheet 2 of 4

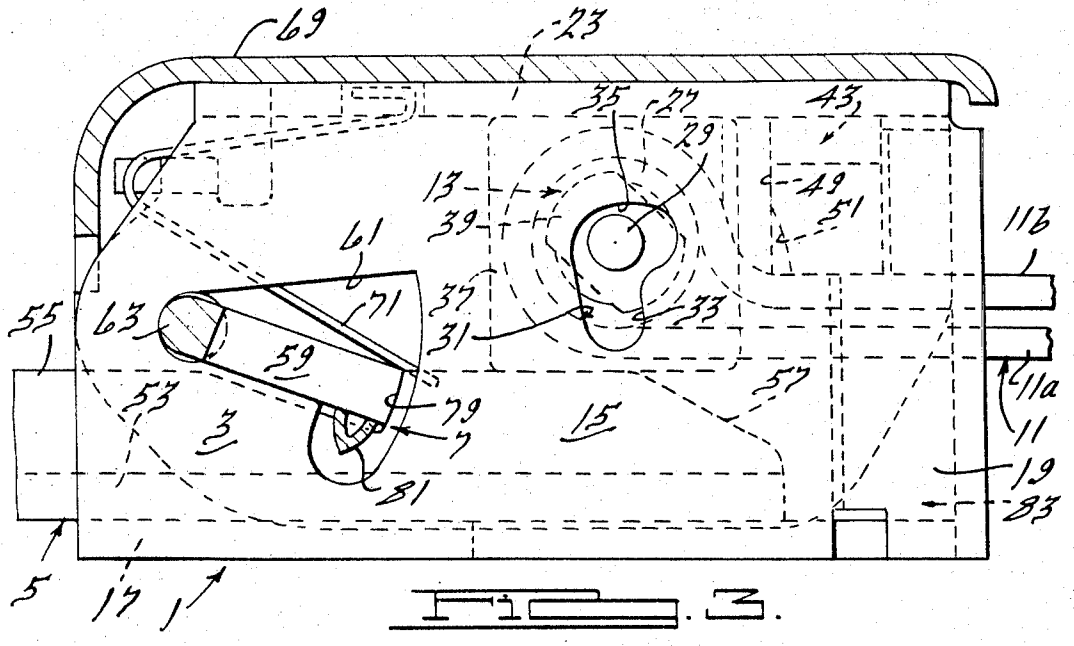


FIG. 3.

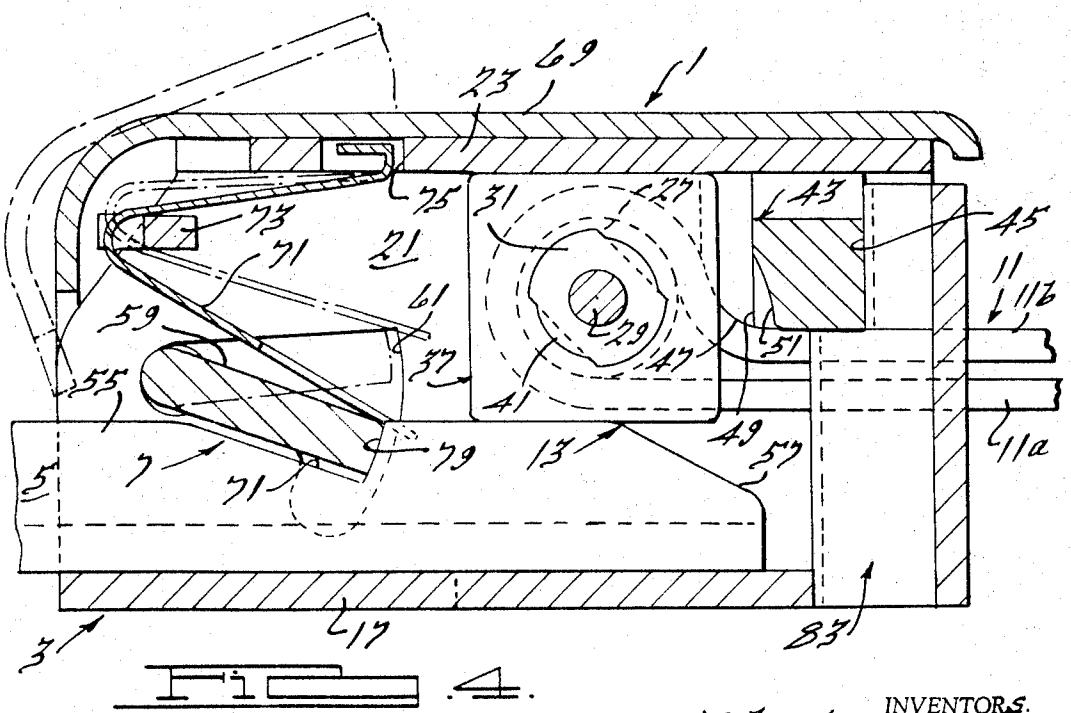


FIG. 4.

INVENTORS.
Robert H. Smith
John J. Henosky.
BY
Harness and Harris
ATTORNEYS.

July 8, 1969 R. H. SMITH ETAL 3,453,699

SAFETY BELT ASSEMBLY

Filed June 9, 1966 Sheet 3 of 4

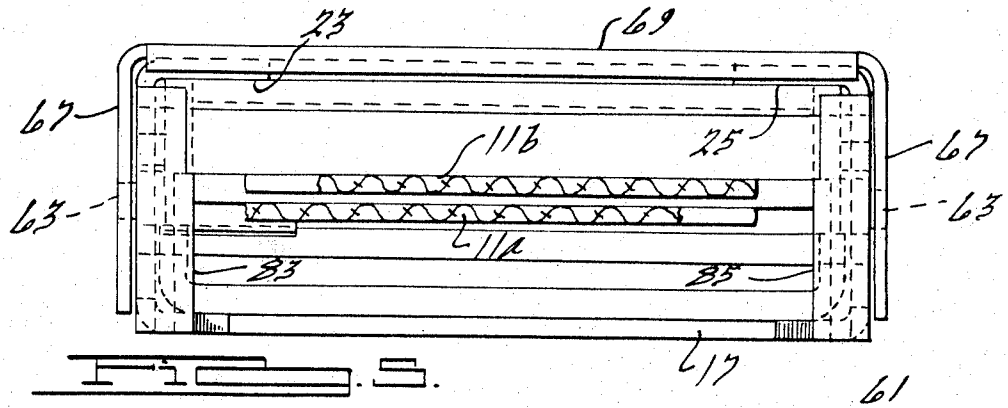


FIG. 5.

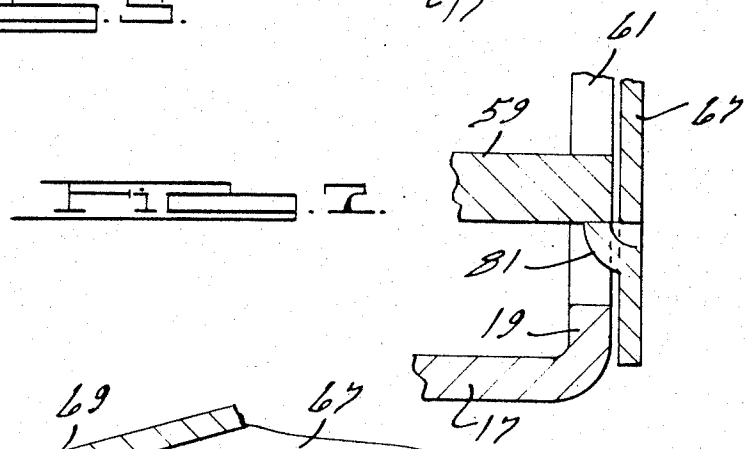


FIG. 7.

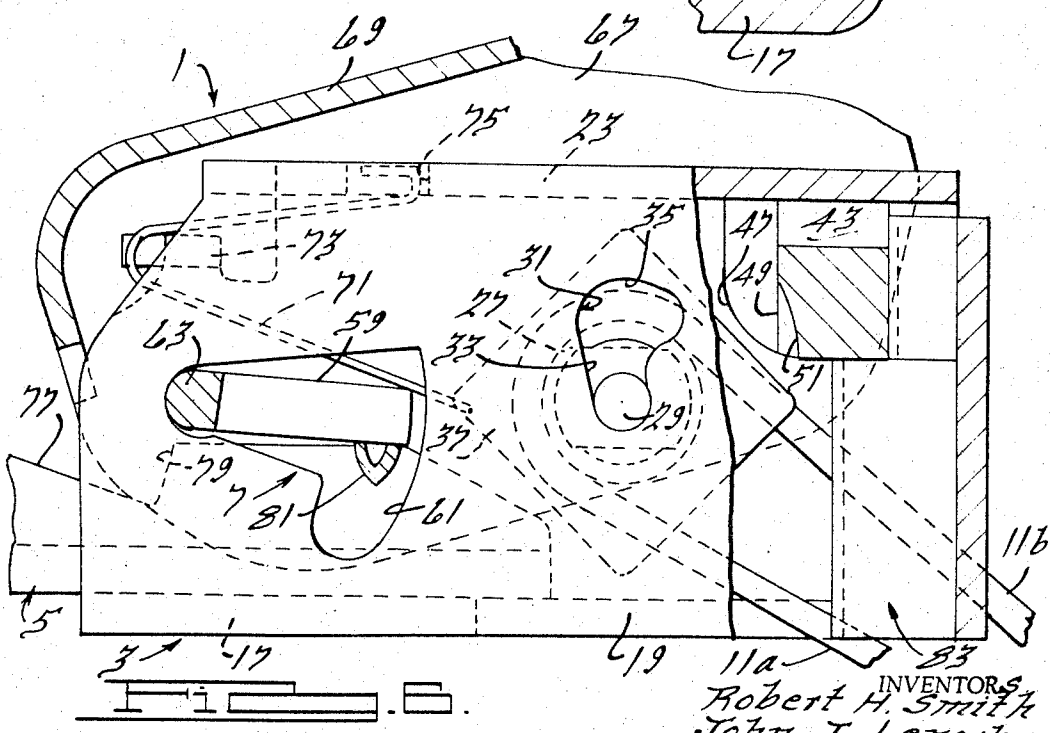


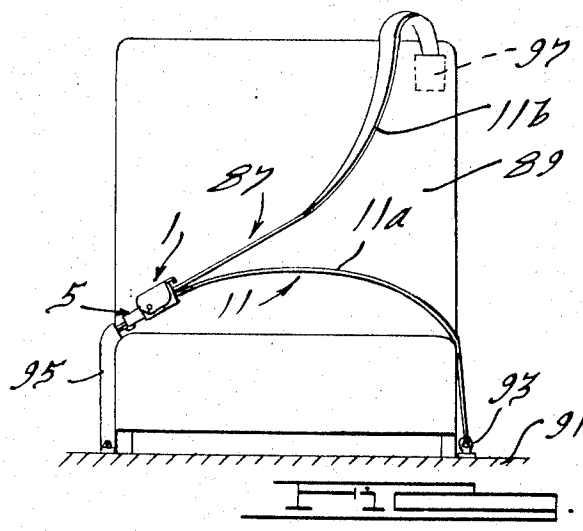
FIG. 8.

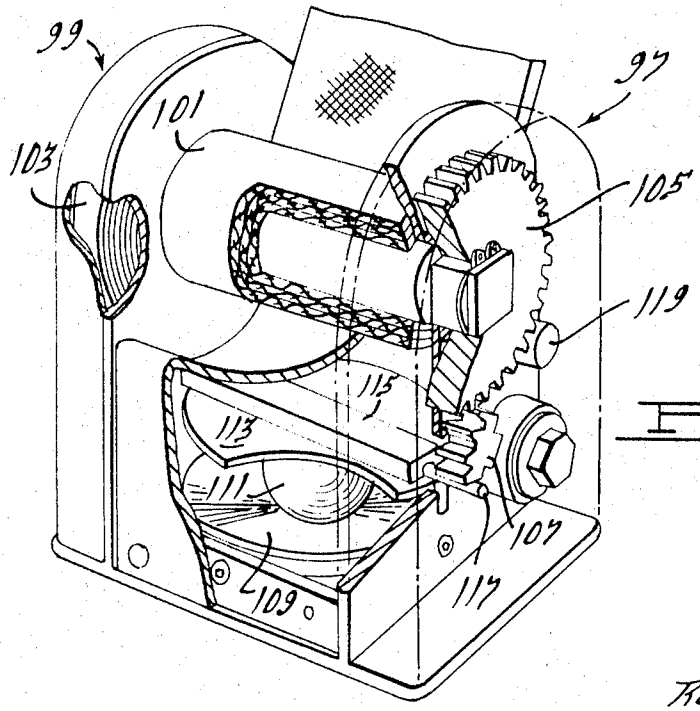
INVENTORS
Robert H. Smith
John J. Lenosky.
BY
Harness and Harris
ATTORNEYS

July 8, 1969 R. H. SMITH ET AL 3,453,699

SAFETY BELT ASSEMBLY

Filed June 9, 1966 Sheet 4 of 4





INVENTORS.
Robert H. Smith
John F. Lenosky.
BY
Harness and Harris
ATTORNEYS.

United States Patent Office 3,453,699
Patented July 8, 1969

3,453,699

SAFETY BELT ASSEMBLY

Robert H. Smith, Southfield, and John J. Lenosky, Highland Park, Mich., assignors to Chrysler Corporation, Highland Park, Mich., a corporation of Delaware

Filed June 9, 1966, Ser. No. 556,468
Int. Cl. A44b 11/25; A62b 35/02
U.S. Cl. 24—77 3 Claims

ABSTRACT OF THE DISCLOSURE

Safety buckle assembly having a rotatable bar around which the belt is trained, the bar having unlimited rotation when the buckle and the tongue of the assembly are separated to permit the belt to have rolling contact with the bar, and locking end heads on the bar, which are locked in a fixed position by the tongue upon insertion of the latter in the buckle to prevent further rotation of the bar. The buckle assembly is incorporated in a belt assembly which has a shoulder portion the end of which is attached to an inertia reel which prevents rapid dispensing of the belt.

This invention relates to safety belt assemblies, more particularly to a safety belt and buckle assembly for seated occupants of vehicles such as automobiles, airplanes, and boats, for example.

In many of the seat belt assemblies presently available, the belt passes through a buckle member which is adapted to grip the belt tightly when the anchored end of the belt extends from the buckle member in one particular direction. Before an increase in the length of belt between an anchored end thereof and the buckle member can be made, it is necessary to tilt the buckle member to a certain angle relative to the belt. This releases a locking mechanism and the buckle member may then be moved along the belt. While this procedure does not affect the safety characteristics of the assembly, it does mean that a certain amount of manual manipulation may be necessary prior to latching the buckle member to a tongue member.

One of the principal objects of this invention is the provision of a safety belt buckle assembly in which the force required to pull the belt through the assembly is considerably less than required in many prior known assemblies.

A further object of the present invention is to provide a seat belt buckle assembly in which the frictional wear on the belt as the latter is drawn through the buckle assembly is less than many prior known assemblies.

A still further object of the present invention is to provide a seat belt buckle assembly of the class described having a buckle member which may be adjusted to various positions along the belt to increase the length of belt between the buckle member and an anchored end of the belt prior to connection of the buckle member to tongue member and without tilting or manipulating the buckle member in any particular manner.

Another object of the present invention is to provide a safety belt assembly which may be self-adjusting after being connected across the party intended to be protected.

Still another object of the present invention is to provide a safety belt buckle assembly which has means for automatically locking the safety belt against movement in one direction in response to connection of a buckle member of the assembly to a tongue member of the assembly.

A further object of this invention is the provision of a safety belt assembly which includes a shoulder belt portion integrally connected to a lap belt portion, and in which the protection afforded by the lap portion is entirely

independent of the protection afforded by the shoulder portion, thereby increasing the overall protection provided by the safety belt.

Still another object of the present invention is to provide a seat belt assembly which automatically moves out of the way of the person using the same after the buckle mechanism is disconnected, and which will assume a predetermined position after disconnection so that the person may readily grasp and reconnect the buckle mechanism when desired.

Another object of the present invention is to provide a safety buckle assembly which, while effective in securely gripping a belt therein against movement in one direction, permits the belt to be moved in another direction without being impedimentary.

A further object of this invention is the provision of a safety buckle assembly which is simple and economical in construction and reliable in operation.

Other objects of this invention will become apparent as the description progresses.

In the accompanying drawings, in which one embodiment of this invention is illustrated,

FIG. 1 is a side elevation of a buckle assembly of this invention;

FIG. 2 is a plan view of the buckle assembly shown in FIG. 1;

FIG. 3 is an enlarged section taken along line 3—3 of FIG. 2;

FIG. 4 is an enlarged section taken along line 4—4 of FIG. 2;

FIG. 5 is an end elevation of the buckle assembly looking from the right-hand side of FIG. 1;

FIG. 6 is a view similar to FIG. 3 showing certain parts in a moved position;

FIG. 7 is an enlarged section taken along line 7—7 of FIG. 1;

FIG. 8 is a front elevation of a seat structure with a safety belt and buckle assembly by this invention attached thereto; and

FIG. 9 is an enlarged perspective view of a dispensing and retracting device forming part of the assembly shown in FIG. 8, certain parts being broken away and other parts being shown in broken lines for clarity.

In the drawings like reference characters indicate corresponding parts throughout the several views.

Referring now to the drawings, a safety or seat belt buckle assembly of this invention is generally indicated at 1 in FIG. 1. Assembly 1 is formed of a buckle member 3 and a tongue member 5 adapted to be connected together by a latching device 7 (FIG. 3). One end of a belt 9 is connected to tongue 5 and another belt 11 passes through a belt-movement control mechanism 13.

Buckle member 3 includes a frame 15 having a base 17 and upstanding sidewalls 19 and 21. Overhanging portions 23 and 25 extend inwardly from the upper edges of sidewalls 19 and 21, respectively. Control mechanism 13 includes a bar or roller 27 extending across the buckle member 3 between sidewalls 19 and 21. Bar 27 is preferably knurled to provide friction surface around which belt 11 is trained. Support pins 29 extend outwardly from opposite ends of bar 27 in an axial direction into curved slots 31 in sidewalls 19 and 21 for slideably and rotatably mounting the bar 27. Each slot 31 has a first portion 33 which extends upwardly from base 17 and a shorter second portion 35 extending laterally from the upper end of portion 33.

Two generally square-shaped end heads 37 are connected to opposite ends of bar 27, inwardly of pins 29, by generally rectangular interlocking sections 39 (FIG. 3) on bar 27 extending into similarly shaped holes in end heads 37. Overhanging lip members 41 on the ends of sections 39 prevent removal of the end heads from the

sections. The end heads **37** are adapted to lock the bar **27** against rotation as will be made apparent hereafter.

A reaction member **43** extends across the buckle member **3** into retaining holes **45** (FIGS. 2 and 3) in sidewalls **19** and **21**. Member **43** has a curved face **47** adjacent bar **27** for engaging one side of belt **11** as the latter passes around bar **27**. The end portions of bar **27** are relieved as indicated at **49** and **51** (FIGS. 2, 3 and 4) to permit the end heads **37** to be rotated without interference when the bar **27** is in the position shown in FIG. 2. If the bar **27** and end heads **37** are not held in the position shown in FIGS. 3 and 4, i.e., if the bar and end heads are free to assume the position shown in FIG. 6, the application of tension on either belt portion **11***a* or **11***b*, regardless of the angle between the buckle member **3** and the belt portion on which tension is applied, causes the bar **27** to rotate and the support pins **29** to be moved toward the lower end of slots **31**, thus permitting the belt to pass freely through the buckle member **3**.

If however, the bar **27** and end heads **37** are held in the position shown in FIGS. 3 and 4, the belt portion **11***b* is clamped between bar **27** and the curved face **47** of reaction member **43**, and any tension applied to belt portion **11***a* only increases the clutching effect exerted by bar **27** and reaction member **43**, thereby preventing movement of the belt through the buckle member **3** in one direction. The application of a tension force on belt portion **11***b* which is proportionally greater than the tension force on belt portion **11***a*, will cause portion **11***b* to slide in clockwise direction as viewed in FIG. 3 around bar **27**. Thus, the belt **11** may be pulled through the buckle member **3** when the bar **27** and end heads **37** are in the position shown in FIGS. 3 and 4 by subjecting belt portion **11***b* to tension.

The bar **27** and end heads **37** are moved from a freely rotatable position such as shown in FIG. 6, in which the belt may be easily pulled through the buckle member **3** by subjecting either belt portion **11***a* or **11***b* to tension, to a locked position such as shown in FIGS. 3 and 4, in which the belt is held against movement when belt portion **11***a* is subjected to tension, but is not held against movement when portion **11***b* is subjected to tension, by the insertion of tongue member **5** into the buckle member **3**.

Tongue member **5** comprises a generally flat base **53** having rails **55** at the lateral edges of the base adapted to be vertically aligned with end heads **37** when the tongue member is inserted into buckle member **3**. The leading edge portions of rails **55** are inclined as indicated at **57** to form camming surfaces for camming end heads **37** from the position shown in FIG. 6 to the position shown in FIGS. 3 and 4. As will be seen by referring to FIG. 6, the leading edges of rails **55** engage either the sides or the rounded corners of the generally square-shaped end heads **37** and kick the latter to a position wherein one side of each end head **37** rests on the inclined portion of the adjacent rail **55**. Since support pins **29** are confined to slots **31**, inward movement of tongue member **5** causes the end heads **37**, and consequently bar **27**, to move upwardly until one corner of each end head engages the inside surface of the respective overhanging portion **23** or **25**. Continued inward movement of tongue member **5** causes the end heads to pivot around the points of engagement with the overhanging or backing portions **23** and **25** to the position shown in FIGS. 3 and 4. This locks the end heads **37** and bar **27** against rotation so that the belt may be locked upon application of tension to portion **11***a*.

The latching device **7** for preventing withdrawal of the tongue **5** includes a locking member **59** extending across buckle member **3** and through openings **61** in sidewalls **19** and **21**. The locking member **59** has lateral extensions **63** which extend through holes **65** in the side plates **67** of a handle or release lever **69** for rotatably mounting the locking member. The locking member **59** is biased to swing downwardly by a flat spring **71** bent around a spring support or reacting arm **73** extending inwardly from sidewall **19**. The fixed end of spring **71** is located in a hole **75** in overhanging portion **23**. The rails **55** of tongue **5** have latching notches or recesses **77** therein into which the outer end portions of locking member **59** are biased when tongue **5** is inserted into buckle member **3** to the position shown in FIGS. 3 and 4. The locking member **59** is butted against shoulder **79** of recesses **77** to prevent the withdrawal of the tongue member.

The side plates **67** of release lever **69** are punched inwardly to provide unlatching ears or shoulders **81** (FIG. 7) which extend through openings **61** below locking member **59**. When the release lever **69** is in the position shown in solid lines in FIGS. 1, 2 and 3, the shoulders **81** are located below the locking member **59** and do not interfere with the seating thereof in recesses **77**. However, if it is desired to release the tongue member **5** from the buckle member **3**, the lever **69** is swung to the position shown in broken lines in FIGS. 1 and 4. This causes shoulders **81** to engage and swing the locking member **59** out of recesses **77** to the position shown in FIG. 6. The tongue member **5** may then be withdrawn from the buckle member **3**.

The sidewalls **19** and **21** are turned in at the right-hand end thereof as viewed in the drawings to provide belt guides **83** and **85**, respectively, for guiding belt portions **11***a* and **11***b* when the buckle assembly is employed in a combination lap and shoulder safety belt assembly described hereafter.

Operation of the buckle assembly **1** and connection of the tongue member is as follows.

First, assuming the belt **9** and belt portions **11***a* are anchored to a support and it is apparent that the belt portion **11***a* has to be lengthened to extend across the person to be protected, the buckle member **3** is grasped and pulled, without regard to the angle belt portion **11***a* forms with the buckle member, toward the tongue member **5**. Thus, it is unnecessary to hold the buckle member in any particular position before the length of belt portion **11***a* may be increased. As the buckle member **3** is pulled to the left as viewed in the drawings, the belt is pulled around and rotates bar **27** in a counterclockwise direction to increase the length of belt portion **11***a*.

Since the belt does not slide over the bar **27**, the frictional wear on the belt is less than the buckle assemblies which require that the belt slide over a locking member. Moreover, the force required to pull the belt portion **11***a* or **11***b* through the assembly is less than the force which would be required if the belt were slid over a nonrotatable bar. The only resistance to rotation of bar **27**, when it is in the FIG. 6 position, is due to friction on the ends of the bar in slot **31**, and even this resistance is minimized by making the projections **29** smaller in diameter than the bar **27**. If the buckle member **3** is pulled too far, so that belt portion **11***a* is too long, it is of no consequence since the belt portion **11***a* may be easily shortened after the buckle and tongue members are coupled.

The tongue member **5** is next inserted into buckle member **3**. As mentioned previously, as the leading ends of the side rails **55** engage the end heads **37** the latter are cammed upwardly from the position shown in FIG. **6** to the position shown in FIGS. 3 and 4 so that the belt may be locked between the bar **27** and reaction member **43** upon the application of tension on portion **11***a*. This will prevent any further significant increase in the length of portion **11***a*. However, if the belt portion **11***a* is too long and has some slack in it, the slack may be readily removed by pulling on belt portion **11***b*. This causes the belt to slide clockwise as viewed in the drawings over the now nonrotatable bar **27** and reduce the slack in portion **11***a*.

When it is desired to release the buckle assembly, the lever **69** is merely swung upwardly to lift the locking member out of recesses **77**.

The buckle assembly **1** is shown in connection with a safety belt assembly **87** of this invention in FIG. 8. Assembly **87** is connected with a seat unit **89** mounted on a support unit **91**, such as a body floor or chassis of an automobile.

Safety belt assembly **87** includes a belt **11** having a lap portion **11***a* adapted to extend across the lap of the person to be protected and a shoulder portion **11***b* adapted to extend across the upper torso of the person from the lower portion at one side thereof to the other side thereof adjacent the shoulder. The lower end of belt **11** is anchored to the support **91** as indicated at **93** and passes across the seat unit **89** to and through a safety buckle assembly **1**. The tongue member **5** of assembly **1** is shown as being connected to a rigid connector **95** secured to support **91** at the side of seat **89** opposite anchor **93**. It will be understood that, if desired, tongue member **5** could be connected to a belt, such as belt **9**, which is secured to support **91**, rather than being attached to connector **95**.

After passing through buckle assembly **1** belt portion **11***b* extends across the torso to a dispensing, locking and retracting mechanism **97**. Mechanism **97** may be any one of various commercially available devices of this type, and is here shown to be an inertia lock device adapted to lock the belt against movement upon sharp braking, high-speed turns, or a minimum amount of acceleration in any direction.

Mechanism **97** comprises a housing **99** connected to seat **89** at the upper end and to one side of the back of the seat. A reel **101** is rotatably mounted in housing **99** and has one end of belt **11** connected thereto. The reel is spring-loaded by a spring **103** to exert tension on belt **11** for winding the latter on the reel. A gear **105** is attached to one end of reel **101** and may be rotated by a gear sector **107** swingingly mounted in housing **99**. Fixed in the housing **99** is a saucer-shaped plate **109** having a ball **111** thereon. A flat disc **113** is located above plate **109** and is connected to a bar **115** having a pin **117** extending through a slot in the housing below gear sector **107**. The mechanism **97** permits the person to be protected to be free for movement, i.e., it permits the belt **11** to be withdrawn from the reel **101** for enabling the person to reach for controls, etc., during normal movements of the vehicle. This condition exists as long as the ball **111** remains in the lower portion of plate **109**. However, a sudden change in direction of the vehicle, or sharp braking, or acceleration unseats the ball and moves it toward the raised rim of the saucer-shaped plate **109** into contact with disc **113**. This raises the disc **113** and bar **115** until the pin **117** on the latter contacts and moves gear sector **107** into mesh with gear **105**. The tension in belt **11** then rotates the gear **105** and consequently sector **107** until the latter engages a stop pin **119**. This prevents further movement of sector **107**, gear **105** and reel **101** so that the reel operates as a fixed anchor and thus prevents dispensing of the belt **11**. When conditions have returned to normal and ball **111** returns to the center of plate **109**, the reel **101** is released by the locking gears and permits the belt **11** to be pulled from the mechanism.

The safety belt assembly **87** operates in the following manner:

Assuming that tongue member **5** and buckle member **3** are separated, the spring-loaded reel **101** retracts the belt **11** until the belt extends from mechanism **97** generally straight downwardly to anchor **93**, with the buckle assembly **1** being located somewhere between the mechanism and the anchor. In this position the belt and buckle assembly is located at one side of the seat unit **89** in an out-of-the-way position which permits the person to slide into and out of seat unit **89** without hinderance by the belt.

After the person is seated in unit **89**, the buckle assembly **1** is grasped and pulled across the person's lap toward and into engagement with tongue member **5**. As the buckle assembly **1** is moved belt **11** is dispensed from mechanism **97** and passed around the bar **27** of the buckle member **3** in a manner previously described. If the buckle assembly **1** is pulled too far from anchor **93** so that the lap portion **11***a* tends to be too long the mechanism **97**, if the spring therein is quite strong, will retract the belt **11** through buckle assembly **1** until the slack is taken up in both the shoulder portion **11***b* and the lap portion **11***a*. If it is desired to take up slack in portion **11***b* only, the spring in the mechanism **97** is designed to have less strength. Thus, the safety belt assembly may be made to be self-adjusting.

The guides **83** and **85** (FIG. 2) orientate the belt portions **11***a* and **11***b* as the latter approach and leave the buckle member **3**.

In view of the foregoing it will be seen that the buckle assembly of this invention may be adjusted along the safety belt without holding it in any particular position relative to the belt. This obviates the necessity of manual manipulation of the buckle assembly as heretofore required in many belt buckles. Upon interlocking the buckle member and the tongue member, the belt is automatically locked against movement in one direction, while at the same time the belt is free to move in another direction upon subjecting the belt to tension.

The safety belt assembly of this invention is, as described previously, self adjusting when the buckle member and tongue member are hooked together. Moreover, the buckle assembly **1** permits the lap portion **11***a* to be locked against movement independently of the locking of the shoulder portion **11***b* against movement, thus providing lap protection which is independent of shoulder protection.

While the belt portion **11***b* has been shown and described herein as either being free or connected to a reel mechanism attached to the seat or other support, it will be understood that for a seat belt having a lap portion only, the belt portion **11***b* could be attached to a wind-up reel connected to the buckle member **3** of the buckle assembly, if desired. In such case, the wind-up reel could be of relatively lightweight construction, since the reel and portion **11***b* would not take any load because the portion **11***a* is locked in buckle member **3**. Alternatively, the wind-up reel could be attached to the floor or the seat or other support adjacent anchor **93**, for example. In this case not only the reel but the belt portion **11***b* may be of light weight construction since they would not be subjected to heavy loads.

While the seat unit **89** is shown in the drawings as being of the bucket-seat type, it will be understood that the term seat unit as used herein and in the claims also refers to that portion of a so-called bench seat structure which is normally occupied by one person. Thus, reference to one side of the seat unit also refers to one side and rearwardly of the portion of a seat in which a person may be seated. Furthermore, it will be understood that the terms safety belt assembly and safety buckle assembly refer to apparatus for restraining movement of a person from a seat of a moving vehicle.

While a preferred embodiment of the invention has been specifically disclosed it is understood that the invention is not limited thereto, as many variations will be readily apparent to those skilled in the art.

We claim:

1. A safety belt buckle assembly comprising a buckle member and a tongue member, said tongue member being adapted for insertion into said buckle member, said buckle member having a top flat wall, cooperating latching means on said members for connecting them together upon insertion of said tongue member, manually operated means for releasing said latching means to permit separation of said members, belt gripping means in said buckle member for securely gripping a belt passing therethrough, said belt gripping means comprising a reaction member, a bar mounted in said buckle member for sliding movement and unlimited rotation when said buckle and tongue

members are separated, said bar being adjacent and substantially parallel to said reaction member, said bar being adapted to have a belt trained around it with the belt on one side of said bar passing between said bar and said reaction member and with two belt portions extending from the bar, and locking means on said bar, said locking means comprising locking members having two opposed flat edge portions the distance between which is greater than the largest transverse dimensions of said bar, said bar and reaction member being adapted to permit the belt to be moved through the buckle member when said buckle member and tongue member are separated and tension is placed on either belt portion, one of said flat edge portions of each locking member engaging said top flat wall and the other flat edge portion engaging said tongue member when the latter is inserted in said buckle member to lock said bar against rotation, said bar and reaction member, when said tongue member is inserted in said buckle member and said locking members are holding said bar against rotation, cooperating to clamp the belt therebetween for preventing movement of said belt when tension is placed on one of said belt portions, the belt being movable when tension is placed on the other belt portion.

2. A safety belt buckle assembly as set forth in claim 1 wherein said buckle member has slots therein in which the ends of said bar are located for forming the slidable mounting of the latter, said bar, when said locking members are engaged by said tongue member, sliding in said slots to the position wherein said flat edge portions are engaged by said top flat wall and tongue member.

3. A safety belt assembly associated with a seat unit mounted on a support unit comprising an elongated belt, means anchoring one end of said belt to one of said units at one side of said seat unit, dispensing means connected to the other end and adapted to dispense said belt, said dispensing means being connected to one of said units and having retraction means for subjecting said belt to tension to reduce slack therein between said dispensing means and said anchoring means, a locking mechanism comprising a buckle member through which said belt passes and a tongue member adapted to be releasably

connected to said buckle member, said tongue member being connected to one of said units at the other side of said seat unit, said buckle member having control means adapted to permit said belt to pass through the buckle member when said buckle and tongue members are separated and when tension is placed on said belt, said tongue member actuating said control means to prevent movement of the belt in a direction which would increase the length of the belt between said buckle and said means anchoring said one end of said belt, said control means comprising a bar extending across said buckle member and adapted to have the belt trained around it, support members extending axially from the outer end thereof, said buckle member having slots in the sides thereof, said support members extending into said slots to mount said bar for sliding movement and unlimited rotation when said buckle and tongue members are separated, generally polygonal locking heads on the ends of said bar adjacent said support members, said bar being rotatable when said tongue and buckle members are separated, said tongue member, upon insertion into said buckle member, engaging said locking heads and moving the latter to a position wherein the heads are held against rotation to lock the bar against rotation.

References Cited

UNITED STATES PATENTS

2,710,649	6/1955	Griswold	297—389
2,964,815	12/1960	Sereno	24—75
3,078,538	2/1963	Brown	24—77 X
3,258,293	6/1966	Sharp	297—389
3,313,572	4/1967	Smith	24—77 X
3,323,749	6/1967	Karlsson	297—388 X

FOREIGN PATENTS

1,315,039	12/1962	France.

BERNARD A. GELAK, *Primary Examiner.*

U.S. Cl. X.R.

24—196, 230; 297—389