

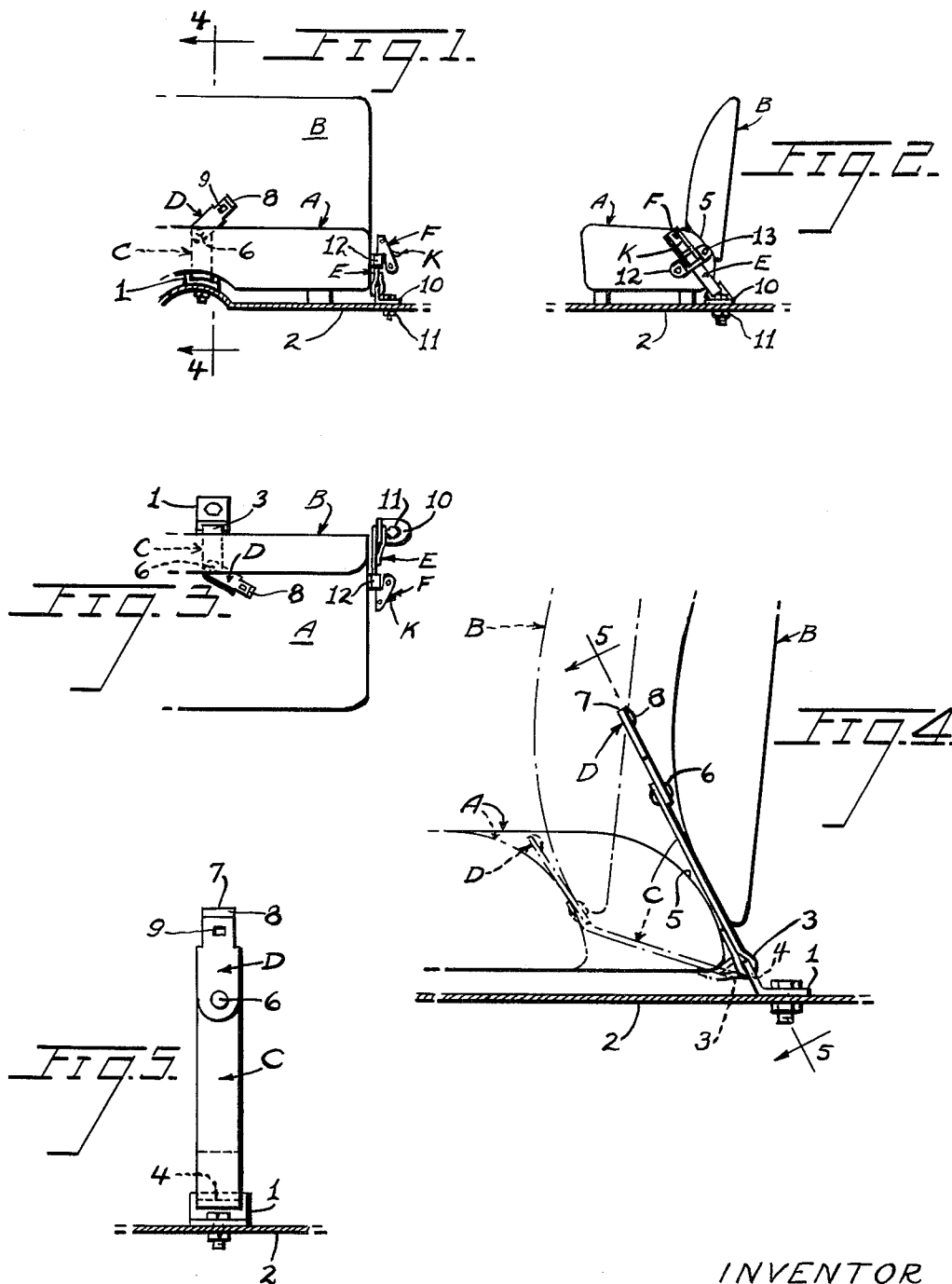
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W. G. SMITH
SAFETY SEAT BELT

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2 Sheets-Sheet 1



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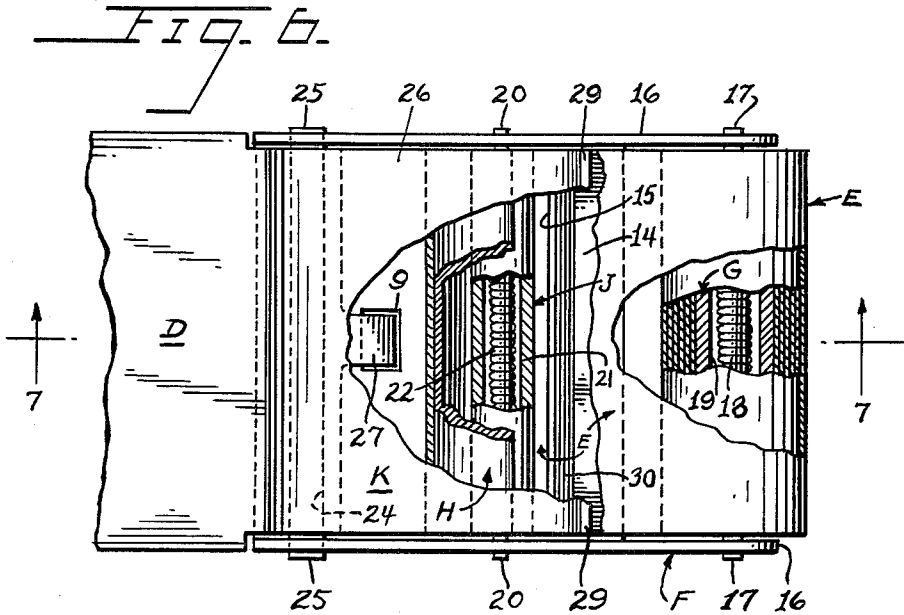
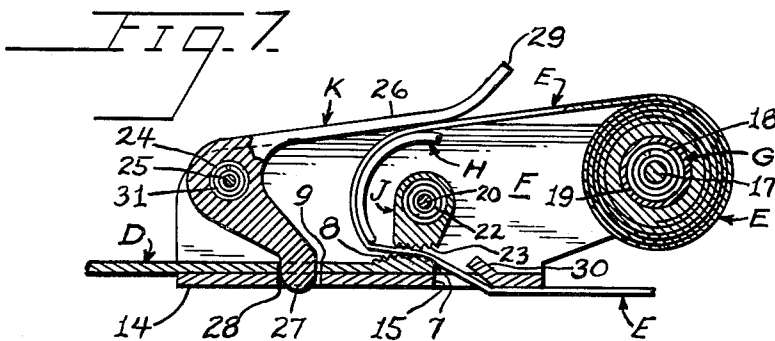
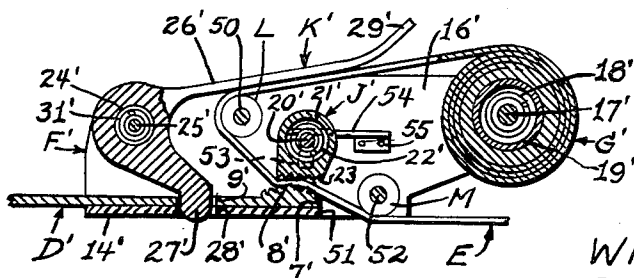
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SAFETY SEAT BELT

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10 Claims. (Cl. 297-388)

The present invention relates to improvements in a safety seat belt and it consists in the combination, construction and arrangement of parts as hereinafter described and claimed.

An object of my invention is to provide a safety seat belt which does not rest on the vehicle seat when the device is in inoperative position. One end of the belt is anchored to the vehicle floor and the other end is wound upon a spring-biased drum that is carried by a single buckle. The buckle is mounted on the side of the vehicle seat when not in use and the unused portion of the belt is carried by the drum. An anchor plate at the center of the seat is pivotally connected to a flexible metal strip that in turn extends between the seat and the seat back and is connected to the vehicle floor. The metal strip holds the anchor plate rigidly enough so that the person occupying the seat can use only one hand to move the buckle and unwind the belt from the drum, the buckle being moved from inoperative position on one side of the seat, across the lap of the person in the seat, and then connected to the anchor plate. The buckle does not rest on the person's lap when the belt is in operative position.

A further object of my invention is to provide a spring-biased cam that will grip the belt when the buckle is connected to the anchor plate and will remove any strain on the portion of the belt still wound upon the drum. The safety belt can accommodate persons of different sizes. Any strain on the belt and buckle caused by an accident or sudden stopping of the vehicle will be transferred to the vehicle floor through the belt and through the anchor plate and flexible anchor strip. A locking lever secures the buckle to the anchor plate and this lever can be manually opened for quick release of the buckle from the anchor plate.

A modified form of my invention substitutes an idler roller for the arcuate shoe. A second idler roller is placed adjacent to the slot in the buckle through which the safety belt extends and it takes the place of the inclined lip that extends along one edge of the slot. I have found that the belt can be fed from the take-up drum and past the belt-engaging pawl or can be fed back onto the drum more readily where idler rollers are used.

A further object of my invention is to provide a safety belt and buckle of the type described which is simple in construction and is durable and efficient for the purpose intended.

Other objects and advantages will appear as the specification continues. The novel features of the invention will be set forth in the appended claims.

Drawings

For a better understanding of my invention, reference should be made to the accompanying drawings, forming part of this specification, in which:

FIGURE 1 is a front elevation of a vehicle seat showing my safety seat belt operatively applied thereto with the buckle and belt disposed at the side of the seat when the belt is not in use. A center flexible metal strip extends between the seat and back and an anchor plate pivoted to the strip can be swung into an out-of-the-way position.

FIGURE 2 is a side elevation of FIGURE 1 and shows the safety seat belt as having one end anchored to the vehicle floor.

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FIGURE 3 is a top plan view of FIGURE 1 and illustrates the center flexible metal strip with one end anchored to the floor and the anchor plate pivotally connected to the other end.

FIGURE 4 is an enlarged vertical transverse section taken along the line 4-4 of FIGURE 1 and illustrating the vehicle seat schematically and as being movable between two extreme positions.

FIGURE 5 is an elevational view of the center flexible metal strip and anchor plate when looking in the direction of the arrows 5-5 in FIGURE 4.

FIGURE 6 is an enlarged top plan view of the buckle and the anchor plate coupled to it with portions of the buckle being shown in section.

FIGURE 7 is a longitudinal vertical section of the buckle coupled to the anchor plate, portions being shown in elevation and is taken along the line 7-7 of FIGURE 6.

FIGURE 8 is a transverse section through a modified form of safety belt buckle.

While I have shown only the preferred forms of my invention, it should be understood that various changes, or modifications, may be made within the scope of the annexed claims without departing from the spirit thereof.

Detailed description

In carrying out my invention I show a vehicle seat in FIGURES 1, 2 and 3. The seat portion is indicated at A and the back of the seat is indicated at B. Although I have in mind a seat for an automobile, my device could be used on airplane seats. FIGURE 4, shows the seat A as being adjustable from a rearmost position shown by the full lines to a foremost position shown by the dot-dash lines. Of course, the seat back B will be moved forwardly or rearwardly as a unit with the seat A. The two positions in FIGURE 4 are shown spaced farther apart than would occur in actual practice. This is done for the purpose of clarity so that the dot-dash line position would be easily distinguishable from the full line position.

In the center of the seat A, I position a metal anchor strip C. This strip is anchored or secured to a bracket 1 that in turn is permanently secured to the floor 2 of a vehicle. The metal strip C has its lower end formed into a loop 3 and the looped portion is passed through a slot 4 provided in the bracket 1. The looped connection of the strip C of the bracket 1 makes the strap pivot about the bracket as the seat A is moved forwardly or rearwardly. The metal strip C is thin and flexible and this permits it to be readily passed through the space 5 formed between the seat A and the seat back B.

An anchor plate D is pivoted to the outer end of the strip C by a rivet 6 or other suitable fastening means. The anchor plate or connector has an outer end 7 that has a rounded upper surface 8 and the purpose of this will be described hereinafter. The anchor plate D also has an opening 9 that is to be used in connection with a safety belt buckle now to be described.

In FIGURE 2 I illustrate a safety belt E that has its end secured to another floor bracket 10 that in turn is secured to the vehicle floor 2 by means of a bolt 11 or other suitable fastening means. The safety belt is then passed through a bracket 12 that is secured to the side of the seat A by screws 13 or other suitable fastening means. FIGURE 7 is a cross section through the safety belt buckle F and this buckle has a base plate 14 with an opening 15 therein for receiving the safety belt E. The base plate 14 has side walls 16 and these side walls carry a shaft 17. The shaft in turn supports a drum G around which the unused portion of the safety belt E is wound. The drum G rotates on the shaft 17 and the

shaft is held against rotation by its connection with the sides 16 of the safety belt buckle F. A torsional spring 18 is mounted in a bore 19 provided in the drum G and this spring has one end connected to the stationary shaft 17 and has its other end connected to the drum. The bore 19 is large enough in diameter to receive the stationary shaft 17 and to still provide space for the coil spring 18. The tendency of the spring when it is wound up is to rotate the drum G in a clockwise direction when looking at FIGURE 7, for winding the unused portion of the safety belt E thereon. A sufficient length of safety belt is provided to extend from the anchor bracket 10 and be passed over the occupant in the seat A and extend across the lap of the occupant to permit the safety belt buckle F to be secured to the anchor plate D. Of course, the safety belt is also long enough to accommodate occupants of the seat that are of different sizes. One end of the safety belt is secured to the bracket 10 while the other end is secured to the drum G.

I will now describe the novel means for causing the safety belt buckle F to grip the safety belt E when the buckle is secured to the anchor plate D. This means permits the desired portion of the safety belt to extend over the lap of the occupant of the vehicle seat and the belt gripping means will permit the unused portion of the safety belt to be automatically wound up on the drum G so that no excess unused portion will be dangling from the safety belt buckle.

In FIGURE 7 I show a portion of the safety belt E extending through the slot 15 in the base 14 of the safety belt buckle F. The safety belt then extends around an arcuate guide shoe H and this shoe extends between the sides 16 of the belt buckle and is rigidly supported by these sides. The safety belt E then extends from the guide shoe H to the spring-biased drum G and this drum has a tendency to be rotated by the torsional spring 18 so as to keep the unused portion of the safety belt wound upon the drum at all times. At the same time, however, the safety belt E will be fed from the drum as it becomes necessary for the belt to pass over the guide shoe H and pass through the opening 15 as the belt buckle is moved from its inoperative position shown in FIGURE 1, to its operative position shown in FIGURE 7, where the belt buckle becomes attached to the anchor plate D.

The space between the sides 16 of the belt buckle F is designed to receive the anchor plate D, see FIGURE 7. The anchor plate slides over the inner wall of the base plate 14 and the rounded upper surface 8 of the lip and the outer end 7 of the anchor plate will be disposed adjacent to the opening 15 in the base plate. The safety belt E will extend over the rounded upper surface 8. This surface 8 may be provided with transversely extending serrations or it may be made rough in any manner so that the safety belt E will have no tendency to slip over the roughened surface when the belt is clamped against this surface by a belt gripping pawl or cam J.

This pawl extends between the sides 16 of the safety belt buckle and it is rotatably mounted on a shaft 20 that has its ends rigidly supported by the sides 16. The belt-gripping pawl J has a bore 21 that receives the stationary shaft 20 and the bore is large enough to also receive a torsional spring 22. This spring has one end connected to the stationary shaft 20 and has its other end connected to the belt-gripping pawl J and the tendency of the spring is to rotate the pawl in a clockwise direction when looking at FIGURE 7. This will swing the pawl J into inoperative position when the anchor plate D is not received in the buckle F.

The position of the shaft 20 and the distance the teeth 23 on the pawl are disposed away from the longitudinal axis of the pawl will cause the pawl teeth to not only engage with a belt portion E when the latter is moved against the pawl teeth by the insertion of the anchor plate D into locked position in the buckle F, but any pull on the belt to tend to move it through the opening 15

will cause the pawl to rock and grip the belt tighter against the lip 8. Any pull on the safety belt E to move the belt through the slot 15 for unwinding additional belt from the drum G will be prevented in this manner.

Of course, the belt can be tightened around the person while he is sitting in the seat A. This is accomplished by the person pulling on the portion of the belt lying between the guide shoe and the drum G. The pawl J will swing clockwise sufficiently to permit the tightening of the belt in this manner and then as soon as the person ceases to pull on the belt, the pull on the belt in the opposite direction will immediately swing the pawl J for clamping the belt against the rounded portion 8 of the anchor plate D.

I provide means for quickly connecting the safety belt buckle F to the anchor plate D and this means can also be manually actuated for the immediate disconnecting of the buckle from the anchor plate when the person desires to free himself from the belt. A spring-biased pivoted latch K is shown in FIGURE 7, and it has a bore 24 for receiving a shaft 25 and this shaft has its ends mounted in the sides 16 of the safety belt buckle F. The latch K has a handle portion 26 and a keeper portion 27. When the latch is in closed position, the keeper 27 will extend through the opening 9 in the anchor plate D and will extend through another opening 28 in the base plate 14 of the safety belt buckle F. The pull on the anchor plate D when the buckle F is attached thereto is such that it will tend to act on the keeper 27 to rotate the latch K in a clockwise direction on the shaft 25 when looking at FIGURE 7. This will move the handle 26 down upon the portion of the safety belt E that extends between the guide shoe H and the drum G.

In addition a coil spring 31 encloses the shaft 25 and is received in the bore 24 in the latch K. One end of the spring 31 is secured to the shaft 25 and the other end is secured to the latch K. The ends of the shaft 25 are rigidly secured in the sides 16 of the buckle frame F and the shaft cannot rotate. The latch K rotates on the shaft and the torsional spring 31 yieldingly urges the latch to rotate clockwise into closed position, see FIGURE 7.

The latch is provided with an outwardly curved end 29 that extends away from the belt portion E and a person who has been strapped in placed by the buckle F secured to a plate D, can merely lift on the outwardly curved end 29 to swing the latch K in a counter-clockwise direction about the latch 25 when looking at FIGURE 7. This movement will free the keeper 27 from the aligned openings 9 and 28 in the anchor plate D and the base plate 14 of the safety belt buckle F respectively. The anchor plate D will immediately pull free of the buckle and the buckle is now freed. There will be sufficient space between the spring-pressed pawl or cam J and the base plate 14 to permit the free movement of the belt E therebetween and the spring-actuated drum G will wind up the unused portion of the safety belt.

Operation

From the foregoing description of the various parts of my invention, the operation thereof may be readily understood. The metal strip C will pivot about the anchor bracket 1 as the seat A is adjusted between its two extreme positions. The anchor plate or connector D can be swung about the rivet 6 into an out-of-the-way position when the safety belt is not used. The rivet 6 creates enough friction between the anchor plate D and the strip C to hold the anchor plate in the angular position into which it has been swung. At the same time when the safety belt buckle F is connected to the anchor plate and the belt is tightened so as to grip the person in the seat A, then the anchor plate D will automatically swing about the pivot 6 so as to cause the longitudinal axis of the anchor plate to coincide with the longitudinal axis of the safety belt buckle frame F.

One of the advantages of my invention is the fact that

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when the safety belt is not used, the belt buckle F will rest upon the bracket 12 and the unused portion of the belt E will be wound upon the spring-biased drum G. This will dispose the buckle F and the unused portion of the belt E in an out-of-the-way position and the buckle and belt can not clutter the top of the seat A when not in use. Also the anchor plate D is swung into an out-of-the-way position.

Another advantage of my invention is that since only a single belt E and buckle F are used, the buckle will not lie in the lap of the person using the device when the belt is fastened in place, but instead the buckle F will be moved entirely across the lap of the person and be connected to the anchor plate D which is placed at the sides of the person. The semi-rigid metal strip C and the anchor plate D are constructed so that the operator need use only one hand in grasping the buckle F from its position adjacent to the bracket 12 and moving the buckle across his lap and connecting it to the anchor plate or connector. This leaves the other hand free to steer the vehicle in case the operator forgets to fasten the safety seat belt before he starts the vehicle and wishes to do this without stopping the vehicle. The usual safety seat belts that are connected to each other by a buckle disposed in the lap of a person requires that two hands be used to fasten the safety seat belt in place. My device obviates this requirement.

The operator in moving the buckle F onto the anchor plate D so as to secure the two together will feed the curved lip 8 between the sides 16 of the buckle and over the inner surface of the base plate 14. The curved lip 8 will act as a cam when it contacts with the keeper 27 and will swing the spring-biased latch K to permit the keeper to ride over the rounded lip. When the opening 9 in the anchor plate aligns with the opening 28 in the base plate, the torsional spring 31 will rotate the latch K clockwise to move the keeper 27 through the aligned openings 9 and 28, see FIGURE 7. The anchor plate is now positively connected to the buckle and all unused portions of the belt E will be wound upon the spring-biased drum G. The latch K functions as securing means between the buckle F and the anchor plate or connector D. The belt will be gripped between the pawl and the rounded lip 8. It is possible to tighten the belt if necessary after the buckle is connected to the anchor plate and, as already explained, this is accomplished by pulling on a portion of the strap E lying between the guide shoe H and the drum G. The pulling on the belt portion E is in a direction to move the belt in a clockwise direction around the guide shoe H when looking at FIGURE 7. The pawl J and the rounded upper surface 8 on the anchor plate D, cooperate to function as a belt-clamping means when the buckle F, is secured to the anchor plate or connector.

I have already explained how the buckle F can be quickly freed from the anchor plate D by merely lifting up on the outwardly curved end 29 of the latch K and swinging the latch in a counter-clockwise direction when looking at FIGURE 7, so as to move the keeper 27 out from the aligned openings 9 and 28. If desired, the opening 15 may have one of its edges inclined as at 30 so that no sharp corners will be presented to the belt E. After the buckle has been freed from the anchor plate it is a simple matter to move the buckle F until it contacts with the bracket 12. The spring-actuated drum G will automatically wind up the excess belt E during this movement. Also the anchor plate D can be swung into an out-of-the-way position. This will free the top of the seat A from any obstruction of the buckle F, belt E and anchor plate D.

In FIGURE 8 I show a slightly modified form of the device illustrated in FIGURES 6 and 7. In FIGURE 8 an idler roller L takes the place of the arcuate guide shoe H and this roller is rotatably mounted on a shaft 50 that has its ends mounted in the sides 16' of the safety belt

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buckle F'. The safety belt E is passed around this roller L.

I have made a second change between the form of the device shown in FIGURES 6 and 7 and the modified form shown in FIGURE 8 and this change includes a second idler roller M. This roller is substituted for the inclined edge 30 and it also takes the place of the base portion 14 that extends to the right of the inclined edge 30 in FIGURE 5. The base 14' of the modified form of buckle F' terminates at the edge 51. I do not provide an opening 15 in the base 14' of the modified form of buckle F'. The idler roller M is rotatably mounted on a shaft 52 and this shaft has its ends mounted in the sides 16' of the buckle F'.

The pawl or cam J' in the modified form of buckle is rotatably mounted on a shaft 20' and this shaft has its ends slidably received in slots 53 provided in the sides 16' of the buckle. Leaf springs 54 are secured to the inner surface of the sides 16' by rivets 55 or other suitable fastening means and the free ends of the leaf springs bear downwardly on the ends of the shaft 20' for yieldingly moving the shaft into its lowermost position in the slots 53.

In all other respects the construction and functioning of the pawl or cam J' is the same as that for the pawl J in the form shown in FIGURES 6 and 7. A torsional spring 22' encloses the shaft 20' and has one end secured to the pawl J' and its other end secured to the shaft 20'. The tendency of the torsional spring 22' is to rotate the pawl in a clockwise direction about the shaft 20'. The shaft 20' is provided with square ends that slide in the slots 53 but prevent rotation of the shaft about its longitudinal axis.

The operation of this form of the device is the same as that shown for the form shown in FIGURES 6 and 7. All parts of the modified form that are the same as the form shown in FIGURES 6 and 7 will be given like reference numerals except that these numerals will be primed. The anchor plate D' will be received between the sides 16' of the buckle F' and this plate will slide over the inner surface of the base 14'. The anchor plate D' is movable into the buckle until it contacts with the belt E and forces the contacted belt portion against the teeth 23' on the pawl J'. The rounded upper surface 8' of the anchor plate D' is serrated or it has transversely extending teeth therein that will engage with the belt portion E. The outer end 7' of the anchor plate D' will terminate at the right hand edge 51 of the base 14' when the anchor plate is in a position to be locked in place by the latch L'.

When the anchor plate D' is in the locked position shown in FIGURE 8, its opening 9' will register with an opening 28' in the base 14' of the buckle F'. The pivoted latch K' will have its keeper 27' enter the aligned openings 9' and 28' and the torsional spring 31' will tend to keep the lever K' in closed position. In this way the anchor plate is secured to the buckle.

I have found that by providing the idler rollers L and M in the modified form of buckle F' instead of the arcuate guide shoe H and the lip 30 in the form shown in FIGURES 6 and 7, the belt E can be moved through the buckle F' with far greater ease and with less friction being developed because the rollers L and M will be rotated by the moving belt. This will not interfere with the gripping of the belt E between the rounded portion 8' on the anchor plate D' and the pawl J' and therefore the belt will be held in adjusted position in the same manner as the belt E is held in place in the form of the device shown in FIGURES 6 and 7.

The anchor plate D' can be released from the buckle F' by the operator merely lifting upwardly on the outwardly curved end 29' of the latch K'. This immediately frees the anchor plate from the buckle. When the anchor plate D' is moved into locked position, it will cause its rounded end 8' to contact with the belt E and to force upwardly this portion of the belt. This belt portion

in turn will be forced against the pawl J' and will move the pawl upwardly until the ends of the shaft 20' reach the upper ends of the slot 53. The pawl J' will grip the belt and prevent it from moving to the right in FIGURE 8.

I claim:

1. A safety seat belt comprising:

- (a) an anchor plate disposed adjacent to a seat;
- (b) means for securing said anchor plate to a floor that also supports the seat for supporting said anchor plate in a semi-rigid position;
- (c) a seat belt having one end secured to said floor;
- (d) a belt buckle for receiving said belt;
- (e) a spring-biased drum rotatably carried by said buckle and having the free end of said belt secured thereto, said drum automatically winding the unused portion of said belt thereon;
- (f) a bracket mounted on said seat and having an opening for receiving said belt, said buckle being supported by said bracket when the seat belt is not used;
- (g) said buckle being adapted to be manually moved by one hand and lifted off said bracket and moved across the lap of the operator who is seated in said seat, and be coupled to said anchor plate,
- (h) a belt-engaging cam carried by said buckle for engaging with one side of said belt;
- (i) said anchor plate having a belt-engaging portion for engaging with the other side of the belt and forcing said belt against said cam when said buckle is coupled to said anchor plate;
- (j) said buckle having belt-guiding means for positioning the belt between said cam and the belt-engaging portion of said anchor plate, and for guiding the unused portion of said belt toward said spring-biased drum where it will be wound thereon; and
- (k) a latch for securing said anchor plate to said buckle.

2. The combination as set forth in claim 1, and in which:

- (a) a torsional spring yieldingly rotates said cam away from said belt when said latch is moved for releasing said anchor plate from said buckle when said buckle is manually freed from said anchor plate;
- (b) whereby said belt is free of said cam and the unused portion of said belt will be automatically wound on said drum as the buckle is moved back to said bracket to be supported thereby.

3. The combination as set forth in claim 1, and in which:

- (a) the means for securing the anchor plate to the floor includes a semi-flexible strip of metal;
- (b) a second bracket pivotally connecting the strip to the floor, said strip being received in the space between a vehicle seat and the seat back; and
- (c) said anchor plate being pivotally secured to the free end of said strip and being frictionally held in the angular position into which it has been manually swung.

4. The combination as set forth in claim 1, and in which:

- (a) said buckle has a base member over which the anchor plate slides when said buckle is coupled to said anchor plate, said base member having an opening therein;
- (b) said anchor plate having an opening therein which is aligned with the opening in said base portion when said buckle is coupled to said anchor plate; and
- (c) said latch has a keeper for entering the two aligned openings when said latch is in closed position for connecting the anchor plate and buckle together.

5. The combination as set forth in claim 1, and in which:

- (a) said belt-guiding means guiding the belt on both sides of said cam for properly positioning the belt

between said cam and the belt-engaging portion of said anchor plate when said buckle is coupled to said anchor plate;

- (b) said cam when engaging with said belt to grip said belt between it and the belt-engaging portion of said anchor plate, preventing any pull on the belt from passing beyond said cam;
- (c) whereby there will be no tendency for this pull to unwind any portion of the unused portion of said belt from said drum.

6. In a device of the type described:

- (a) a buckle frame having a base and two spaced apart side walls, said base having a slot therein through which a safety belt extends;
- (b) a spring-biased cam extending between the side walls of said buckle and being positioned so that the belt will extend near it so that the cam can contact the belt;
- (c) a spring-biased drum carried by said side walls and having the unused portion of said belt wound thereon;
- (d) an anchor plate slidable over the inner surface of said base and between said sidewalls, and having a belt-engaging portion for moving the belt against said cam for causing the belt to be gripped therebetween; and
- (e) a latch for securing said anchor plate to said buckle.

7. The combination as set forth in claim 6, and in which:

- (a) an arcuate guide shoe for the belt extends between the side walls of said buckle frame and is supported by them;
- (b) said arcuate guide shoe being positioned to receive the belt as it leaves said cam and guiding the belt to said drum;
- (c) said latch being spring-biased with the handle of said latch being yieldingly held against a portion of the belt and pressing this portion against said arcuate guide shoe when said latch is in closed position.

8. The combination as set forth in claim 6, and in which:

- (a) said spring-biased cam is mounted on a shaft;
- (b) the side walls of said buckle frame having slots therein for slidably receiving the ends of said shaft, said shaft ends being non-circular in cross section so that they will slide in the slots but will hold the shaft from rotating; and
- (c) leaf springs carried by said side walls and bearing against said shaft for yieldingly urging the shaft ends in one direction in said slots, the slots extending toward said base so that the leaf springs will tend to move the shaft and cam toward the belt-engaging portion of said anchor plate when the latter is coupled to said buckle frame.

9. The combination as set forth in claim 6; and in which:

- (a) an idler roller is rotatably carried by said side walls and guides the portion of the belt extending between said cam and said drum; and
- (b) another idler roller rotatably is carried by said side walls and is positioned for feeding the belt toward said cam.

10. In combination:

- (a) a buckle having a reel mounted thereon;
- (b) a belt having one end attached to a vehicle and its other end attached to said reel with the unused portion of the belt being wound upon said reel;
- (c) a connector fixed to the vehicle;
- (d) means for securing said buckle to said connector; and
- (e) means for clamping said belt when said buckle is secured to said connector;
- (f) said clamping means including a spring-biased pawl for engaging with one side of said belt; and

(g) said connector having a portion engaging with the other side of said belt so that the belt will be gripped between said pawl and the connector portion engaging with said belt;
(h) said pawl being so mounted in said buckle as to be swung toward the belt-contacting portion of said connector when a pull is exerted on said belt tending to pull said belt through said belt-clamping means.

References Cited by the Examiner

UNITED STATES PATENTS

1,101,049	6/1914	Adamson	24—1.4
2,705,115	3/1955	Ewing	297—386

5

10

2,725,097
2,822,595
2,846,745
2,855,028
2,898,976
2,945,275
2,964,815
2,965,945
3,020,089

11/1955
2/1958
8/1958
10/1958
8/1959
7/1960
12/1960
12/1960
2/1962

Thoreson	297—388
Ruhl	24—17
Lathrop	297—385 X
Matthews	297—385
Barecki	297—386 X
Almeter	297—385 X
Sereno	24—230.1
Lapzich	24—205.15
Monroe	297—388

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