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Higuchi

[11] **3,775,813**

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[54] **SAFETY BUCKLE**

[76] Inventor: **Nori Higuchi,** 147-25 38th Ave., Flushing, N.Y.

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[52] **U.S. Cl.** ..... **24/230 A**

[51] **Int. Cl.** **A44b 11/06**

[58] **Field of Search** ..... 24/230 AP, 230 AT, 24/75, 78, 170, 171, 193, 196, 230 A, 230 AK, 230 AL, 230 AV

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Primary Examiner—Donald A. Griffin
Attorney—Stephen E. Feldman

[57] **ABSTRACT**

A buckle for safety belts including latch means for releasably connecting the buckle to a first webbing, adjustment means for adjustably securing the buckle to a second webbing, and spring means which cooperate with both the latch and adjustment means. The adjustment means includes a member which is pivoted to extend down to the base plate of the buckle and has a groove therein which meshes with the base plate. The length and position of the member directs the load along the plane of the base plate to better distribute the load on the buckle and prevent the base plate fron deforming. The groove in the member causes the webbing to travel in a greater path to provide more surface contact, and thus a greater holding force. The member is also split longitudinally so that it may be readily removed from its supporting shaft. The spring means cooperates with the latch to releasably secure an end plate of the first webbing to the buckle and also acts to bias the adjustment member to a home position; a position where the webbing can be readily adjusted with respect to the buckle.

7 Claims, 5 Drawing Figures

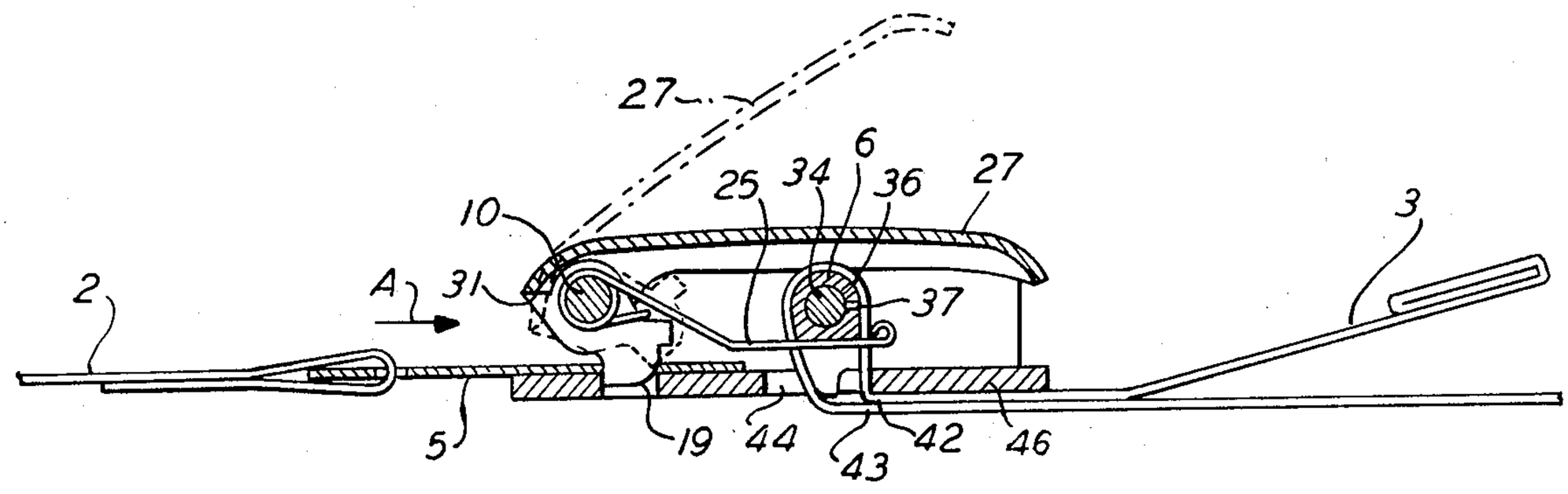


FIG. 1

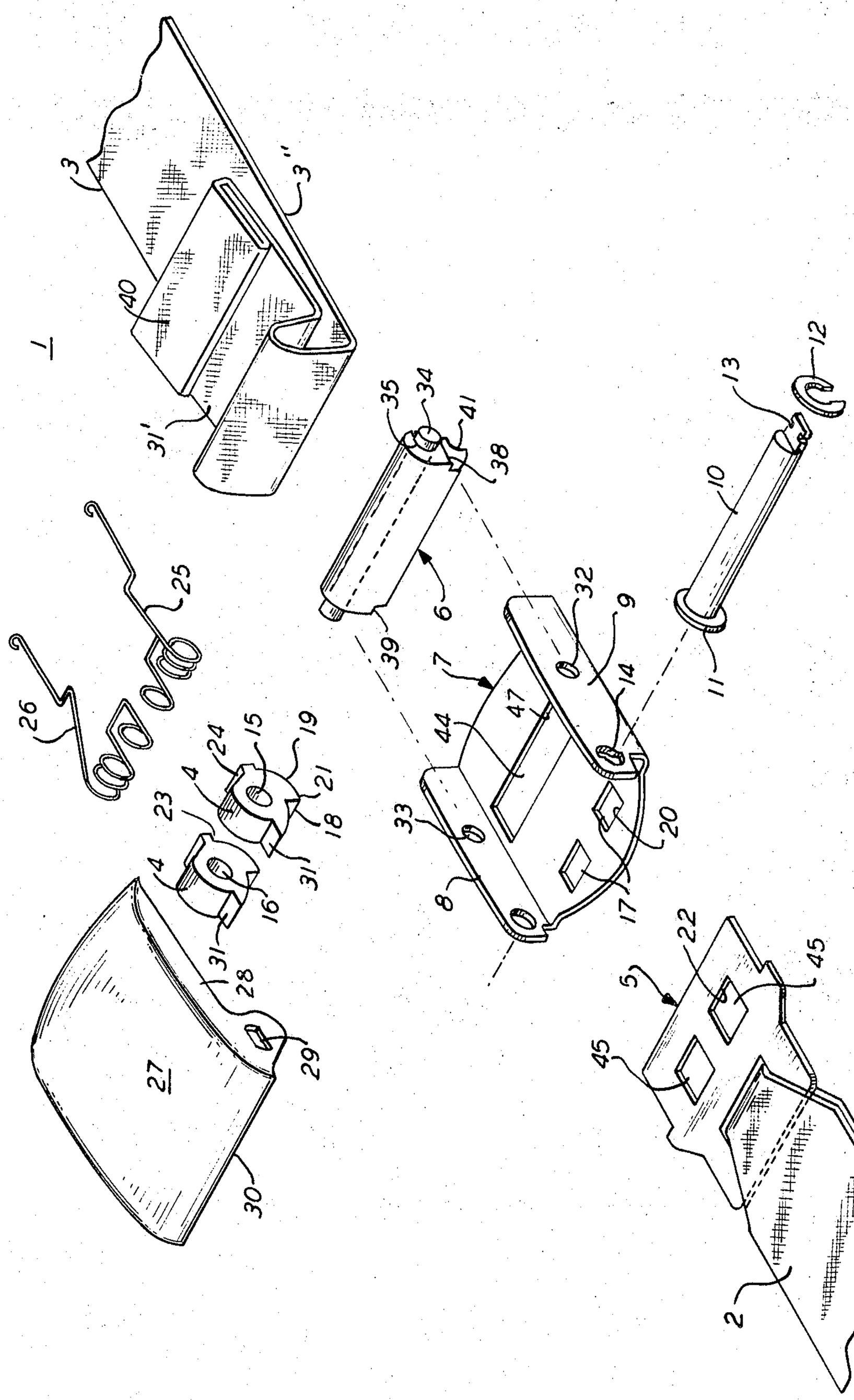

1
3
3''
40
31'
35
34
41
38
6
9
39
32
7
44
47
14
33
8
20
17
10
13
12
11
25
26
4
24
15
19
23
21
18
16
31
28
29
27
30
5
22
45
2

FIG. 2

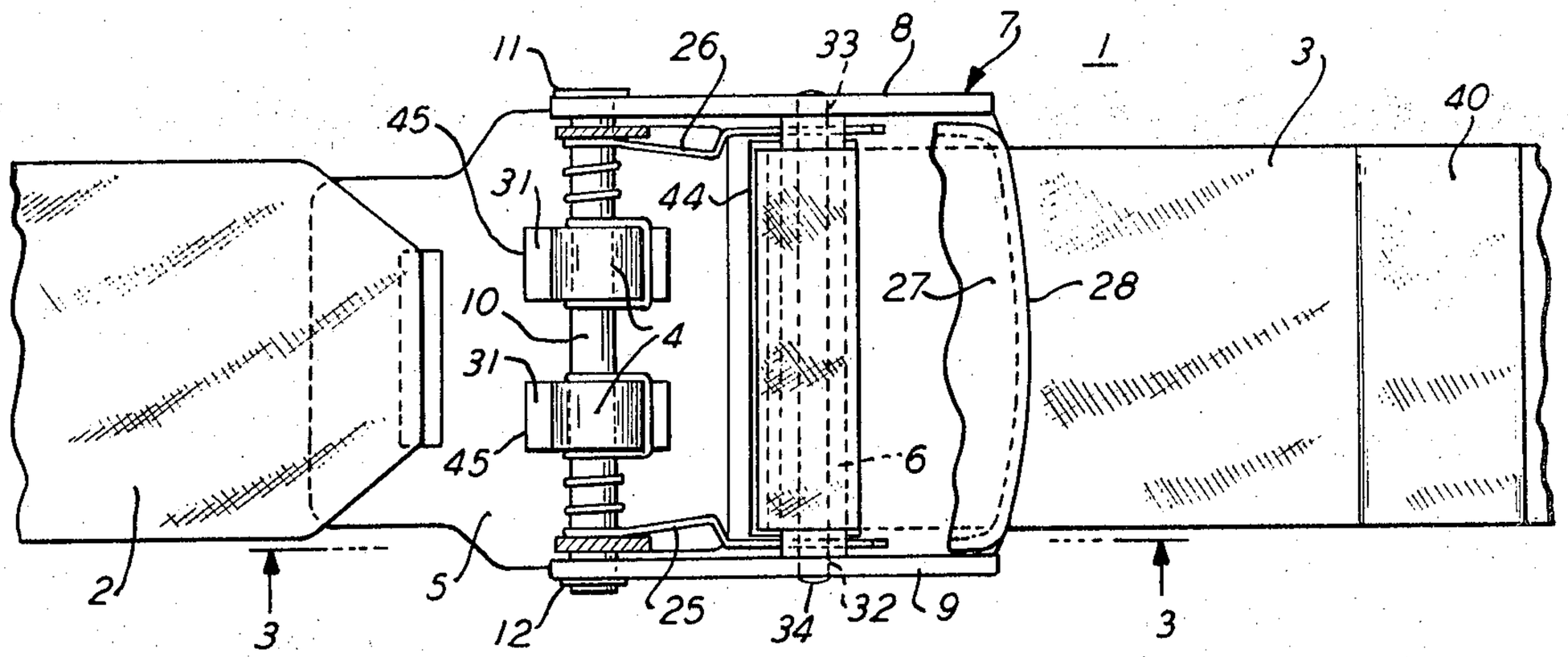


FIG. 3

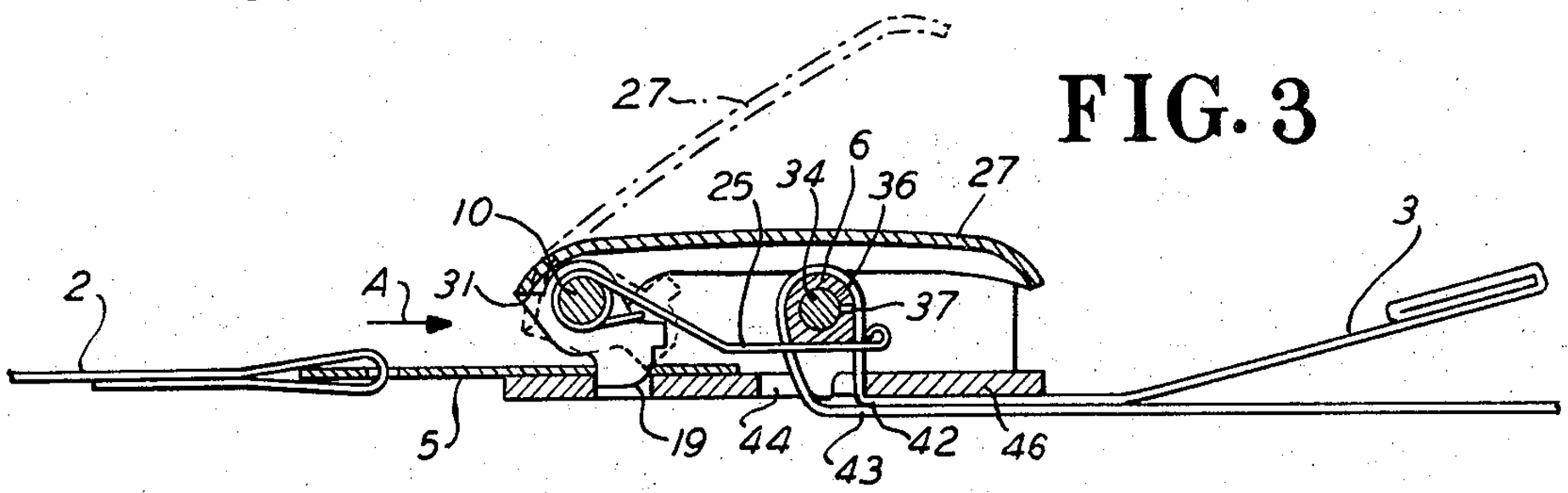


FIG. 4

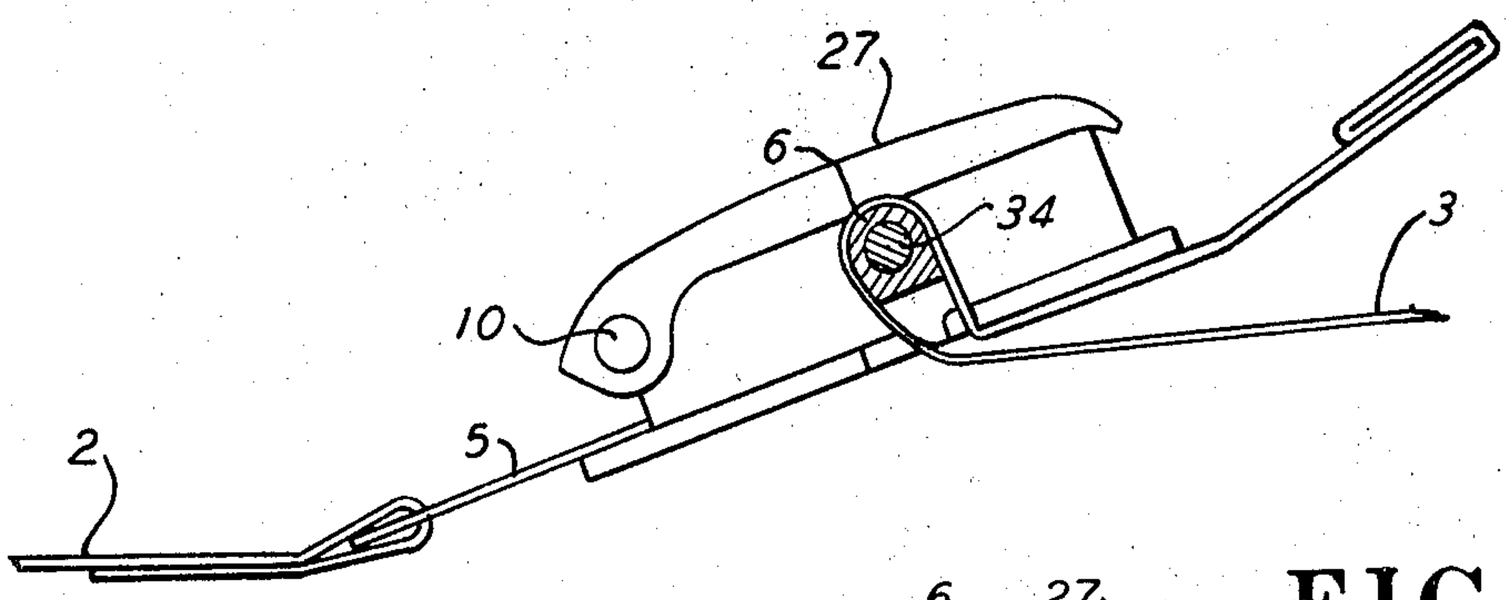
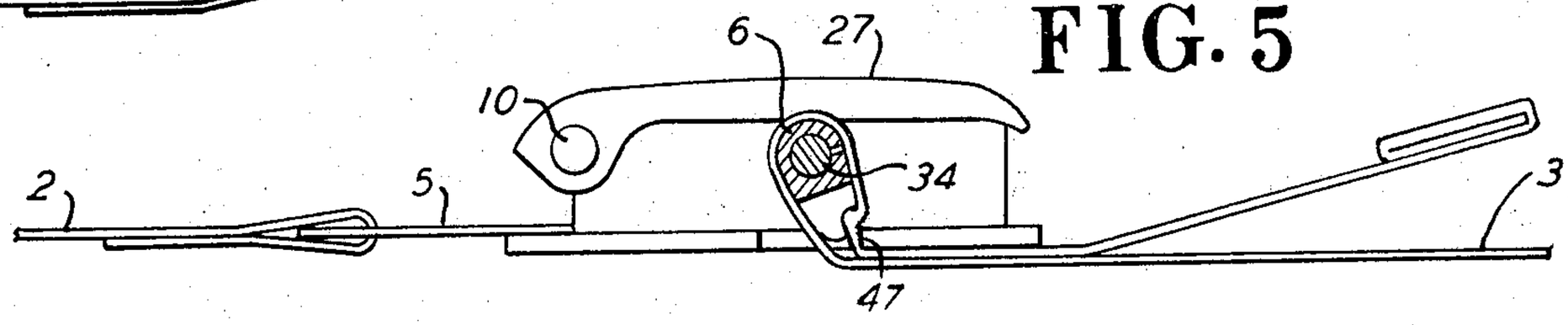


FIG. 5



SAFETY BUCKLE

BACKGROUND OF THE INVENTION

In most safety belt buckles in use today, the webbing passes around an adjustment means (usually a bar) and then contacts the bottom surface of the base plate. When these buckles are subjected to an extreme load the webbing pushes up on the base plate and the base plate tends to tear or crack. Alternatively, if the buckle is constructed so that the force is entirely on the adjusting means, the adjusting means will fail. Thus, it is desirable to construct a buckle where the load is distributed between the adjusting means and the base plate; the load on the base plate is along the plane of the base plate; and vertical forces are shared by both adjusting means and base plate, and thus neither the base plate nor the adjusting means will fail. It would also be desirable if the contacting surfaces between the adjusting means and the base plate could be made quite large and curved so that the webbing would follow a large path between the two and would be held securely between them over a large surface area so that there would be less chance of the web slipping. Further, it would be desirable if the adjusting means could be made so that it was normally spring-biased to a home position where the webbing was adjustable. Finally, it would be desirable if the adjusting means could be easily removed for cleaning.

Thus, the object of this invention would be to provide a buckle which would distribute the load more advantageously, provide better contact to hold the webbing more securely, provide an adjusting means which is easily removable and an adjusting means which is normally in a position where the webbing can be adjusted.

SUMMARY OF THE INVENTION

A safety buckle having an adjusting means that extends down to the plane of the bottom of the base plate, and where the adjusting means has a groove in its end which corresponds with an edge of the base plate so that when a force is applied to the webbing the load is distributed between the adjusting means and the base plate. The adjusting means, is spring-biased so that it normally is oriented so that the web can be adjusted; when the load is applied, the adjustment member rotates to trap the webbing between the groove and the base plate. The adjusting means is also force fitted over a shaft so that it can be easily removed for cleaning.

BRIEF DESCRIPTION FO THE DRAWINGS

FIG. **1** is an exploded perspective view of a buckle constructed in accordance with the present invention.

FIG. **2** is a plan view of the buckle of FIG. **1** with the cover lever partly broken away to show the covered parts of the buckle.

FIG. **3** is a cross sectional view taken along line **3—3** of FIG. **2.**

FIG. **4** is a side view of the buckle showing the webbing being adjusted.

FIG. **5** is the same view as FIG. **3** with the pin rotated to the operative position, with a load applied.

PREFERRED EMBODIMENT OF THE INVENTION

Referring to FIG. **1,** a buckle **1** for safety belts for use in automobiles, airplanes, and other passenger vehicles is shown. Buckle **1** is adapted to detachably and adjustably connect the ends of webbing **2** and **3** so as to permit the belt to be connected about the wearer. The other ends of webbing **2** and **3** (not shown) are adapted to be anchored to the floor or frame of a vehicle. The manner and means by which webs **2** and **3** are connected to the vehicle do not form a direct part of the present invention and hence will not be described in detail.

Buckle **1** includes latches **4** at one end thereof for detachable securing end plate **5** of webbing **2** thereto to permit the webbing to be secured about the wearer. Member **6** is provided at the opposite end of the buckle **1** to permit the webbing **3** to be adjusted in length so that the webbing may be cinched tightly about the wearer.

Referring firstly to the structure of buckle **1,** the buckle comprises a base plate **7** integrally formed with a pair of upwardly bent side walls **8** and **9.** A pivot pin **10,** about which latches **4** are pivoted, as hereinafter more particularly described, extends parallel to the base **7. Pin 10** is connected at its ends to walls **8** and **9.** One end of the pin contains a head **11** and the other end is locked in place by a conventional snap ring **12,** seated in groove **13** formed in the pin. This pin itself is flattened near one end so that its cross sectional shape near that end will be somewhat rectangular. There is a similarly shaped opening **14** in wall **9** into which the pin fits. The pin is inserted into this opening and then rotated so that its ends cannot slide out through the opening. Snap ring **12** is then placed into groove **13** to hold the pin firmly in place.

Latches **4,** which detachably secure end plate **5** of webbing **2** to the buckle **1,** are pivotably mounted about pin **10.** These latches have axially aligned aperatures **15** and **16** therein for receiving pin **10** and are adapted to make releasably latching engagement with openings **45** in end plate **5.**

When connecting end plate **5** to the buckle **1,** the plate is adapted to enter in a direction indicated by arrow A and engage cam surface **18** of the latches. The latches are then pivoted to the broken line position shown in FIG. **3.** Upon further movement of the end plate **5** in the direction of arrow A, ends **19** of the latches pivot downwardly into apertures **17** in base plate **7** and into apertures **45** in the end plate thereby latching the end plate **5** in place. Edges **20** of apertures **17** are close to edge **21** of latches **4** so that when a load is applied, the load is transferred in part through base plate **7,** thus relieving to some extent the load on pivot **10.** Also edges **22** of aperture **45** are aligned with notches **23** in latches **4** so that when a load is exerted, the load is also transferred in part through end plate **5** by means of this contacting relationship.

Latches **4** include grooves **24** over which wire springs **25** and **26,** respectively, pass. These springs are each coiled around the pivot pin and then become straight and extend under adjustment member **6.**

The mounting of the springs is such that they urge latches **4** in a downward direction so as to normally maintain the latches in engagement with end plate **5.**

A lever **27** pivoted on pin **10** is adapted to unlatch the latches from openings **17** in end plate **5,** so as to permit removal of end plate **5.** Lever **27** is also designed to form a cover for the parts disposed between sidewalls **8** and **9.** Further lever, **27** has an edge **28** which extends downwardly on either side of the lever to contact the upper surface of adjustment members **6** to retard the

rotation of these members. This rotation will be discussed in detail hereinafter.

Lever **27** also includes an enlarged end portion including openings **29** adapted to receive pivot pin **10.** One of these openings is of the same rectangular shape as one end of the pivot pin. This is provided so that the pivot pin and lever **27** will rotate together. This rotation is limited however, since the rectangular edge of the pin hits the edge of the opening in the side wall If rotation were not so limited, the lever would be raised too high and slip completely over and jam the buckle.

The rear edge **30** of the lever contacts projections **31** on latches **4** so that when lever **27** is swung upward edge **30** engages projections **31** to cause the latches to be pivoted to the broken line portion shown in FIG. **3,** thereby releasing end plate **5.**

Now referring to the webbing adjustment member **6,** this adjustment member permits the webbing to be adjusted so as to cinch it tightly around the wearer.

Side walls **8** and **9** of buckle **1** include aligned circular openings **32** and **33,** for receiving shaft **34,** on which adjustment member **6** is mounted.

The adjustment member is elongated in configuration and includes an aperture **35,** running longitudinally therethrough. This aperture is of a key hole configuration, having a main circular opening **36,** and a horizontal connecting keyway **37.** The keyway which extends from the inner opening **36** to the outer surface of the member permits the diameter of opening **36** to be increased by inserting a wedge in the keyway to increase its size. Opening **36** is made slightly smaller in diameter than shaft **34,** so that when member **6** is placed on the shaft, the size of opening **36** will have to be increased so that when it is released its spring force will cause it to clamp tightly onto shaft **34.** This arrangement permits member **6** to be easily removed by simply wedging open keyway **37,** so that opening **36** becomes larger in diameter than shaft **34** and then simply sliding shaft **34** out of opening **32** in the side wall. By removing shaft **34,** the whole buckle can be removed from the webbing for purposes of cleaning.

Also, member **6,** when it is clamped on shaft **34,** will prevent the shaft from slipping out of either opening **32** or **33,** since it is larger in diameter than either opening.

Member **6** is normally biased to the vertical position shown in FIG. **4,** by the force of springs **25** and **26,** the ends of which ride on the flat horizontal surfaces **38** and **39** on opposite ends of member **6,** biasing the member into the normal vertical orientation.

When member **6** is in the normal position, the webbing can be freely moved around the member as shown in FIG. **4,** it can be moved until the webbing is properly adjusted about the user. Thus, the webbing can be easily adjusted with the buckle of this invention. In adjusting the webbing the position of member **6** provides for adjusting with hardly any sliding abrasion on the webbing. On the other hand, in the conventional safety buckle, the sliding adjustment bar causes the webbing to undergo substantial abrasion during adjustment.

Web **3** terminates in a folded-over-end portion **40** which is of a thickness greater than the spacing between bar **6** and base **7.** As a result, web **3** is not free to slip out and inadvertantly remove the buckle from web **3.**

Referring back to member **6,** the member projects through the longitudinal aperture in the back plate through which the webbing passes. A longitudinal channel **41** is provided in member **6** proximate edge on the base plate. This channel is of approximately the same height as the thickness of the base plate and is so positioned that when a force is applied to buckle **1,** the load is applied through section **3''** of web **3.** This tends to cause **3'** and **3''** to move in opposite directions, forcing the adjacent engaged surfaces **42** and **43** of the sections into frictional locking engagement, and also causing member **6** to rotate counter-clockwise (as shown in FIG. **5**) against the force of the springs **25** and **26.** This causes section **3'** of the web to be entrapped between edge of the base plate and channel **41.**

Section **3'** of the webbing then follows a curved route as shown in FIG. **5** as it is sandwiched between channel **41** of member **6** and edge **44** of the back plate. The webbing has a large area over which it contacts member **6** to provide a high degree of frictional contact. The large area of contact (instead of a point contact as in most safety buckles) permits the buckle to hold a larger load without slipping.

The relationship of member **6** to the base plate is especially critical. By member **6** extending to a point where it almost reaches the plane of the outer surface of the base plate and by member **6** rotating towards the base plate so that the member and the base plate with the web therebetween are in intimate contact, when a force is applied on web **3''**, the force will be distributed between member **6,** shaft **34** and the base plate and will be somewhat applied along the plane of the base plate. This part of the base plate **46** will then act as a column to resist the applied force. By using this part of the base plate as a column, significant loads can be applied without failure of the buckle. Also, by using it as a column a greater load can be applied on the base plate and thus some of the load can be removed from the adjusting means.

With conventional safety buckles, member **6** would not extend as far as the base plate and the web would then exert a force tending to push the base plate upwards towards the lever causing the base plate to crack, most of the force would then be applied on the adjustment pin tending to cause it to fail also. The base plate would not act as a column at all. Thus the present buckle can absorb significantly greater loads than the conventional buckles without any tendancy to fail.

A light-weight low profile safety buckle has been described.

While a specific embodiment of the invention has been described, it is understood that it is desired to protect all changes and modifications as may fall within the true spirit and scope of the invention.

What is claimed is:

1. A safety buckle comprising:

a support having a back plate

web adjustment means for adjustably connecting a web of material to said support,

said web adjustment means extending substantially into the plane of the back plate, and coacting with the back plate in that, in the operative position, the web is entrained between the back plate and the web adjustment means,

said web adjustment means being rotatable from said inoperative to operative position by a force on the web and,

wherein said adjustment means is spring biased to the inoperative position.

2. A safety buckle as defined in claim 1 wherein said adjustment means has a channel positioned therein which meshes with an edge of said back plate with the web therebetween when said adjustment means is rotated to the operative position.

3. The safety buckle of claim 2 wherein in the operative position, the applied force on said back plate passes somewhat along the plane of the back plate, so that the back plate acts as a column.

4. The safety buckle as defined in claim 2 including latch means for latching a web end plate to said support.

5. The safety buckle of claim 4 wherein said latch means includes two movable members which fit into corresponding apertures in said end plate.

6. A safety buckle as defined in claim 1 wherein said adjustment means comprises an adjustment member which is releasably spring clipped onto a supporting shaft that is pivoted on said support.

7. The safety buckle as defined in claim 6 wherein said adjustment member contains an aperture therein which is of at most the same diameter as said supporting shaft.

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