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(71) Applicant: **Nippon Seiko Kabushiki Kaisha**
6-3, Ohsaki 1-chome Shinagawa-ku
Tokyo 141(JP)

(72) Inventor: **Seto, Toshiaki**
16-14, Kameino 2-chome, Fujisawa
Kanagawa 252(JP)

(74) Representative: **Klingseisen, Franz, Dipl.-Ing.**
et al
Dr. F. Zumstein Dipl.-Ing. F. Klingseisen
Bräuhäusstrasse 4
W-8000 München 2(DE)

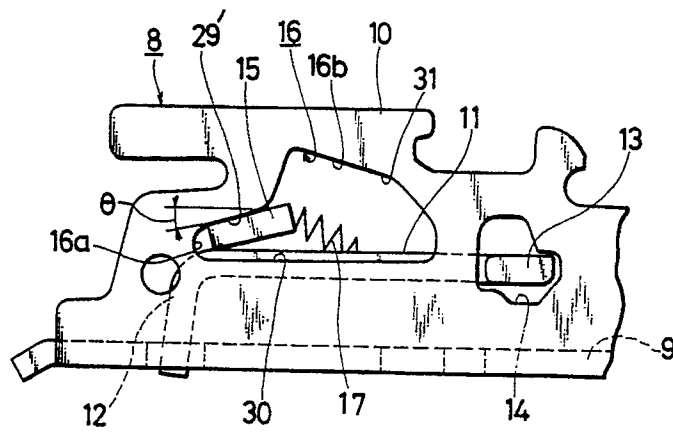
(54) **Buckle for seat belt.**

(57) A buckle for a seat belt is disclosed. A lock plate (15) is arranged movably back and forth on an upper surface of a buckle latch piece (11) and is loosely received at both lateral ends thereof in a pair of through-holes (16) formed in a pair of opposing upright side wall portions (10) of a buckle base (8). The paired through-holes (16) include on front sides thereof constricted hole portions (16a) in which lateral end portions of the lock plate (15) lie while an

associated tongue is latched in the buckle (4). Upper edges (29') of the constricted hole portions (16a), said upper edges being located on a side opposite to the base plate portion (9) relative to lower edges of the constricted hole portions (16a), extend obliquely relative to the base plate portion (9) whereby the distances between the upper edges (29') and the base plate portion (9) increase as rear ends of the upper edges (29') are approached.

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FIG. 1



The present invention relates to an improvement in or relating to the structure of a buckle in a seat belt applied to a seat of a motor vehicle to protect an occupant in the event of a collision or the like, so that an associated tongue can be unlatched from the buckle by a reduced, namely, lighter operating force.

Reference is first made to FIG. 6, which is a perspective view showing the overall construction of a seat belt. To protect an occupant in a seat of a motor vehicle the event of a collision or a similar accident, the seat is provided with a seat belt similar to that shown in FIG. 6.

To use the seat belt, a tongue plate 2 through which a continuous lap-shoulder webbing 1 extends is latched in a buckle 4 which is secured to an upper end of an anchor member 3 supported at a lower end thereof on a stationary part of the motor vehicle. As a result, the occupant in a seat 5 is restrained by the webbing 1 so that the occupant will be protected from being thrown forward in the event of a collision or the like.

Upon egress from the motor vehicle, a release button of the buckle 4 is pressed to release the latching between the buckle 4 and the tongue plate 2, so that the webbing 1 is taken up in an unillustrated retractor. Accordingly, the occupant is no longer prevented from leaving the seat 5.

To ensure smooth entry into and egress from the motor vehicle, it is necessary to allow the occupant to easily effect both latching and unlatching of the buckle 4 and the tongue plate 2. As disclosed, for example, in Japanese Utility Model Application Laid-Open (Kokai) Nos. 134306/1986 and 153511/1986, seat belt buckles of various structures have been proposed to achieve such an object.

The structure of such a conventionally-known buckle 4 will first be described with reference to FIGS. 2-5. Some parts shown in FIG. 2 have slightly different shapes from their corresponding parts depicted in FIG. 3-4. It is to be noted that these parts have no relevance to the subject matter of the present invention.

A buckle base 8 is held within a spacing defined by an upper cover 6 and a lower cover 7, and is connected at one end thereof to a proximal end portion of an anchor member 3 (see FIG. 6). The buckle base 8 has been formed by bending a metal plate having sufficient rigidity, such as a steel plate in a flattened square U-shaped transverse cross-section. The buckle base 8 includes a flat base plate portion 9, which lies right above the lower cover 7, and upright side wall portions 10,10 extending at right angles from both side edges of the base plate portion 9.

Designated at numeral 11 is a buckle latch piece for bringing the buckle base 8 of the buckle

4 into engagement with the associated tongue plate 2. The buckle latch piece 11 has a detent 12 at a front end portion, which is positioned closer to the free end of the buckle 4 and is a left-hand end portion as viewed in FIGS. 2-4. At a rear end portion of the buckle latch piece 11, said rear end portion being closer to the basal end portion of the buckle 4 where the buckle 4 is connected to the anchor member 3, lugs 13,13 extend laterally from both side edges of buckle latch piece 11 into first through-holes 14,14 formed in the corresponding upright side wall portions 10,10, whereby the buckle latch piece 11 is supported rockably about the rear end portion thereof between the paired upright side wall portions 10,10.

Numerals 15 indicates a lock plate which unless a button 18 to be described subsequently is pressed by the occupant, holds the buckle latch piece 11 at a lock position, namely, at a position where the detent 12 is positioned close to the base plate portion 9 as shown in FIG. 5 to be described subsequently. Both lateral end portions of the lock plate 15 are inserted in second through-holes 16,16 formed in the corresponding upright side wall portions 10,10 in such a way that the lateral end portions are movable to limited extents in both up-and-down and rear-and-front directions as viewed in the drawings. The lock plate 15 is composed of a plate-like member having a predetermined width in the direction of the length of the buckle 4, namely, in the horizontal direction as viewed in the drawings. Disposed between the rear edge of the lock plate 15 and the buckle latch piece 11 is a lock plate spring 17 in the form of a compression spring, whereby a spring force is applied to the lock plate 15 in an upward and frontward direction.

At numeral 19, there is illustrated a buckle slider. A push-out spring 21 in the form of a compression spring is arranged between the buckle slider 19 and a catch seat 20 formed in the base plate portion 9 of the buckle base 8, whereby a forward spring force is always exerted to the buckle slider 19.

The release button 18 is disposed movably back and forth between the lower face of the upper cover 6 and the upper edges of the upright side wall portions 10,10 of the buckle base 8. A button spring 24 in the form of an extension spring is provided between a hook 22 formed at a rear end portion of the release button 18 and a hook 23 formed at a front portion of the buckle latch piece 11, so that a forward spring force is applied to the release button 18 and a clockwise turning spring force is exerted to the buckle latch piece 11.

To latch the tongue 2 in the buckle 4 constructed of such parts or components as described above, a free end portion 2a of the tongue plate 2 is inserted into a slit-like gap 25 defined between

the lower face of the release button 18 and the upper face of the base plate portion 9 of the buckle base 8 (see FIG. 4), thereby to push the buckle slider 19 rearward (rightward as viewed in FIGS. 2-4) against the spring force of the push-out spring 21.

As the buckle slider 19 moves rearward, a rear face 19a of the buckle slider 19 rearwardly pushes bent fingers 26,26 extending downwardly from the buckle latch piece 11. As a consequence, the buckle latch piece 11 is rocked counterclockwise, as viewed in FIG. 4, against the spring force of the button spring 24 about the rear end portion thereof where the lugs 13,13 are in engagement with the corresponding first through-holes 14,14, so that the detent 12 formed at the front end portion of the buckle latch piece 11 is caused to advance into the opening 28 formed in the free end portion 2a of the tongue plate 2 to inseparably unit the tongue plate 2 and the buckle plate 4.

On the other hand, because of the engagement between the notch 27 of the lock plate 15 and the neck portion 23' of the hook 23, the lock plate 15 is associated with the buckle latch piece 11 in such a way that they are slidable relative to each other only in the directions of planes in which they lie respectively. Following rocking of the buckle latch piece 11, the lock plate 15 also rocks in the same direction, i.e., counterclockwise as viewed in FIG. 4, and eventually the lock plate 15 is pushed by the spring force of the lock plate spring 17 into the constricted hole portions 16a,16a formed on the front sides of the second through-holes 16,16. The lock plate 15 is held in this state, so that the front end portion of the buckle latch piece 11 is prevented from moving upward. As a result, it is possible to avoid any accidental release of the engagement between the detent 12 of the buckle latch piece 11 and the opening 28 of the tongue plate 2.

To release the engagement between the buckle 4 and the tongue plate 2, the release button 18 is pressed toward the basal end portion of the buckle 4 (i.e., rightwards as viewed in FIG. 4) against the spring force of the button spring 24, whereby the lock plate 15 is pushed rearward by rear faces 18a (see FIG. 4) of side wall portions formed in the release button 18.

As a result, both the lateral end portions of the lock plate 15 are disengaged from the corresponding constricted hole portions 16a,16a of the second through-holes 16,16, and are brought into the broader hole portions 16b,16b formed behind and in continuation with the constricted hole portions 16a,16a so that the lock plate 15 becomes movable upwardly. Consequently, the buckle latch piece 11 is rockable clockwise, as viewed in FIG. 4, about a pivot formed by the engagement between the first

through-holes 14,14 and the corresponding lugs 13,13. The buckle latch piece 11 thus rocks clockwise by the spring force of the button spring 24. As a consequence, the detent 12 formed at the front end portion of the buckle latch piece 11 is upwardly pulled out of the opening 28 of the tongue plate 2 so that the tongue plate 2 and the buckle 4 can be separated from each other.

Conventional seat belt buckles which are constructed and operate as described above are however accompanied by the following inconvenience.

As shown in FIG. 5, upper edges 29 of the constricted hole portions 16a formed on the front sides of the second through-holes 16 to loosely receive the corresponding lateral end portions of the lock plate 15 are parallel to the upper surface of the buckle latch piece 11 in a locked state (also to the base plate portion 9 as a matter of fact), namely, when the tongue plate is latched in the buckle 4. Therefore, the lower surface of the lock plate 15 and the upper surface of the buckle latch piece 11 are caused to contact with each other over a wide area when the lock plate 15 and the buckle latch piece 11 are brought into a locked state. Incidentally, for the sake of clarification, the term "upper" as used herein indicates an element, portion, part or the like farther from the base plate portion 9 of the buckle base 8 while the term "lower" indicates the corresponding element, portion, part or the like closer to the base plate portion 9. It is therefore to be noted that the indication of "upper" or "lower" does not necessarily conform with the position in actual use.

When the lower surface of the lock plate 15 and the upper surface of the buckle latch piece 11 are brought into contact with each other over such a wide area in a locked state as described above, a large friction force is produced between these surfaces so that a great force is required to move the lock plate 15 from the constricted hole portions 16a to the broader hole portions 16b.

The need for such a large force to move the lock plate 15 from the constricted hole portions 16a to the broader hole portions 16b as described above undesirably leads to the need for a large operating force to press the release button 18 upon release of the engagement between the tongue plate 2 (see FIG. 6) and the buckle 4.

An object of the present invention is therefore to provide a seat belt buckle which does not involve such inconvenience.

In one aspect of the present invention, there is thus provided a buckle for a seat belt, including a buckle base formed by bending a metal plate in a flattened square U-shaped transverse cross-section and having a base plate portion and a pair of opposing upright side wall portions extending from both side edges of the base plate portion, a buckle

latch piece pivotally supported at a rear end portion thereof on the upright side wall portions and having at a front end thereof a detent releasably engageable with an opening formed in an associated tongue plate, a spring normally biasing the buckle latch piece in a direction that the detent moves away from the base plate portion, a pair of through-holes formed in a mutually-opposing relation in the paired upright side wall portions, respectively, said through holes defining in a continuous relation broader hole portions on rear sides thereof and constricted hole portion on front sides thereof, a lock plate arranged movably back and forth on an upper surface of the buckle latch piece and loosely received at both lateral ends thereof in the paired through-holes, respectively, and a lock plate spring disposed between the lock plate and the buckle latch piece and applying a spring force to the lock plate in a direction toward a front end portion of the buckle latch piece. Upper edges of the constricted hole portions of the paired through-holes, said upper edges being located on a side opposite to the base plate portion relative to lower edges of the constricted hole portions, extend obliquely relative to the base plate portion whereby the distances between the upper edges and the base plate portion increase as rear ends of the upper edges are approached.

When the tongue plate is latched in or unlatched from the seat belt buckle of the present invention constructed as described above, the buckle operates in substantially the same manner as the conventional seat belt buckle described above.

In the seat belt buckle of the present invention, the upper edges of the constricted hole portions are formed oblique or aslant relative to the base plate portion and a spring force is applied upwardly and frontwardly to the lock plate by the lock plate spring. At the time of locking, the lock plate is therefore tilted relative to the upper surface of the buckle latch piece so that the lower surface of the lock plate and the upper surface of the buckle latch piece are not brought into firm contact with each other over a wide area.

The frictional force to be produced between the lower surface of the lock plate and the upper surface of the buckle latch piece is therefore reduced, whereby a smaller force is required to pull out the lock plate from the constricted hole portions. This means that a smaller operating force is required to press the release button when it is desired to release the engagement between the tongue plate and the buckle.

The seat belt buckle according to the present invention therefore requires a smaller force for operating the release button to release the engagement between the tongue plate and the buckle in

spite of the fact that its structure is still simple and its manufacturing cost is not high.

The above and other objects, features and advantages of the present invention will become apparent from the following description of the invention and the appended claims, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a partly-simplified fragmentary side view of a seat belt buckle according to a preferred embodiment of the present invention;

FIG. 2 is an exploded perspective view of an exemplary conventional seat belt buckle;

FIG. 3 is a plan view of the conventional seat belt buckle in an assembled state, in which a part of an upper cover is cut away;

FIG. 4 is a longitudinal cross-sectional view of the conventional seat belt buckle, taken in the direction of arrows IV-IV of FIG. 3;

FIG. 5 is a side view of the conventional seat belt buckle in a state similar to the seat belt buckle in FIG. 1; and

FIG. 6 is a perspective view showing the overall construction of a seat belt.

The seat belt buckle according to the preferred embodiment of the present invention will hereinafter be described in further detail with reference to FIG. 1, in which elements of structure similar to the corresponding ones in the conventional example of FIGS. 2-5 are identified by like reference numerals. Description of such elements is omitted herein.

In the seat belt buckle according to the preferred embodiment of this invention, upper edges 29' of the constricted hole portions 16a of the paired through-holes 16 extend obliquely and upwardly at an angle θ relative to the base plate portion 9 of the buckle base 8 so that the distances between the upper edges 29' and the base plate portion 9 increases as rear ends of the upper edges 29' (namely, the righthand ends of the upper edges 29' as viewed in FIG. 1) are approached.

When the tongue plate 2 is latched in and unlatched from the buckle 4 constructed as described above, the buckle 4 operates in exactly the same manner as the conventional buckle described above.

However, the force required to press the release button 18 so as to release the engagement between the buckle 4 and tongue plate 2 is lighter in the buckle 4 of the present invention compared with the conventional seat belt buckle.

In the case of the seat belt buckle 4 according to the present invention, the upper edges 29' of the constricted hole portions 16a extend obliquely relative to the base plate portion 9. As have been described above in connection with the conventional seat belt buckle, the constricted hole portions 16a make up the front parts of the second through-

holes 16 in which both lateral end portions of the lock plate 15 are loosely received and when the tongue plate 2 is latched in the buckle 4, the lateral end portions of the lock plate 15 are positioned in the constricted hole portions 16a, respectively. By the lock plate spring 17 provided between the lock plate 15 and the buckle latch piece 11, a spring force is applied to the lock plate 15 in an upward and frontward direction. Accordingly, upon latching, the lock plate 15 is caused to turn in such a way that the lock plate 15 is twisted counter-clockwise as viewed in FIG. 1, whereby the upper surfaces of both the lateral end portions of the lock plate 15 are brought into firm contact with the corresponding upper edges 29'.

In this state, as shown in FIG. 1, the lock plate 15 lies obliquely relative to the upper surface of the buckle latch piece 11 so that the lower surface of the lock plate 15 is in contact with the upper surface of the buckle latch piece 11 only at an extremely small area of a front end portion of the former surface and both the surfaces are no longer allowed to contact with each other over a wide area.

A reduction has hence been brought about in the frictional force to be developed between the lower surface of the lock plate 15 and the upper surface of the buckle latch piece 11 when the tongue plate 2 is latched in the buckle 4. As a result, a smaller force is required to move the lock plate 15 rightward as viewed in FIG. 1 and to pull out of the lock plate 15 from the constricted hole portions 16a of the second through-holes 16 toward their wider hole portions 16b.

The lock plate 15 is not prevented from tilting relative to the upper surface of the buckle latch piece 11 by the engagement between the neck portion 23' of the hook 23 of the buckle latch piece 11 and the notch 27 of the lock plate 15, because the engagement is loose.

When it is desired to unlatch the tongue plate 2 from the buckle 4, a smaller operation force is therefore required to press the release button 18 for moving the lock plate 15 rearward.

The inclination θ of the upper edges 29' of the constricted hole portions 16a is suitably about 3-8 degrees. If θ is smaller than the lower limit, no substantial advantageous effects can be brought about over the conventional buckle. On the other hand, θ values greater than the upper limit lead to a reduction in the function to hold the latch piece 11.

Claims

1. A buckle for a seat belt, including a buckle base (8) formed by bending a metal plate in a flattened square U-shaped transverse cross-

section and having a base plate portion (9) and a pair of opposing upright side wall portions (10) extending from both side edges of the base plate portion, a buckle latch piece (11) pivotally supported at a rear end portion thereof on the upright side wall portions and having at a front end thereof a detent (12) releasably engageable with an opening (28) formed in an associated tongue plate (2), a spring (24) normally biasing the buckle latch piece in a direction that the detent moves away from the base plate portion, a pair of through-holes (16) formed in a mutually-opposing relation in the paired upright side wall portions, respectively, said through holes (16) defining in a continuous relation broader hole portions (16b) on rear sides thereof and constricted hole portion (16a) on front sides thereof, a lock plate (15) arranged movably back and forth on an upper surface of the buckle latch piece and loosely received at both lateral ends thereof in the paired through-holes, respectively, and a lock plate spring (17) disposed between the lock plate and the buckle latch piece and applying a spring force to the lock plate in a direction toward a front end portion of the buckle latch piece, characterised in that upper edges (29') of the constricted hole portions (16a) of the paired through-holes (16), said upper edges being located on a side opposite to the base plate portion (9) relative to lower edges of the constricted hole portions (16a), extend obliquely relative to the base plate portion (9) whereby the distances between the upper edges (29') and the base plate portion (9) increase as rear ends of the upper edges (29') are approached.

2. The buckle of claim 1, wherein the lock plate (15) is composed of a plate-like member having a predetermined width in the direction of the length of the buckle (4) and the lock plate (15) is biased at a rear end portion thereof by the lock plate spring (17), whereby upon engagement of the tongue plate (2) with the latch piece (11), the lock plate (15) is in contact with the latch piece (11) only at a front end portion of the lock plate while being maintained in contact with the upper edges (29') of the through-holes (16).
3. The buckle of claim 1 or 2, wherein the inclination of the upper edges (29') relative to the base plate portion (9) is 3-8 degrees.
4. The buckle of any one of claims 1-3, wherein the latch piece (11) has an upwardly extending hook (23), and the hook (23) is received in a notch (27) formed longitudinally in the lock

plate (15) and has a neck portion (23') for permitting rocking of the lock plate (15) relative to the latch piece (11).

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FIG. 1

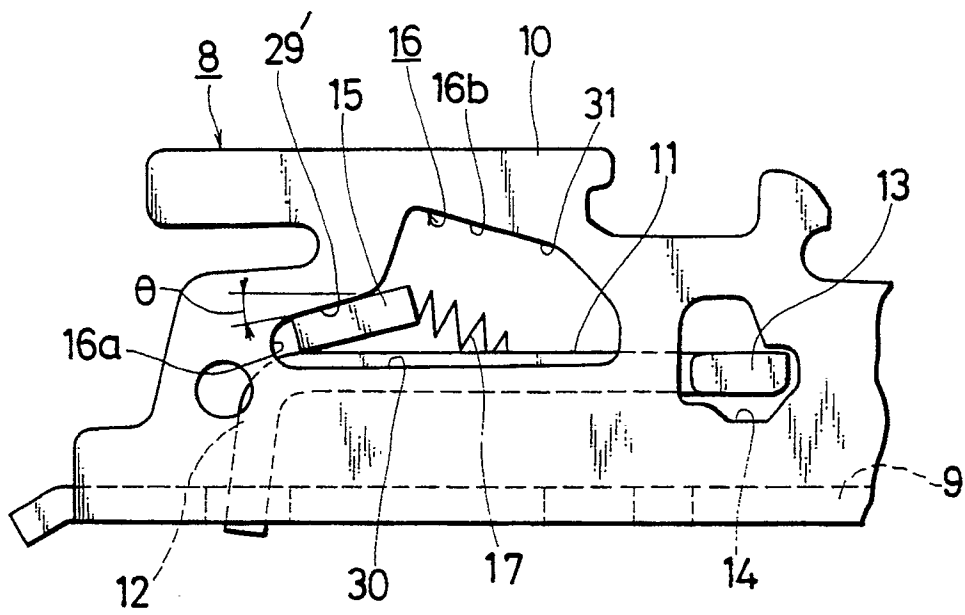


FIG. 2
PRIOR ART

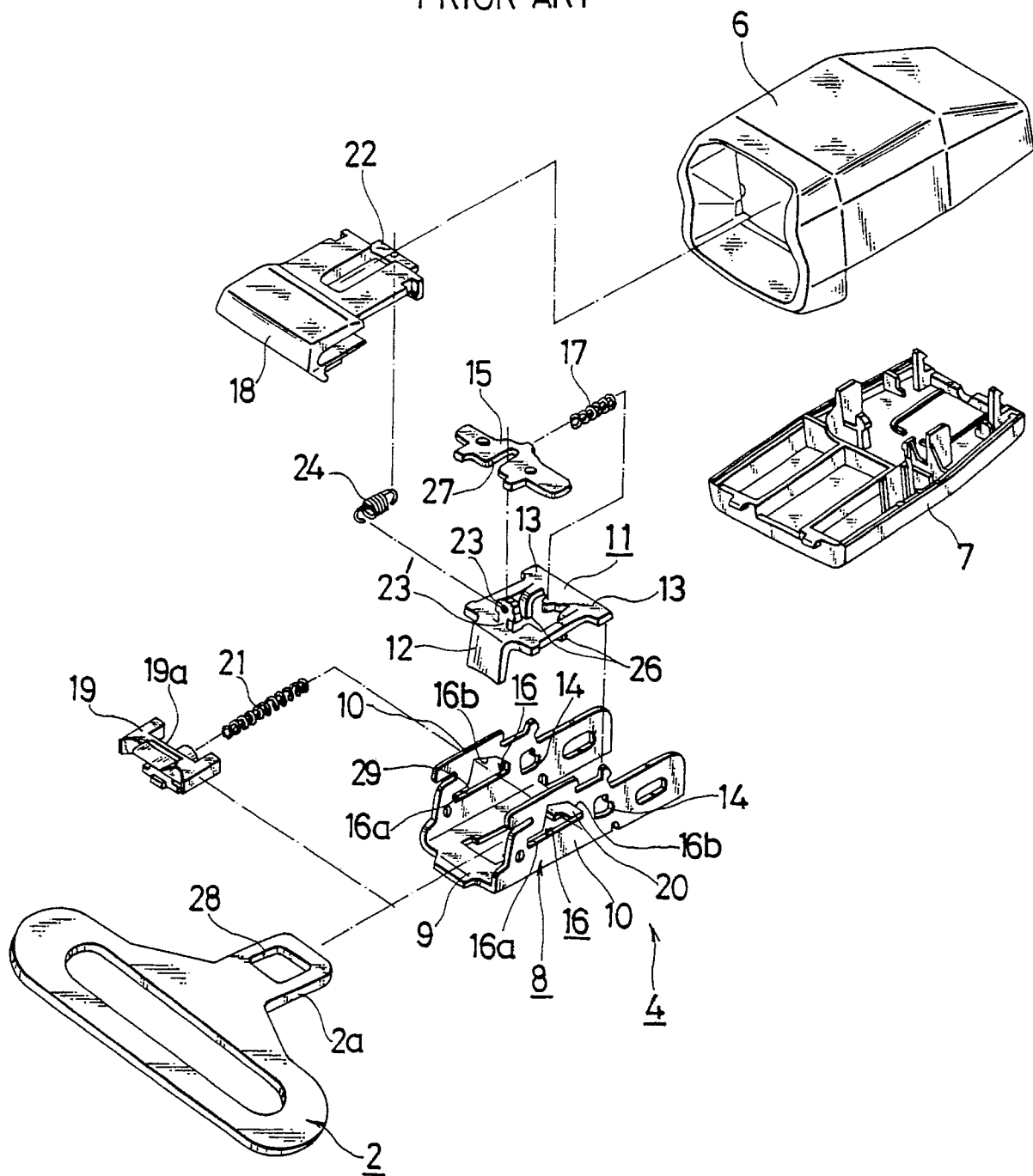


FIG. 3
PRIOR ART

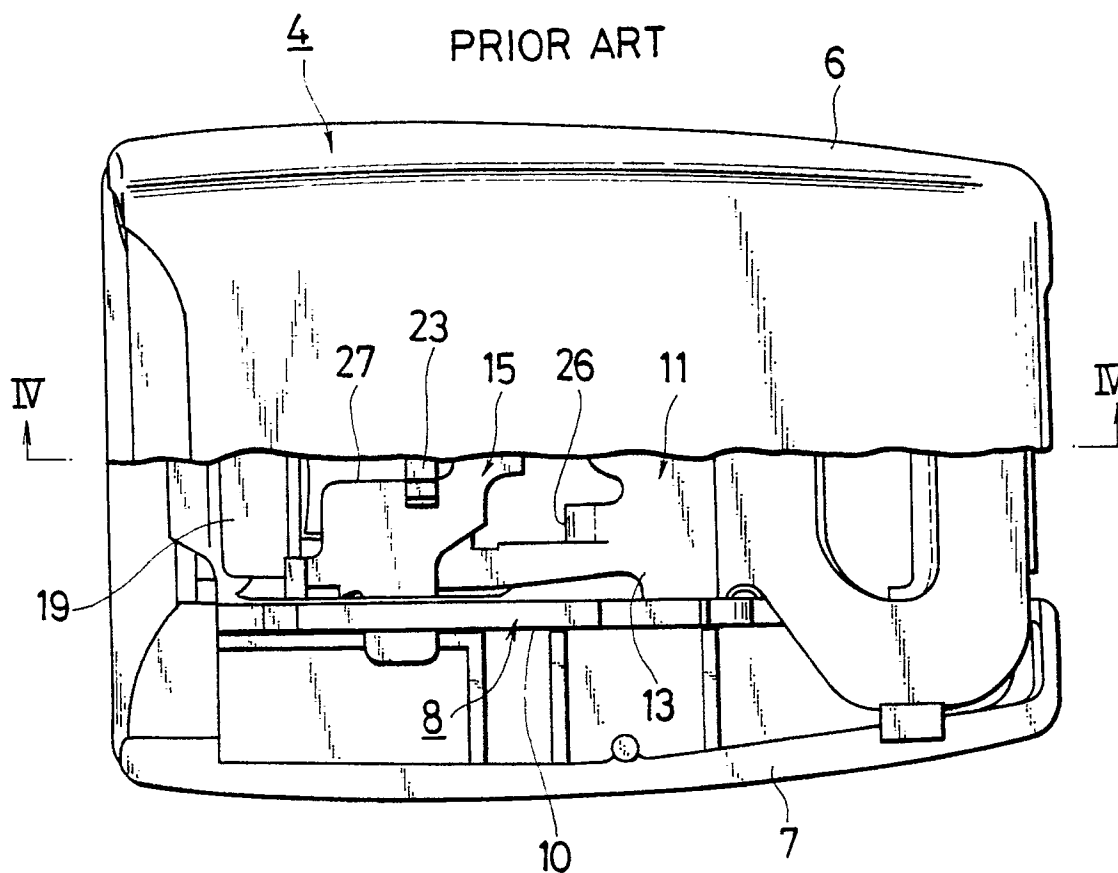


FIG. 4
PRIOR ART

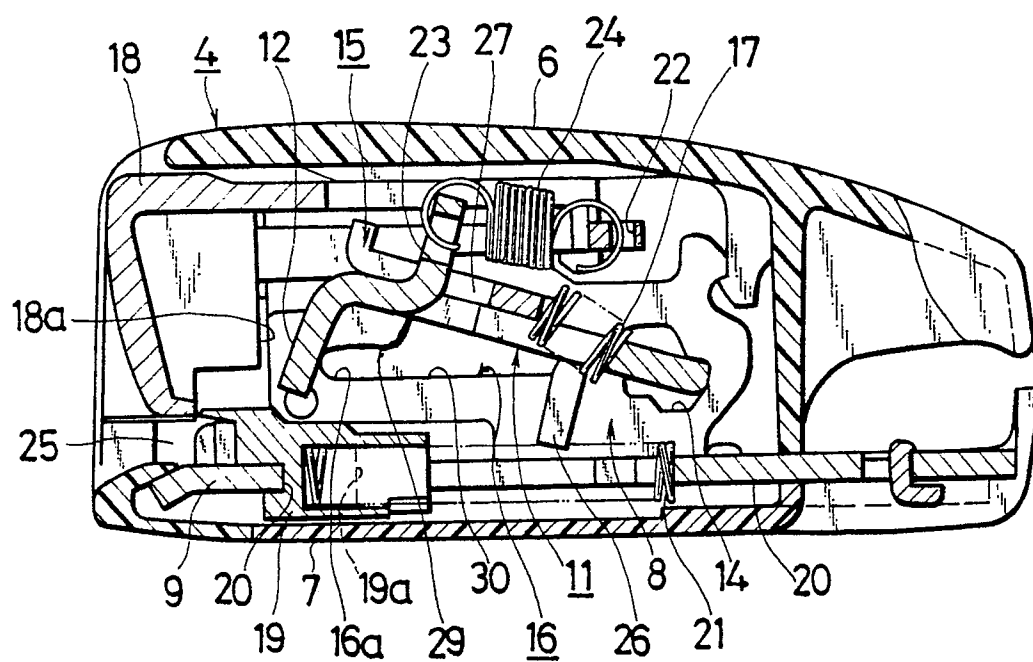


FIG. 5
PRIOR ART

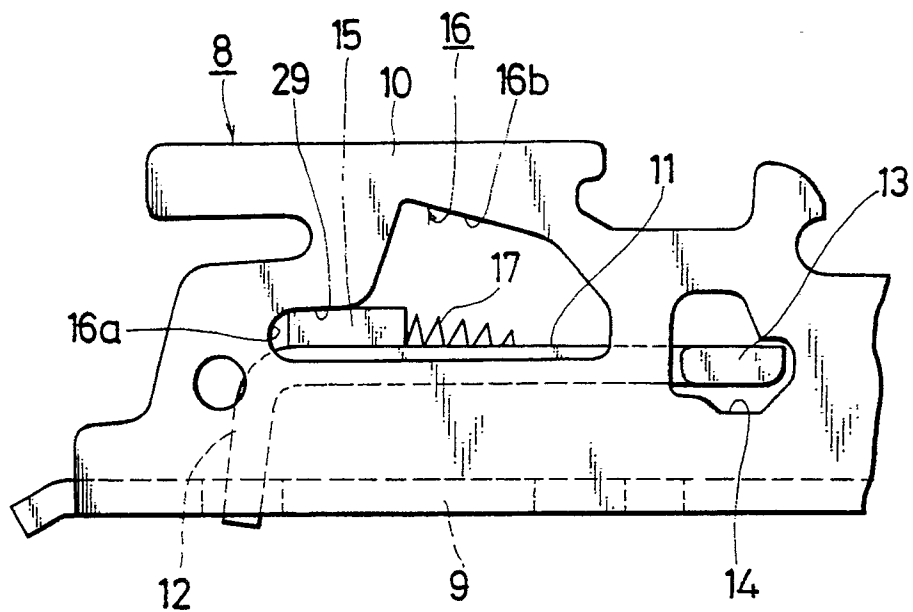
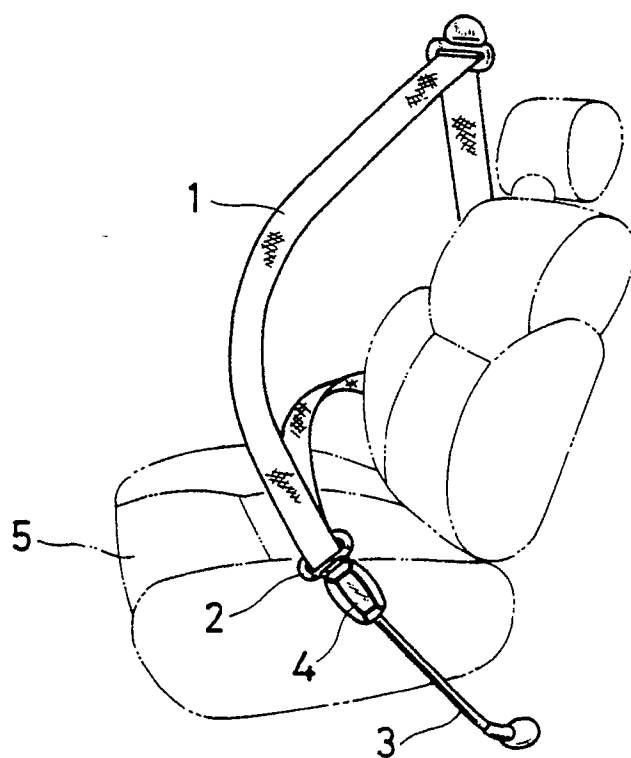


FIG. 6





European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 90 10 8048

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	EP-A-0318031 (NIPPON SEIKO KABUSHIKI KAISHA) * the whole document *	1	A44B11/25 B60R22/22
Y	GB-A-2173243 (LOYD'S INDUSTRI) * page 1, line 126 - page 2, line 15; figures 1, 2 *	1	
A		2	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A44B B60R
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 06 DECEMBER 1990	Examiner BLURTON M.D.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application I : document cited for other reasons & : member of the same patent family, corresponding document			