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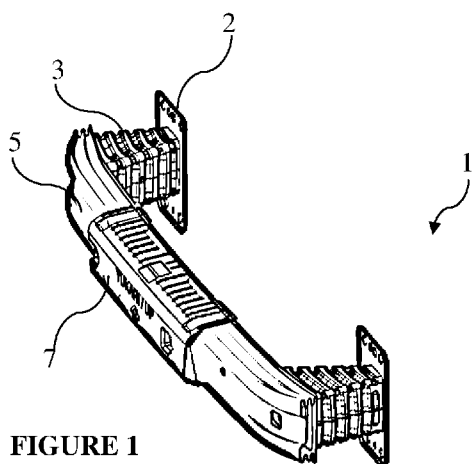


FIGURE 1

(57) Abstract: The present invention relates to a crash cross beam (1), which enables the energy absorbed by the vehicle bumper to be distributed evenly among the bumper parts, comprising at least one chassis connection piece (2) which is connected on the chassis, at least one crash box (3) which is connected on the chassis connection piece (2), at least one cross beam rear part (4) which is connected on the crash box (3) and is in form of a flat plate, at least one cross beam front part (5) which has a U profile shape and the parallel arms of which are connected on the cross beam rear part (4), at least one first opening (51) which is made on the cross beam front part (5), and characterized by at least one first opening (51) which is made on the cross beam front part (5), at least one cross-sectional protective part (6) which has a C profile form, and which is connected on the cross beam rear part (4) of the tab parts such it will be between the cross beam rear part (4) and cross beam front part (5), at least one bumper protecting part (7) which has a U profile shape and the parallel arms of which are connected on the cross beam front part (5), at least one collapsible connection tab (71) which extends over the parallel arms of the bumper protecting part (7), at least one fixed connection tab (72) which extends over the bumper protecting part (7) and which is placed into the first opening (51), at least one tie piece (73) having an X shape which is placed on the flat part of the bumper protecting part (7) having a U profile form.

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A CRASH CROSS BEAM

5 **Field of the Invention**

The kinetic energy, generated in the event vehicle crashes from the front at high or low speeds, is absorbed by the vehicle bumper. The present invention relates to a crash cross beam that prevents the vehicle bumper parts from being damaged by means of the load distribution formed between the bumper parts being balanced by the energy absorbed by the vehicle bumper.

Background of the Invention

15 Traffic accidents happen due to various reasons between the automobiles which are indispensable means of transport in our day. These accidents can be between two cars, as well as they can be with single vehicle or between a vehicle and a pedestrian. These accidents are inevitable even though precautions are taken to prevent these accidents. Several new safety precautions are developed especially in field of vehicle design in order to prevent accidents and decrease life and property losses that can occur during these accidents. These safety precautions can be divided into two as active and passive safety precautions. Active safety includes notification systems that will increase control and braking abilities of the vehicle so that the driver avoids the accident, and control algorithms that will activate to detect the possibility of accident and prevent the vehicle from this possibility. Passive safety is material change precaution taken on the vehicle and design precautions such as structural improvements in order to minimize the negative effects of the accident as much as possible in case of an accident.

30 In case the vehicles crash from the front, the deformation in front of the vehicle moving towards the passenger compartment can cause unwanted situations in

terms of safety. Effects of inertia are decreased by absorbing kinetic energy of the vehicle in a balanced and continuous manner in this kind of accidents, and therefore the less harm comes on the people inside the vehicle. Shock absorbers are used behind the front bumper so that the passenger cabin is harmed less in case the vehicles crash from the front. The shock absorbers dampen the kinetic energy of the vehicle to a certain extent by means of undergoing plastic deformation. If the shock absorbing profiles are designed considering their absorbing characteristics, these profiles reduce the negative effects originating from the crash by folding like an accordion. A certain part of the energy is absorbed on the shock absorbers after the bumper which receives the first impact during crash. Absorption of energy is realized by the plastic deformation of the front shock absorbers folding like the accordion. At the time of the first collision, the bumper absorbs a certain amount of energy by means being deformed, and then the shock absorbers begin to deform, the reaction force coming in the axial direction reaches its highest value, then the reaction forces begin to oscillate around an average value. In the meantime, the structure shortens by being intertwined by means of local twists. Shock-absorption systems known in the state of the art cannot realize the energy absorption efficiently against the non-linear forces.

Since the bumper known in the state of the art cannot balance the load distribution occurring in the vehicle bumper due to kinetic energy generated in case the vehicle crashes from the front at high or low speeds and it causes unbalanced load transfer distributed to the load routes of the vehicle; the bumper parts get damaged such that they cannot be used again; and this situation increases the cost of the accidents since the said part should be changed.

Crash cross beam and crash box components mounted behind the bumper known in the state of the art cannot guide the bumper and its movement at low speed collisions, and therefore it causes the bumper mounting tabs and parts enabling connection to break.

Japanese Patent document no JP2011051508, an application known in the state of the art, discloses an energy absorbing structure placed in front of the vehicle cross beam. However, the said patent document cannot provide a balanced energy absorption, in other words, it cannot enable the bumper connections to move without meeting an obstacle or resistance by preserving the cross sectional and outer surface forms of the bumper parts while absorbing sufficient energy. For this reason, when the bumper cannot move freely, deformation-related breaks are seen on the bumper. Patent document, known in the state of the art, does not change the direction of the energy absorption, it only realizes a more efficient energy absorption.

German patent document no DE102007053998, an application known in the state of the art, discloses an energy absorption part which is realized for pedestrian safety and placed inside the bumper. The said energy absorbing part is provided to extend to the rear part of the crash cross beam in order to absorb the energy. An energy absorber is disclosed which prevents damage to the pedestrian in case the vehicle hits the pedestrian's leg. However there is no explanation for decreasing the damages occurring in the bumper parts of the vehicle in the said patent document, and there are no components solving a similar technical problem.

The Problems Solved with the Invention

The objective of the present invention is to provide a crash cross beam which decreases service costs by preventing collision on the vehicle parts such as radiator by means of contributing bending and twisting stiffness of the bumper due to the kinetic energy generated in case of vehicle collisions from the front at high or low speeds.

Another objective of the present invention is to provide a crash cross beam that prevents the vehicle bumper parts from being damaged by means of the load

distribution formed between the bumper parts being balanced by the energy absorbed by the vehicle bumper.

Detailed Description of the Invention

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A crash cross beam developed to fulfill the objective of the present invention is illustrated in the accompanying figures, in which:

- Figure 1 is the perspective view of the crash cross beam.
- 10 Figure 2 is the exploded perspective view of the crash cross beam.
- Figure 3 is the perspective view of the crash box.
- Figure 4 is the top view of the crash box.
- Figure 5 is the lateral view of the crash box.
- Figure 6 is the front perspective view of the bumper protecting part.
- 15 Figure 7 is the rear perspective view of the bumper protecting part.
- Figure 8 is the perspective view of the cross-sectional protective part.

The components shown in the figures are each given reference numbers as follows:

20

- 1. Crash cross beam
- 2. Chassis connection piece
- 3. Crash box
 - 31. First connection surface
 - 25 32. Recess connection surface
 - 321. Hole
 - 322. Spring
 - 33. Passage connection surface
 - 34. Second connection surface
- 30 4. Cross beam rear part
- 5. Cross beam front part

- 51. First opening
- 6. Cross-sectional protective part
 - 61. Twisting angle
- 7. Bumper protecting part
- 5 71. Collapsible connection tab
 - 72. Fixed connection tab
 - 73. Tie piece
 - 74. Sliding angle
- 10 A crash cross beam (1), which enables the energy absorbed by the vehicle bumper to be distributed evenly among the bumper parts, comprises
 - at least one chassis connection piece (2) which is connected on the chassis,
 - at least one crash box (3) which is connected on the chassis connection piece (2),
 - 15 - at least one cross beam rear part (4) which is connected on the crash box (3) and is in form of a flat plate,
 - at least one cross beam front part (5) which has a U profile shape and the parallel arms of which are connected on the cross beam rear part (4),
 - at least one first opening (51) which is made on the cross beam front part (5),
 - 20 - at least one cross-sectional protective part (6) which has a C profile form, and which is connected on the cross beam rear part (4) of the tab parts such it will be between the cross beam rear part (4) and cross beam front part (5),
 - at least one bumper protecting part (7) which has a U profile shape and the parallel arms of which are connected on the cross beam front part (5),
 - 25 - at least one collapsible connection tab (71) which extends over the parallel arms of the bumper protecting part (7),
 - at least one fixed connection tab (72) which extends over the bumper protecting part (7) and which is placed into the first opening (51).

In the crash cross beam (1) of the present invention, in order to enable load distribution of the energy absorbed by the vehicle bumper among bumper parts in a balanced way; a chassis connection piece (3) is connected on the chassis, chassis connection piece (2) is in form of a flat plate and has openings thereon, the chassis connection piece (2) is connected on the chassis preferably via connection members by means of the said openings.

A crash box (3) is attached on the chassis connection piece (2). The crash box (3) has a first connection surface (31) connected on the chassis connection piece (2). The first connection surface (31) is connected perpendicular to the chassis connection piece (2). A passage connection surface (33) is connected to one end of the first connection surface (31). A second connection surface (34) is connected on the passage connection surface (33). The surface area of the first connection surface (31) is smaller than the surface area of the second connection surface (34) and the passage connection surface (33) extends starting from the first connection surface (31) to the second connection surface (34) by enlarging. In a preferred embodiment of the present invention, the first connection surface (31) having a rectangular shape and having different dimensions and the long edges of the second connection surface (34) are parallel to each other and at the same axis, however their short edges are positioned at different axes. For this reason, the passage connection surface (33) has a conical rectangular structure and extends by widening. A recess connection surface (32) having a channel shape is made on the passage connection surface (33). The recess connection surface (32) runs along the edges of the passage connecting surface (33) and a hole (321) is opened on the edge portions of the recess connection surface (32). In a preferred embodiment of the present invention, a spring (322) is formed by bending the channel-shaped recess connection surface (32) running along the edges of the passage connection surface (33). On the crash box (3), there are structures and elements for optimizing the relationship between its resilience and energy damping ability and for increasing the energy damping ability. An accordion shaped structure is formed by opening recess connection surfaces (32) on the passage connection

surface (33) which the said crash box (3) has. Said accordion shaped structure has elements arranged one after the other in the same form with the recess connection surfaces (32). The said recess connection surfaces (32) are positioned to provide optimum efficiency. Furthermore, there is a spring (322) and openings (321) at the corner part of the said recess connection surfaces (32). These openings ensure that balance of the forces moving on the crash box (3) between the box structures of the crash box (3) is provided and therefore the crash box (3) exhibits a stable behavior. In other words, by means of the intermediate connection surface (32) having a channel shape and holes (321) and spring (322) structure provided at the edges therefor, it is provided that the crash box (3) is bent easily in case of a collision or in case a force is applied. In a preferred embodiment of the invention, the crash box (3) is connected on the chassis connection pieces (2) via connection parts. In a preferred embodiment of the invention, the crash box (3) is connected on the chassis connection pieces (2) via welding.

15 A cross beam rear part (4) in form of a flat plate is connected on the crash box (3), in other words the second connection surface (34) is connected to the cross beam rear part (4). There is at least one cross beam front part (5) which has a U profile shape and the parallel arms of which are connected on the cross beam rear part (4). In a preferred embodiment of the invention, the cross beam rear part (4) and the cross beam front part (5) are connected to each other via connection member. In a preferred embodiment of the invention, the cross beam rear part (4) and the cross beam front part (5) are connected to each other via welding method. A first opening (51) is made on the cross beam front part (5). A cross-sectional protective part (6) which has a C profile form is connected on the cross beam rear part (4) of the tab parts such it will be between the cross beam rear part (4) and cross beam front part (5). In a preferred embodiment of the present invention, the cross-sectional protective part (6) is connected to the cross beam rear part (4) by spot welding, since it enables the cross-sectional protective part (6) to be easily displaced in the event of a collision. A reference hole is made on the cross-sectional protective part (6) and by means of the said reference hole it is ensured

that the cross-sectional protective part (6) is positioned correctly during assembly. The cross-sectional protective part (6) protects the closed cross-section formed between the cross beam rear part (4) and the cross beam front part (5) during low speed impactor collision. Furthermore, there are twisting angles (61) on the corners of the cross-sectional protective element (6) having C profile, and the twisting angles (61) prevent any possible contact of the cross beam with the radiator by increasing the rotational inertia of the protective element (6) during collision.

10 A bumper protecting part (7) has a U profile shape and its parallel arms are connected on the cross beam front part (5). An X-shaped tie piece (73) is placed on the flat part of the bumper protecting part (7) having U shape. There is at least one collapsible connection tab (71) which extends over the parallel arms of the bumper protecting part (7). A fixed connection tab (72) which extends over the bumper protecting part (7) and which is placed into the first opening (51) is made. By means of placing a plurality of tie pieces (73) on the bumper protecting part (7), the tie pieces (73) applies pressure on the cross beam front part (5) during collision, and enables the collapsible connection tab (71) to be opened. In this way, the bumper protecting member (7) provides the damping of the collision energy before it reaches the cross beam front part (5). In other words, the tie pieces (73) having variable thicknesses prevent bumper interference due to the stiffness the tie pieces (73) has during low speed pendulum collision and thus decrease bumper deformation, the tie pieces allow deformation since they operate at an area above their stiffness at high speed collisions, thereby decreasing the force coming on the cross beam part. A sliding angle (74) is formed on the corner parts of the bumper protecting part (7) having a U profile shape. The sliding angle (74) guides the movement of the bumper contact surface and the fixed connection tabs (71) therein at the first moments of the collision, and the continuity of the angular movement is provided by means of the collapsible connection tabs (71) opening at later stages of the collision. In this way, the bumper fixed connections

tabs (72) are subjected to a small amount of deformation. The fixed connection tab (72) ensures that the part position does not change during collision.

In the event that the vehicle crashes from the front at low speeds, first, the bumper protecting part (7) absorbs the energy. The collapsible connection tabs (71) flex by means of the sliding angle (74) provided on the bumper protecting part (7) in order to absorb the energy, and in the meantime the fixed connection tabs (72) pass through the first opening (51) and move straight. As a result, no part of the bumper is damaged in collisions occurring at low speeds. A crash cross beam (1) is realized which reduces service cost by means of the cross sectional protective part (6) which has C profile shape and which is provided between the cross beam front part (5) and the cross beam rear part (4) protecting the closed cross sectional form which the cross beam front part (5) and the cross beam rear part (4) have and by means of preventing to crash vehicle components such as radiator by contributing to its stiffness due to its bending and twisting in case a collision occurs at higher speeds.

Finally, the crash box (3) provided in the system absorbs all kinetic energy, and a crash cross beam (1) is realized which prevents the vehicle bumper parts from being damaged by balancing the load distribution occurring among the bumper parts due to the energy absorbed by the vehicle bumper.

CLAIMS

1. A crash cross beam (1), which enables the energy absorbed by the vehicle bumper to be distributed evenly among the bumper parts, **comprising**
 - 5 - at least one chassis connection piece (2) which is connected on the chassis,
 - at least one crash box (3) which is connected on the chassis connection piece (2),
 - at least one cross beam rear part (4) which is connected on the crash box (3) and is in form of a flat plate,
 - 10 - at least one cross beam front part (5) which has a U profile shape and the parallel arms of which are connected on the cross beam rear part (4),
 - at least one first opening (51) which is made on the cross beam front part (5), and **characterized by**
 - at least one first opening (51) which is made on the cross beam front part (5),
 - 15 - at least one cross-sectional protective part (6) which has a C profile form, and which is connected on the cross beam rear part (4) of the tab parts such it will be between the cross beam rear part (4) and cross beam front part (5),
 - 20 - at least one bumper protecting part (7) which has a U profile shape and the parallel arms of which are connected on the cross beam front part (5),
 - at least one collapsible connection tab (71) which extends over the parallel arms of the bumper protecting part (7),
 - at least one fixed connection tab (72) which extends over the bumper protecting part (7) and which is placed into the first opening (51),
 - 25 - at least one tie piece (73) having an X shape which is placed on the flat part of the bumper protecting part (7) having a U profile form.
2. A crash cross beam (1) according to claim 1, wherein the crash box (3)
 - 30 comprises

- a first connection surface (31) connected on the chassis connection piece (2),
 - a passage connection surface (33) connected to one end of the first connection surface (31),
 - 5 - a second connection surface (34) connected on the passage connection surface (33), and
 - a passage connection surface (33) extending starting from the first connection surface (31) to the second connection surface (34) by widening, a recess connection surface (32) made in form of a channel on
 - 10 the passage connection surface (33).
3. A crash cross beam (1) according to claim 2, **comprising** a passage connection surface (33) which has a conical rectangle shape.
- 15
4. A crash cross beam (1) according to claim 2, **comprising** a hole (321) which runs along the edges of the passage connection surface (33) and is made on the edge parts of the recess connection surface (32).
- 20
5. A crash cross beam (1) according to claim 2, **comprising** a spring (322) which is formed by twisting the recess connection surface (32) in form of a channel running along the edges of the passage connection surface (33).
- 25
6. A crash cross beam (1) according to claim 1, **comprising** two twisting angles (61) which are placed at corner parts of cross sectional protective part (6) having C profile shape.
- 30
7. A crash cross beam (1) according to claim 1, **comprising** one tie piece (73) which is placed in form of an X shape on the flat part of the bumper protecting part (7) having a U profile form.

8. A crash cross beam (1) according to claim 1, **comprising** one sliding angle (74) which is formed on corner parts of the bumper protecting part (7) having a U profile form.

FIGURE 1

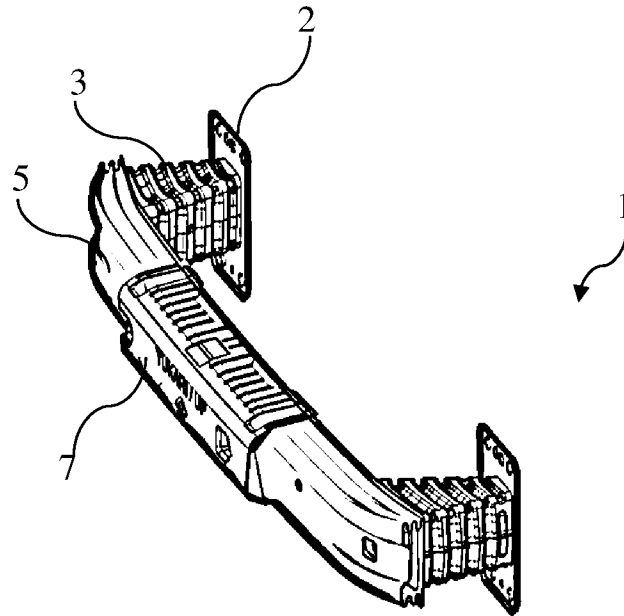


FIGURE 2

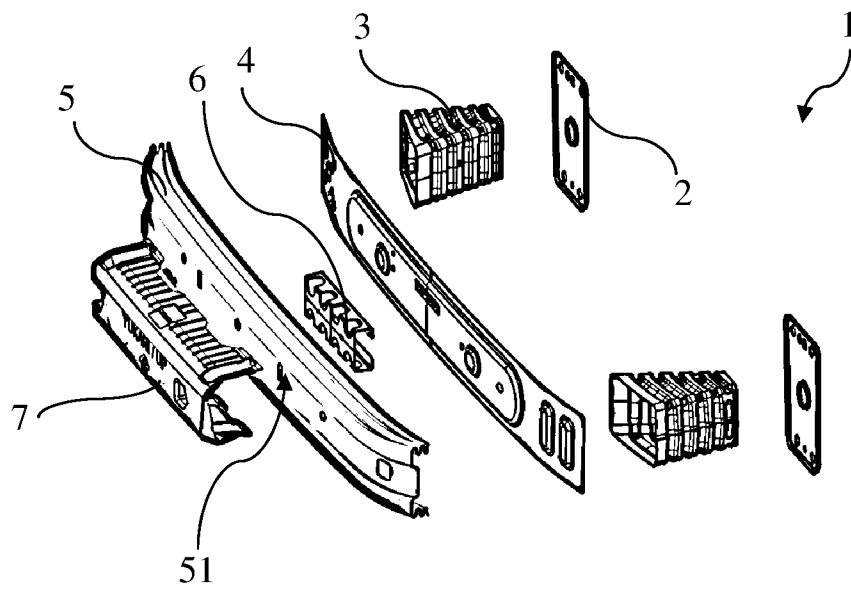


FIGURE 3

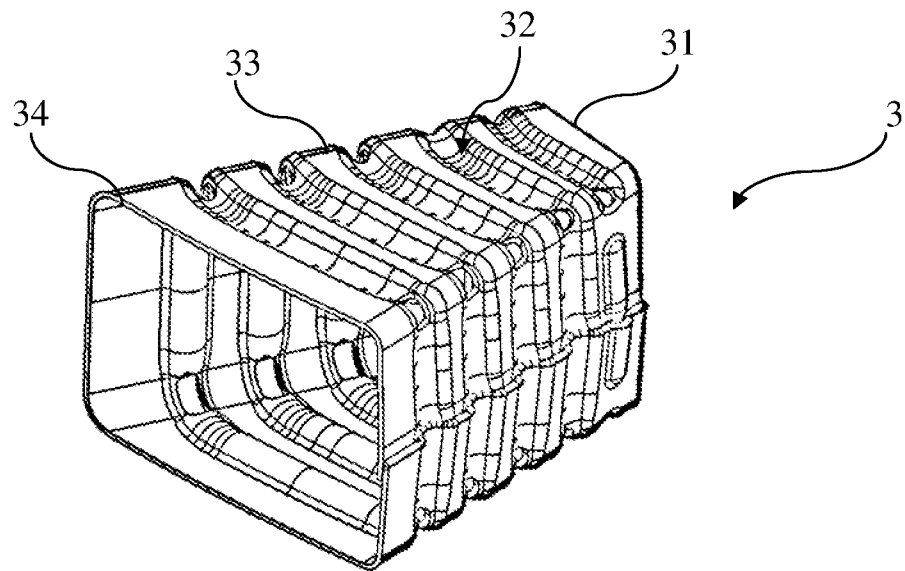


FIGURE 4

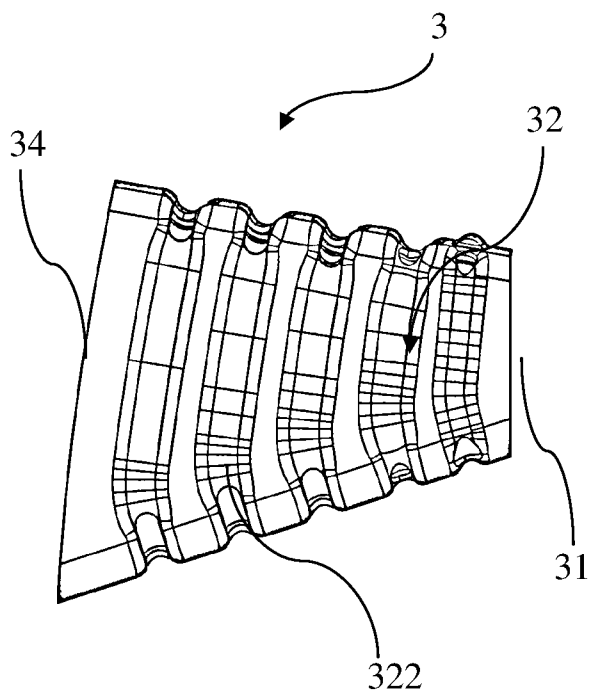


FIGURE 5

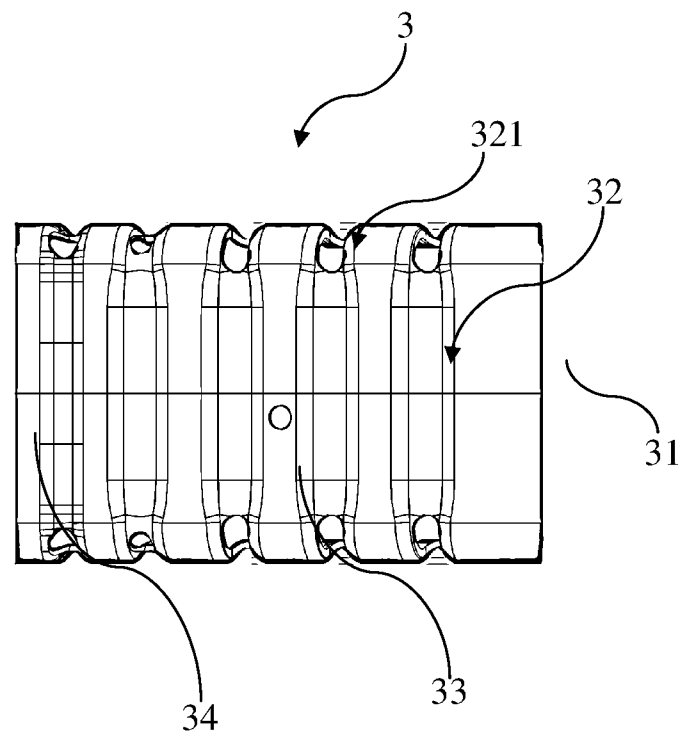


FIGURE 6

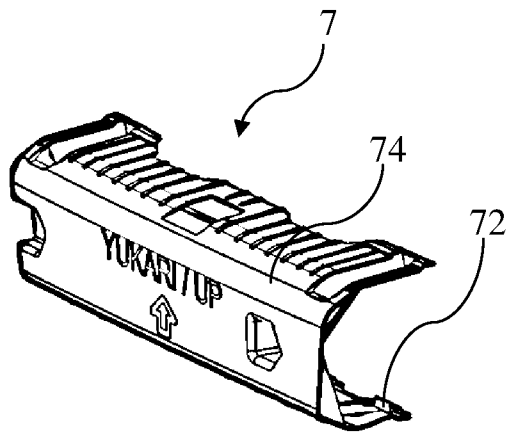


FIGURE 7

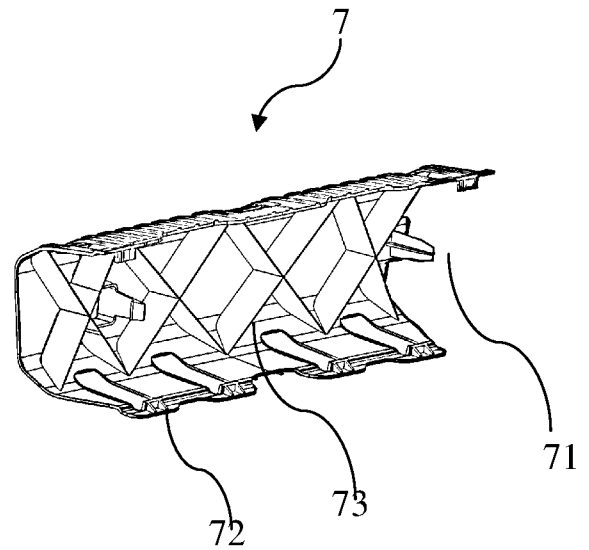


FIGURE 8

