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(54) **TRAFFIC SAFETY WALL**

VERKEHRSSCHUTZWAND

PAROI DE SÉCURITÉ ROUTIÈRE

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Description

Technical Field

[0001] The present invention relates to a road safety barrier comprising a series of prefabricated concrete parts with constant cross-section, facing each other at their longitudinal ends and which include: bottom parts making up the base of the barrier, and top parts making up the body of the barrier, said top parts being attached by attaching means which connect the facing ends thereof.

[0002] This road safety barrier is within the field engaged in the manufacture of protective elements intended to delimit vehicle traffic areas.

Background Art

[0003] Currently, barriers used to delimit vehicle traffic areas constituted of concrete parts with constant cross-section along their length and which are attached to the ground or which simply are supported thereon, are widely known.

[0004] Among concrete barriers, barriers are known formed by a series of concrete elements having a single part body, and barriers formed by bottom parts making up a base of the barrier and top parts which are supported on the bottom parts and conforming the body of the barrier itself, the latter, made by a top part and another bottom part, being those which are the closest to the road safety barrier object of this invention.

[0005] In barriers made up of a top part and another bottom part, the bottom parts with constant cross-section along all their length are arranged in alignment and comprise, on their upper surface, a longitudinal extension protruding towards the upper area, while the top parts have, on their bottom surface, a longitudinal groove for receiving the longitudinal extension of the bottom parts, enabling said top parts to be vertically assembled and disassembled. A barrier of this type can be seen, for example in the Patent Document US 4 059 362. The disadvantage of this barrier, likewise with the barriers made up of a single part of concrete, is that they do not have a structure suitable to be deformed and to significantly absorb the kinetic energy of a vehicle in the event of an impact and, therefore, they do not minimise the harmful effects to those involved in the accident.

[0006] Road safety barriers also usually have attaching means for attaching the successive parts at their facing longitudinal ends, helping to maintain the alignment of the successive parts.

[0007] For example, rigid reinforcements housed in housings provided in the concrete elements of the barrier are used in patent EP 1106738 A2 to ensure the continuity of the road safety barrier parts.

[0008] In the patent EP 0641893 A1, metal H-shaped parts are used as fastening elements whose opposite ends are inserted vertically in C-shaped housings defined

on the opposite ends of the concrete parts.

[0009] Another concrete barrier with a bottom part having a groove and a top part having an extension received therein is known from US 9 644 332 B1.

[0010] These attaching elements, like others on the market, have the disadvantage that, in the event of the barrier receiving a very strong impact, the constituent parts of the barrier are excessively misaligned, and the top parts then could be released from the bottom parts of the barrier and said top parts could be broken at the assembly areas of the attaching means.

[0011] Road protection barriers generally have, at the bottom or base, a protruding part whose purpose is to return the vehicle to the road in the event that the wheels of the vehicle impact the barrier at a reduced speed; however, when the vehicle impacts at a higher speed, the wheels exceed this edge or projection of the barrier, the vehicle impacting against the vertical body or element of the barrier.

[0012] One problem with existing barriers is that, in the event of an impact, it is the vehicle that absorbs the energy, with the consequent high risk of injury to occupants.

[0013] An alternative are safety barriers that are not fixed to the ground and that can be displaced, absorbing the displacement of the barrier by the impact, part of the kinetic energy of the vehicle, reducing the risk of damage to the occupants of the vehicle. However, the problem with the use of these displaceable barriers is that they cannot be installed in certain areas, for example on the central reservation of traffic routes since, in the event of an impact, such a barrier would invade the opposite lane; and if these barriers were to be installed on the sides of the traffic routes, a space would have to be provided on each side for the displacement of the barrier in the event of an impact.

[0014] Therefore, in view of the background existing in the state of the art and the existing problems with road safety barriers, the technical problem that arises is the development of a barrier with bottom parts that act as a base and that are not displaced in the event of an impact, and that has top parts connected to each other and to the base, so that they can absorb a significant part of the kinetic energy of a vehicle in the event of an impact, reducing the severity of the impact, with the consequent reduction of possible harmful effects to those involved in the accident and, consequently, improving the level of containment.

Summary of the invention

[0015] The road safety barrier object of this invention, which comprises prefabricated concrete parts including: bottom parts forming the base of the barrier, top parts forming a vertical body or element of the barrier and, optionally, means for attaching successive top parts, has characteristics aimed at significantly increasing the absorption of kinetic energy during the impact of a vehicle through deformation of the structural system of the bar-

rier.

[0016] Thus, one objective of the road safety barrier, object of the invention, is to reduce impact severity (ASI index) and improve containment level.

[0017] The geometric and mechanical characteristics of the assembly make its behaviour on impact less damaging to those involved in the accident, compared to existing concrete barriers in the state of the art.

[0018] According to the invention, the bottom parts of the barrier have an upper surface provided with a longitudinal channel for coupling, in a longitudinal direction and with the possibility of limited vertical displacement, a longitudinal extension protruding from a bottom surface of the top parts; said longitudinal channel of the bottom part and said longitudinal extension of the top part having similar cross-sections and with dimensional differences calculated so that, in the event of an impact of a vehicle, the top part maintains its integrity and performs, with respect to the vertical median plane of the bottom part, a lateral rotation of an amplitude determined and limited by the coupling means of the upper and bottom parts.

[0019] In the case that the barrier incorporates attaching means for the top parts, said attaching means cooperate with the coupling means in limiting the lateral rotation of the top part with respect to the bottom part.

[0020] The possibility of limited vertical displacement of the top part with respect to the bottom part, together with the also limited lateral rotation of said top part with respect to the bottom part, contributes to improving the absorption of kinetic energy from the impact.

[0021] According to the invention, the longitudinal channel of the bottom part and the longitudinal extension of the top part comprise, at least: an upper segment of decreasing overall width towards the bottom area, and a bottom segment of a width comprised between the greater and lesser widths of said upper segment.

[0022] This characteristic and the dimensional difference between the longitudinal channel of the bottom part and the longitudinal extension of the top part allow, in the event of an impact, the lateral rotation, of limited amplitude, of the top part with respect to the bottom part and prevent said top part from being released in the vertical direction from the bottom part of the barrier.

[0023] Preferably, the attaching means of the successive top parts comprise threaded rods, of the *dywidag* type, assembled longitudinally through the top parts of the barrier and attached with the successive threaded rods by threaded sleeves; or metal parts embedded at the opposite ends in holes or housings defined for this purpose at the opposite ends of the said top parts of the barrier. In the event of an impact, said attaching means contribute to limiting the lateral rotation of the top parts relative to the bottom parts of the barrier, minimising the risk of breakage or detachment of concrete fragments from the parts of the barrier.

[0024] In order to avoid these breakages or partial detachments of concrete, it has been provided that both the longitudinal channel of the bottom part and the longitu-

dinal extension of the top part have longitudinal rounded edges, also promoting the lateral rotation of the top part in the event of an impact.

[0025] Preferably, the bottom parts of the barrier are anchored to the ground with no possibility of lateral displacement, thereby preventing the parts of the barrier from invading the traffic lanes in the event of an impact.

[0026] In this invention it has also been provided that the bottom parts and the top parts have the same length and that they can be aligned vertically in pairs, i.e., overlapping; or displaced mutually in a longitudinal direction, in a staggered way, so that the joints of the bottom parts are displaced in a longitudinal direction with respect to the joints of the top parts.

[0027] The characteristics of the invention will be more readily understood in view of the example embodiment shown in the accompanying drawings described below.

Brief description of the contents of the drawings

[0028] In order to complement the description that is being carried out and with the purpose of facilitating the understanding of the characteristics of the invention, the present description is accompanied by a set of drawings wherein, by way of a non-limiting example, the following has been represented:

- Figure 1 shows a perspective view of one exemplary embodiment of the road safety barrier, according to the invention.
- Figure 2 shows an elevational view of a barrier segment in which the top parts have been partially sectioned to allow visualisation of the attaching means thereof which, in this exemplary embodiment, comprise threaded rods attached at their ends by threaded sleeves.
- Figure 3 shows an exploded, profile view of a bottom part and a top part of the barrier.
- Figure 4 shows a profile view of the barrier shown in Figures 1 and 2, and in which a top part coupled to a bottom part of the barrier can be seen.
- Figures 5 and 6 show two profile views in which the limited rotation of the top parts towards one or the other side with respect to the vertical median plane of the bottom parts in the event of an impact can be seen.
- Figure 7 shows a lateral-top perspective detail of the ends of two consecutive top parts, and in which the fastening thereof by the attaching means can be seen when one of them rotates laterally, as shown in Figures 5 and 6, due to a lateral impact.
- Figures 8 and 9 show elevational views of a barrier

according to the invention, wherein the top parts are respectively aligned and misaligned in a longitudinal direction with respect to the bottom parts of the barrier.

Detailed explanation of embodiments of the invention

[0029] As can be seen in Figure 1, the road safety barrier of the invention comprises bottom parts (1) and top parts (2) of concrete, prefabricated and of constant cross-section in the longitudinal direction.

[0030] As can be seen in Figures 1 and 2, both the bottom parts (1) and the top parts (2) are facing each other at their longitudinal ends forming respective alignments.

[0031] The successive top parts (2) are connected by attaching means, consisting of threaded rods (3), of the *dywidag* type, which pass through the interior of said top parts (2) and which are fixed at their ends by threaded sleeves (31). These attaching means cooperate with the coupling of the extension (21) and the channel (11) in limiting the lateral rotation of the top parts (2) in the event of an impact of a vehicle against the barrier.

[0032] Each of the bottom parts (1) has, on its upper surface, a longitudinal channel (11) for coupling in the longitudinal direction, like a slide, a longitudinal extension (21) protruding from the lower surface of the top parts (2).

[0033] The channel (11) and the extension (21) have similar cross-sections with dimensional differences that facilitate their coupling in the longitudinal direction and limit their relative displacement in the vertical direction.

[0034] In Figure 3 it can be seen that both the channel (11) of the bottom part and the extension (21) of the top part have an upper segment, referred to as (a) in the extension (21), of decreasing overall width towards the lower area; and a lower segment (b) of a width between the greater and lesser width of the upper segment (a).

[0035] Once the extension (21) is coupled longitudinally in the channel (11), the top part (2) is arranged vertically in alignment with the longitudinal median plane (p) of the bottom part (3), as shown in Figure 4.

[0036] Due to the shape and dimensional difference between the channel (11) of the bottom parts (1) and the longitudinal extension (21) of the top parts (2), when the barrier receives a lateral impact from a vehicle, the top part (2) makes a rotation to either side with respect to the vertical median plane (p) of the lower part (1), as shown in Figures 5 and 6, which contributes to improving the absorption of kinetic energy from the impact and reducing the harmful effects to those involved in the accident.

[0037] The lateral rotation of the top parts (2) with respect to the bottom parts (1) is limited by the geometry of the channel (11) of the bottom parts and by the longitudinal extension (21) of the top parts, the possibility of rotation being also limited by the action of the attaching means, in this case the threaded rod (3), as shown in

Figure 7.

[0038] Calculations and tests carried out during the development of this road safety barrier of the present invention have shown that, with the characteristics indicated, this barrier absorbs up to 25% of the total kinetic energy of the impact of a vehicle, which far exceeds the energy absorption capacity of the concrete barriers existing on the market.

[0039] In the embodiment shown, and as can be seen for example in Figure 1, the bottom parts present the typical cross-section in a generally trapezoidal shape, with side ramps (12) tending to return the vehicle to the road in the event of a low speed impact.

[0040] Finally, and as shown in Figures 8 and 9, it has been provided that the bottom parts (1) and the top parts (2) have the same length, in this exemplary embodiment of about 6 metres, and that, in the assembling position, the top parts (2) and the bottom parts (1) can be aligned vertically in pairs, i.e., with their longitudinal ends vertically aligned, as shown in Figure 8; or displaced in the longitudinal direction, in a staggered way, as shown in Figure 9.

Claims

1. - A road safety barrier comprising a series of prefabricated concrete parts, of constant cross-section, facing each other at their longitudinal ends, which include: bottom parts (1), forming a barrier base, and top parts (2), forming a barrier body, supported and coupled on the bottom parts (1) wherein the bottom parts (1) each have an upper surface provided with a longitudinal channel (11) for coupling in the longitudinal direction, **characterized in that** the top parts (2) each have a longitudinal extension (21) protruding from a lower surface of the top parts (2), the road safety barrier being adapted to allow limited vertical displacement of said longitudinal extensions (21); said longitudinal channels (11) of the bottom parts (1) and said longitudinal extensions (21) of the top parts (2) having similar cross-sections, and having calculated dimensional differences so that, in the event of an impact of a vehicle, the top parts are adapted to maintain their integrity and to perform, with respect to the vertical median plane (p) of the bottom parts (1), a lateral rotation of an amplitude determined and limited by the coupling means, provided by the longitudinal channels (11) and the longitudinal extensions (21) of the top and bottom parts; wherein the longitudinal channels (11) of the bottom parts (1) and the longitudinal extensions (21) of the top parts (2) comprise each at least: an upper segment (a) of decreasing overall width from a greater width to a lesser width towards the lower area, and a lower segment (b) of a width between the greater width and the lesser width of the upper segment (a).

2. The barrier, according to claim 1, **characterised in that** the successive top parts (2) are connected by attaching means (3, 31) that cooperate with the coupling means provided by the extension (21) and the channel (11) in limiting the lateral rotation of the top parts (2), in the event of an impact of a vehicle against the barrier.
3. The barrier, according to any one of the preceding claims, **characterised in that** the longitudinal channel (11) of each bottom part (1) and the longitudinal extension (21) of each top part (2) have rounded longitudinal edges.
4. - The barrier, according to any one of the preceding claims, **characterised in that** the bottom parts (1) are anchored to the ground, with no possibility of displacement.
5. - The barrier, according to any one of the preceding claims, **characterised in that** the bottom parts (1) and the top parts (2) have the same length and are vertically aligned in pairs; or mutually displaced in a longitudinal direction, in a staggered way.

Patentansprüche

1. Verkehrsschutzwand, umfassend eine Reihe von Betonfertigteilen mit gleichbleibendem Querschnitt, die an ihren Längsenden einander zugewandt sind, die Folgendes einschließt: Unterteile (1), die eine Wandbasis bilden, und Oberteile (2), die einen Wandkörper bilden, die auf den Unterteilen (1) getragen und gekoppelt sind, wobei die Unterteile (1) jeweils eine obere Fläche aufweisen, die mit einem Längskanal (11) zum Koppeln in der Längsrichtung versehen ist, **dadurch gekennzeichnet, dass** die Oberteile (2) jeweils eine Längserweiterung (21) aufweisen, die von einer unteren Fläche der Oberteile (2) vorstehen, wobei die Verkehrsschutzwand angepasst ist, eine begrenzte vertikale Verschiebung der Längserweiterungen (21) zu ermöglichen; wobei die Längskanäle (11) der Unterteile (1) und die Längserweiterungen (21) der Oberteile (2) ähnliche Querschnitte aufweisen und berechnete Maßdifferenzen aufweisen, sodass im Falle eines Aufpralls eines Fahrzeugs die Oberteile angepasst sind, ihre Integrität beizubehalten und in Bezug auf die vertikale Mittelebene (p) der Unterteile (1), eine seitliche Drehung mit einer Amplitude ausführen können, die durch die Kopplungsmittel bestimmt und begrenzt wird, die durch die Längskanäle (11) und die Längserweiterungen (21) der Ober- und Unterteile vorgesehen sind; wobei die Längskanäle (11) der Unterteile (1) und die Längserweiterungen (21) der Oberteile (2) jeweils mindestens Folgendes umfassen: ein oberer Abschnitt (a) mit einer Gesamtbreite, die

zum unteren Bereich hin von einer größeren Breite zu einer geringeren Breite abnimmt, und ein unterer Abschnitt (b) mit einer Breite, die zwischen der größeren Breite und der geringeren Breite des oberen Abschnitts (a) liegt.

2. Wand nach Anspruch 1, **dadurch gekennzeichnet, dass** die aufeinanderfolgenden Oberteile (2) durch Befestigungsmittel (3, 31) verbunden sind, die mit den von der Erweiterung (21) und dem Kanal (11) vorgesehenen Kopplungsmitteln zusammenwirken, um die seitliche Drehung der Oberteile (2) im Falle eines Aufpralls eines Fahrzeugs gegen die Wand zu begrenzen.
3. Wand nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Längskanal (11) jedes Unterteils (1) und die Längserweiterung (21) jedes Oberteils (2) abgerundete Längskanten aufweisen.
4. Wand nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Unterteile (1) am Boden verankert sind, ohne dass eine Verschiebung möglich ist.
5. Wand nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Unterteile (1) und die Oberteile (2) die gleiche Länge haben und paarweise vertikal ausgerichtet sind, oder gegeneinander in einer Längsrichtung in gestaffelter Weise verschoben sind.

Revendications

1. - Barrière de sécurité routière comprenant une série de pièces préfabriquées en béton, de section transversale constante, orientées respectivement vers leurs extrémités longitudinales, comprenant : des pièces inférieures (1) formant une base de barrière et des pièces supérieures (2), formant un corps de barrière, supportées et accouplées sur les pièces inférieures (1) dans laquelle les parties inférieures (1) ont chacune une surface supérieure pourvue d'un canal longitudinal (11) pour le couplage dans la direction longitudinale, **caractérisée en ce que** les parties supérieures (2) ont chacune une extension longitudinale (21) faisant saillie à partir d'une surface inférieure des parties supérieures (2), la barrière de sécurité routière étant adaptée pour permettre un déplacement vertical limité desdites extensions longitudinales (21) ; lesdits canaux longitudinaux (11) des parties inférieures (1) et lesdites extensions longitudinales (21) des parties supérieures (2) ayant des sections transversales similaires, et ayant des différences dimensionnelles calculées, de sorte qu'en cas de choc d'un véhicule, les parties supé-

rieures sont adaptées pour maintenir leur intégrité et effectuer, par rapport au plan vertical médian (p) des parties inférieures (1), une rotation latérale d'une amplitude déterminée et limitée par les moyens d'accouplement prévus par les canaux longitudinaux (11) et les prolongements longitudinaux (21) des parties supérieures et inférieure ; dans laquelle les canaux longitudinaux (11) des parties inférieures (1) et les prolongements longitudinaux (21) des parties supérieures (2) comprennent chacune, au moins :
 un segment supérieur (a) d'une largeur globale décroissante d'une largeur plus grande à une largeur plus petite vers la zone inférieure, et un segment inférieur (b) d'une largeur comprise entre la largeur la plus grande et la largeur la plus petite du segment supérieur (a).

2. - Barrière, selon la revendication 1, **caractérisée en ce que** les parties supérieures successives (2) sont reliées par des moyens de fixation (3, 31) qui coopèrent avec les moyens d'accouplement prévus par le prolongement (21) et le canal (11) pour limiter la rotation latérale des parties supérieures (2) en cas de choc d'un véhicule contre la barrière.
3. - Barrière, selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le canal longitudinal (11) de chaque partie inférieure (1) et l'extension longitudinale (21) de chaque partie supérieure (2) ont des bords longitudinaux arrondis.
4. - Barrière, selon l'une quelconque des revendications précédentes, **caractérisée en ce que** les parties inférieures (1) sont ancrées au sol, sans possibilité de déplacement.
5. - Barrière selon l'une quelconque des revendications précédentes, **caractérisée en ce que** les parties inférieures (1) et les parties supérieures (2) ont la même longueur et sont alignées verticalement par paires ; ou sont décalées l'une par rapport à l'autre dans une direction longitudinale, de manière échelonnée.

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DIBUJOS

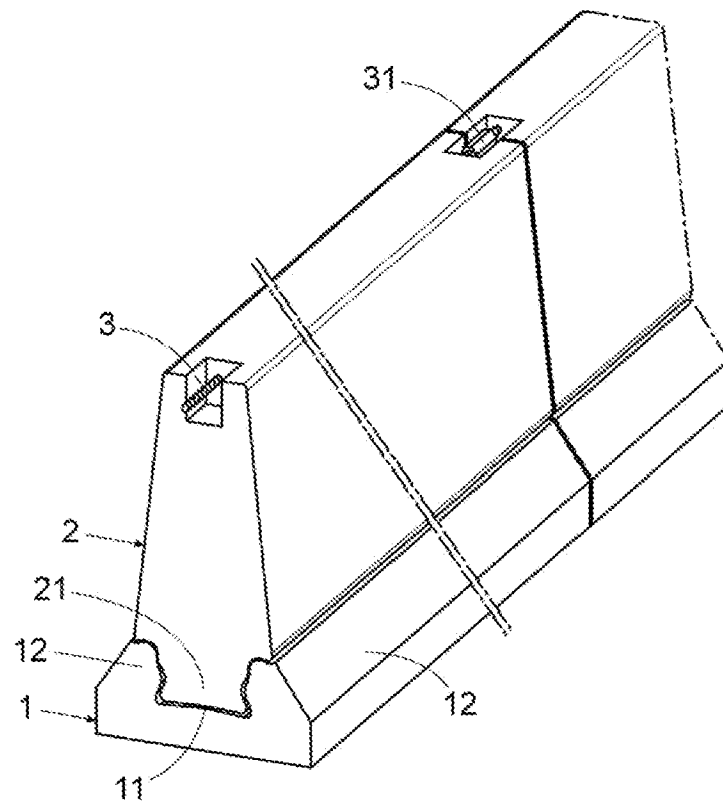


Fig. 1

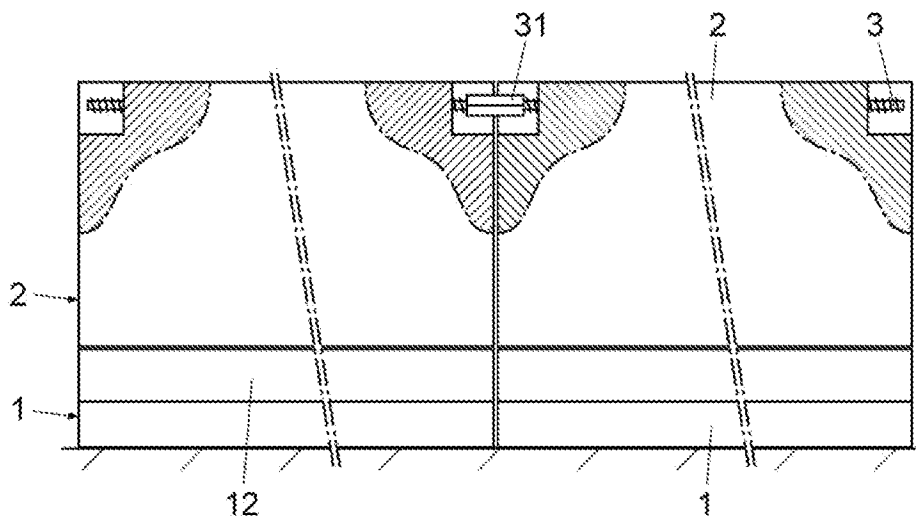


Fig. 2

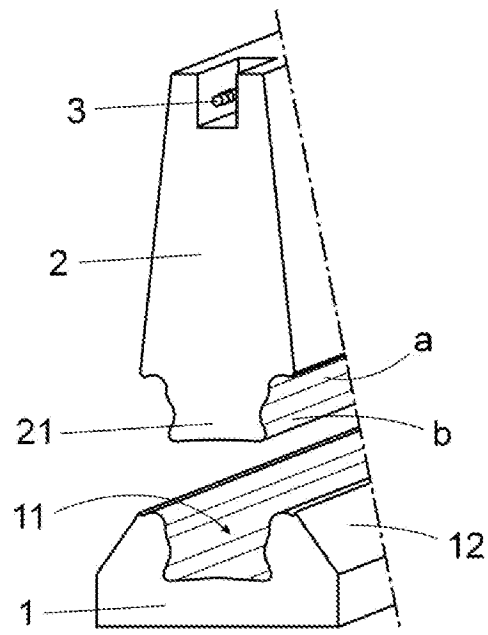


Fig. 3

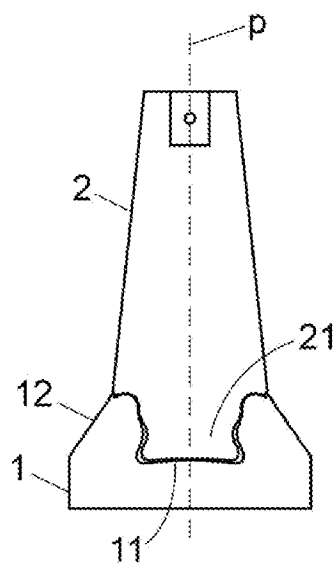


Fig. 4

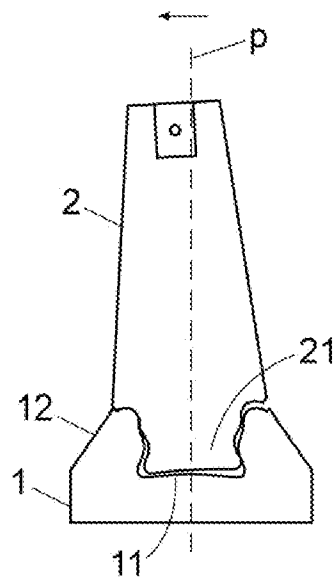


Fig. 5

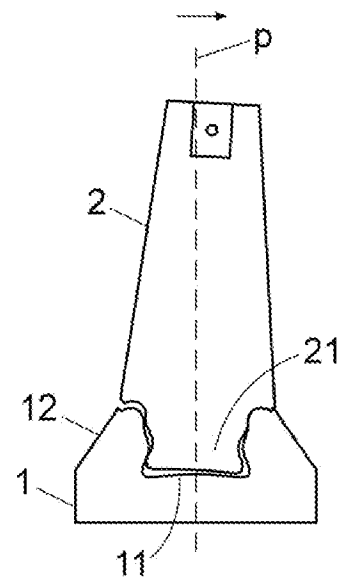


Fig. 6

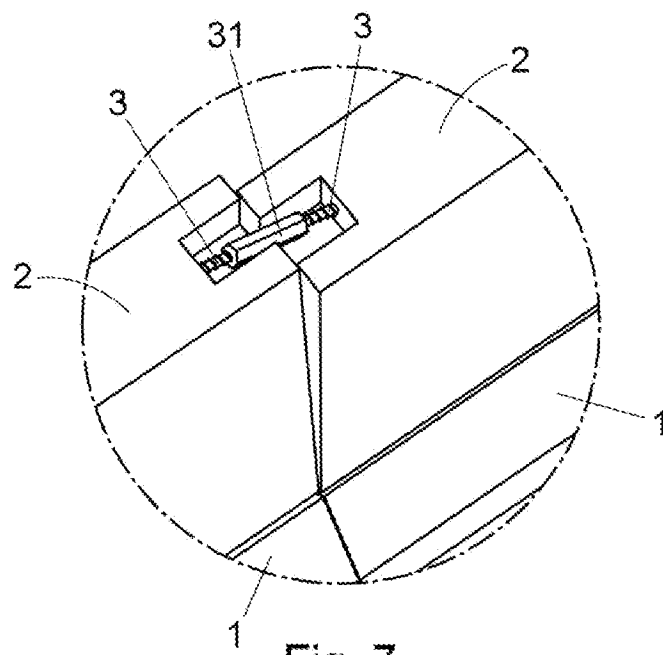


Fig. 7

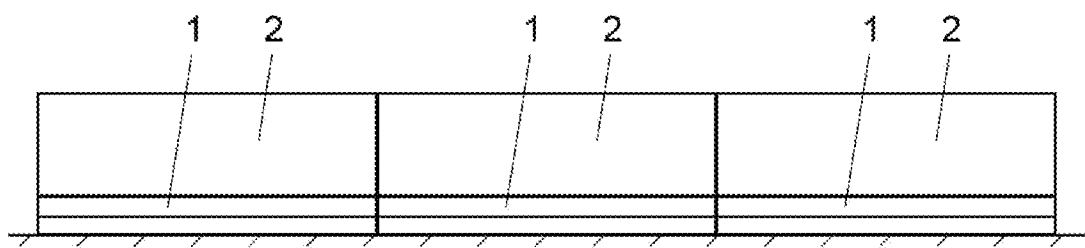


Fig. 8

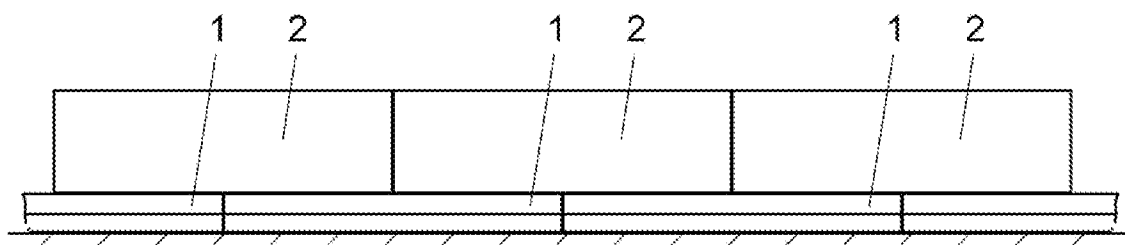


Fig. 9

REFERENCES CITED IN THE DESCRIPTION

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- EP 1106738 A2 **[0007]**
- EP 0641893 A1 **[0008]**
- US 9644332 B1 **[0009]**