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(54) **IMPROVED LANE SEPARATOR FOR CYCLE PATHS**

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Description

BACKGROUND OF THE INVENTION.

[0001] The invention arises within the range of devices for road signs and road safety. In detail, it reveals an innovative system to separate a cycle lane and a motor vehicles lane, in which some characteristics relating to the efficiency and practical of the device are improved.

STATE OF THE ART.

[0002] The increasing use of vehicles with a low environmental impact, is to be considered an established trend in global mobility.

[0003] Actually there is a growing interest and use for vehicles of Urban Mobility - and not only - represented by bicycles, in addition to new technologies that allow reducing or eliminating pollutant emissions in the new prototypes of automobiles and motorcycles.

[0004] The development of cycle paths in the new urban infrastructures in all the cities of the world is known, as is equally known is the commitment to reconvert the infrastructure of the current urban and extra-urban communication routes for the use of bicycles. For this purpose, this conversion - when enabled by the architecture already present in the street furniture or by the appropriate changes implemented - is mainly based on the use of special road barriers whose purpose is to separate the motor vehicle lane from that meant for the transit of bicycles. For this application the common concrete curbs already present at the side of the roads are not only used, but also curbs made of mostly synthetic material, with a height and geometry suitable for the purpose and designed to guarantee safety and functionality.

[0005] These devices are often called "road separators" or "lane separator".

[0006] In EP3138962A1 patent, for example, a road separator for cycle paths is illustrated, having an asymmetrical shape and the casings suitable to hold the strips of retro-reflective material. The two side walls are inclined relative to the ground with two different angles: the one facing the cycle path [Prior Art EP3138962A1, Fig2 (103)] has an angle of 45 degrees or less, such as to allow a non-violent impact with the wheel of a bicycle in case of a collision. The one facing the motor vehicle lane [Prior Art EP3138962A1, Fig2 (102)] has instead a much more accentuated angle, in order to more effectively counteract a collision with a car wheel, preventing the vehicle from getting into the cycle lane. This solution is to be considered useful for the passive safety. The materials used in the realization of the device are synthetic, while the special screws are used to fix the structure on the road surface.

[0007] Even GB2235485A patent claims a road separator but such separator is designed with characteristics that make it also usable in other applications, such as roadworks. The device has a mechanical interlocking

coupling at the front and rear [Prior Art GB2235485A, Fig2 (34) (36)] such as to make it matching with preceding separator and the one following. This interlocking coupling can also take the form of a triangular profile bracket [Prior Art GB2235485A, Fig6 (38) (40)]. The above joining elements allow to form a sort of modular structure and self-supporting. Furthermore, the device allows the casing of devices capable of reflecting or emitting light, of poles for road signs and also the internal casing of a volume which can be filled with concrete or other solid and / or liquid substances, capable of weighing down the structure and ensure its positioning on the road surface. WO 01/25681 A1 show a road line separator made by a lower element and an upper element with a symmetrical design, where safety performance for road user are not improved. In one of the embodiment, the invention "provide a smooth transition at 44 with the mounting surface 50" (see Pag11, line14 -22). This patent, instead, claims a module for an elongated lighting system to increase visibility and use light source like hazard signal.

[0008] The inventions mentioned here however are not adequate for a new concept of road traffic: the expected increase in the circulation of bicycles in the cities must necessarily be accompanied by an increase in the passive safety performance of the devices called "lane separators".

[0009] The present invention concerns a new inventive approach and a family of possible solutions for the purpose, thanks to the variance of the basic technical characteristics.

DESCRIPTION OF THE INVENTION.

[0010] The device according to the invention provide a road separator in synthetic material [Fig1] consisting of two distinct parts: the lower one in contact with the road surface hereafter called "Base" [Fig1 (16)] and the upper one interlocked on it called "Extension" [Fig1 (11)].

[0011] The basic parts are positioned sequentially one after the other on the road surface, so as to create the delimitation of the desired lane. Likewise the Extensions are placed above the Bases. During this operation however the parts Base and Extension are longitudinally staggered by a measure such that an Extension [Fig6 (60)] is placed simultaneously above two below Bases [Fig6 (61) (62)]. This creates a stronger connection between all the upper and lower parts of the device that realize the road separator according to the idea of the invention, similar to the procedures for use of the masonry brick in building. When the Bases and Extensions are positioned in this way, the through holes in the two devices [Fig6 (63) (65)] align each other vertically. This allows a screw [Fig6 (64)] to fix both the Extension and the Base placed under it on the road surface.

[0012] In Drawings the basic characteristics of the device are described:

- Fig1 shows a set of the Base and the Extension.

- Fig2 shows a front view of the Base.
- Fig3 shows a front view of the Base and the Extension.
- Fig4 shows a view of the top of the Base flexed longitudinally, thanks to the lateral reworking according to the idea of the invention.
- Fig5 shows the details of the profiles and of the internal channel of the Base.
- Fig6 shows the alignment of the Bases under the Extensions and the connection screws towards the road surface.
- Fig7 shows the details of the filling of the openings that allow the longitudinal bending of the Base.
- Fig8 shows a modular Base block with added side walls.
- Fig9 shows the curvature profiles of the side walls of the Base.
- Fig10 shows the device that warns the cyclist to change his trajectory.
- Fig11 shows the progressive curve to a geometric progression of the side walls.
- Fig12 shows a detail of the plugs that can be removed from the Base body.
- Fig13 shows a profile of a Base from above.
- Fig14 shows a non-linear assembly of two Bases.

[0013] In section the Base essentially consists of a trapezoidal shape [Fig2 (20)] in which the upper surface is worked in such a way as to obtain a shape similar to a track with two longitudinally extended guides [Fig2 (21) (22)] [Fig5 (50) (51)] able to form a deeper channel inside them [Fig2 (23)] [Fig5 (52)]. This shape is complementary to the lower body of the Extension [Fig3 (30)]; when put above the Base [Fig3 (31)] in fact, the Extension interlocks in the track [Fig3 (36) (37)] and in the inner channel present in it [Fig3 (32)]. Internal casings are provided on both pieces to host the fixing screws [Fig2 (24)] [Fig3 (33)] to the road surface.

[0014] The Extension consists in a linear or slightly concave profile in its upper part [Fig3 (35)] such as not to present sharp corner dangerous for crossings and / or falls on it. The side walls of the Base are designed asymmetrically because the respective lanes facing them are intended for two different categories of vehicles according to the idea of the invention.

[0015] The side wall whose the lane is reserved for motor vehicles [Fig9 (90)] rise from the roadway line with an almost vertical angle of 90 degrees [Fig9 (91)]; then it continues with a concave profile [Fig. 9 (92)] which ends upon reaching the upper vertex of the device. This overall profile is suitable for effectively repelling the wheel of a motor vehicle within its lane in the event of an attempt to accidentally cross the cycle path. At the same time this geometry avoids an excessively violent impact that would occur if the side wall of the road separator were completely vertical and could cause damage to the vehicle even when its speed was very limited and not sufficient to cross the separator. The opposite wall along the cycle

path [Fig9 (93)] was instead designed with a single concave surface [Fig9 (94)] in which the radius of curvature gradually decreases [Fig9 (95)] moving towards the upper summit of the Base according to a law of geometric progression [Fig 11 (110)].

[0016] Unlike the lane reserved to motor vehicles, the foot of the Base does not create an orthogonal corner with the asphalt line [Fig9 (96)] to avoid that the wheel of a bicycle in any impact on it is repelled with too much force or worse, causes it the fall. The increasing curvature of this wall during its vertical development however makes it possible to bring the bike wheel (and therefore the whole vehicle) more effectively towards the respective lane in the event of a higher speed of impact.

[0017] The progression of this curvature is therefore studied in order to obtain the best possible benefit for the passive safety of the vehicles passing through the respective lanes.

[0018] Particularly for bicycles, this progressive curvature acts on the vehicle according to the speed of impact, increasing the force of rejection in proportion to the achievement of the upper limit in height of the separator, indicating a high speed of the bicycle. It is also possible to provide a capacity of the separator to accommodate different shapes of the geometry of the side walls according to the idea of the invention, in order to allow wider uses and applications. This is made possible by removable side profiles.

[0019] A series of removable and specific lateral profiles can be connected by screws [Fig8 (83)] and interlocking coupling [Fig8 (84)] Fig8 (85) (86)] to the Base [Fig8 (80)] and to its side walls [Fig8 (81) (82)]. It is therefore possible to design different curvatures of the side profiles and adapt them to the same Base block at different times from the installation of the road separator.

[0020] The added value of this solution is mainly defined by a relevant aspect: the possibility to upgrade the performances of the road separator by changing the specific side profiles.

[0021] Small protuberances of various shapes and sizes can be arranged [Fig10 (101) (102)] on the side profiles of the road separator [Fig10 (100)], both in those as a single block of the Base (Fig9 (92)) and in the specific and removable ones [Fig8 (85) (86)]. These protuberances have a shape devoid of corner such as to dissuade the cyclist from following the lower margins of the road separator, thus avoiding unsafe behavior in the reserved lane.

[0022] Further solutions have been integrated in the device to allow an advantageous implementation in relation to the state of the art.

[0023] The front and rear of a Base are equipped with a slightly specular and curved profile [Fig13 (130) (131)], in order to facilitate the installation in the situations where it is necessary to curve the lane separators along the roadway.

[0024] In this situation the space between the two Bases mounted on the road surface [Fig14 (140)] can con-

veniently be filled with concrete or synthetic products based on silicone or other similar materials.

[0025] The Base can be realized with a further feature visible in [Fig4]. This processing consists of a weakening of two opposite sections of the structure constituting the device, in the form of a triangular bracket [Fig4 (40)]. This procedure is achieved symmetrically both on the right side and on the left side of the Base, exactly in half of its overall length. This weakening allows an easy removal of the aforesaid portion of material (when necessary) during the assembly of the separator on the road surface [Fig4 (41)].

[0026] Two parts of the Base are formed, one anterior [Fig4 (45)] and one posterior [Fig4 (46)], joined by a reduced and central section of the same material as the Base [Fig4 (42)].

[0027] The remaining Base section thus obtained in its central area, allows a curving of the two parts along the direction parallel to the road surface, thus eliminating the original structural rigidity.

[0028] Therefore, the movement does not derive from an intrinsic flexibility of all the material constituting the separator, but from the advantageous additional reworking carried out on the structure of the device. This allows to conveniently curve the device during the installation of the separator on the road surface; it also allows a greater choice of raw materials, even when they are not particularly flexible.

[0029] In [Fig 4] a curved Base according to the technique of the invention, is coupled in succession with another Base element with an extension installed above it [Fig4 (44)]. At the torsion point a joint element can be inserted (silicone, concrete, rubber etc.) [Fig7 (70) (71)] to guarantee the geometric continuity of the profile of the Base, also with a view of safety and maximum protection guarantee by the separator resulting from the idea of the invention.

[0030] Finally, the Base has two other processing which allow further advantages to the invention: the presence of a central channelling [Fig3 (34)] to allow any wiring or pipe to travel along the lane separation line, and the side openings [Fig1 (15)] that allow suitable rainwater drainage. The Extension elements, in addition to guaranteeing greater height in road separation, can be configured for additional visibility functions, installation of luminous signs or billboards, reflective panels, installation of electronic communication equipment with the road infrastructure, batteries, antennas etc.

[0031] The Extension elements in fact have an internal volume functional in order to hold such devices [Fig. 9 (97)] and a lower channeling extended throughout the length of the device [Fig. 3 (38)] for further functional purposes.

ADVANTAGES OF THE INVENTION.

[0032] The device shows the following advantages according to the idea of the invention:

- The asymmetric lateral profiles with progressive concave curve allow improved performance compared to the state of the art.
- In the version with separable side profiles, the device can be easily updated or repaired in the event of damage.
- In the version with separable side profiles, the Base and Extension can normally be used even without these parts.
- The variable height of the separator can be modified only by the size of the Extension device interlocked above the Base.
- The Base itself provides enough passive protection for a cycle path.
- The removable triangular profile bracket of the Base allow the separator to flex along the horizontal road surface.
- The removable triangular profile bracket of the Base allow a wider choice of the basic material for the realization of the device, even among those not particularly flexible.
- The staggered assembly along the longitudinal axis of the Base compared to the Extension allows to reach a greater overall structural rigidity.

Claims

1. Modular separator for cycle paths or other road application, made by a lower element called "Base" (20) and an upper element called "Extension" (35) wherein:
 - the Base and the Extension are vertically mounted one on the other and horizontally offset so that the upper Extension may rest symmetrically on two lower Bases,
 - the Base consists in a trapezoidal section shape (20) made by two upper side rails placed at the edge of the Base profile (21,22) forming a central channel within them (23) able to determine a surface for the interlocking of the Extension element,
 - the Base is equipped with a concave side wall (93) made by variable radius of curvature with geometric progression (110) on the side designed to contain the cycle path, and an opposite side wall (90) with an orthogonal profile with respect to the plane of the roadway (91) combined in the upper part to a profile with constant concave curvature (92),
 - the lateral side walls (85,86) are equipped with a disconnect system from the remaining body of the Base (81,82) by an interlocking coupling (84) and/or screw (83,84),
 - the surface of side walls of the Base (100) have a series of protuberances with a rounded shape arranged along the horizontal development of

- the modular separator (101,102),
- the profiles of the front wall of the Base (131) and the back wall (130) have a reciprocal and curved shape,
 - the Extension consists of a parallelepiped shape made up of a profile with a central block in the lower part (30) complementary to the shape of the Base channel (23) with a central channeling (38) and equipped in the upper area with a linear or convex profile (35),
 - the Base and Extension elements joined together have vertical through holes for fixing screws (63,65) (24) (33) that align each other only when an upper Extension (60) rests symmetrically on two lower Bases (61,62).
2. Modular separator according to claim 1 wherein the variable radius of curvature of the side wall designed to contain the cycle path (94,95) of the Element Base increases from the top vertex to the lower vertex under a geometric progression law (110).
3. Modular separator according to claims 1 and 2 wherein the Element Base has a weakening of two opposite section of the Base structure made by a triangular bracket (40) arranged along the whole height of the Base, with a length less than half of the width of the Base itself (120) detachable from the body structure of the modular separator (41).
4. Modular separator according to claim 1, 2 and 3 wherein a central channeling of the Base can be placed near the road (34) along the total length of the modular separator.
5. Modular separator according to claim 1, 2, 3 and 4 wherein the Base has holes placed on the basis of the side wall (15) suitable for rainwater drainage.
6. Modular separator according to claim 1 wherein the Extension is equipped with an internal volume (97) suitable for the holding of visual and/or acoustic road infrastructure device also with electronic and radio communication functions.

Patentansprüche

1. Modularer Trenner für Fahrradwege oder andere Straßenanwendungen, hergestellt aus einem unteren Element, das als "Basis" (20) bezeichnet wird, und einem oberen Element, das als "Erweiterung" (35) bezeichnet wird, wobei:
- die Basis und die Erweiterung vertikal übereinander und horizontal versetzt montiert sind, so dass die obere Erweiterung symmetrisch auf zwei unteren Basen aufliegen kann,

- die Basis eine trapezförmige Querschnittsform (20) aufweist, die aus zwei oberen Seitenschienen besteht, die am Rand des Basisprofils (21, 22) angeordnet sind und zwischen ihnen (23) einen zentralen Kanal bilden, der eine Oberfläche für die Verriegelung des Erweiterungselements bestimmen kann,
- die Basis mit einer konkaven Seitenwand (93), die mit einem variablen Krümmungsradius mit geometrischem Verlauf (110) auf der Seite hergestellt ist, die zur Aufnahme des Fahrradwegs ausgelegt ist, und einer gegenüberliegenden Seitenwand (90) mit einem orthogonalen Profil in Bezug auf die Ebene der Fahrbahn (91) und im oberen Teil zu einem Profil mit konstanter konkaver Krümmung (92) kombiniert ausgestattet ist,
- die seitlichen Seitenwände (85, 86) mit einem System zum Trennen vom restlichen Körper der Basis (81, 82) durch eine Verriegelungskuppelung (84) und/oder Schraube (83,84) ausgestattet sind,
- die Oberfläche der Seitenwände der Basis (100) eine Reihe von Vorsprüngen mit abgerundeter Form aufweist, die entlang der horizontalen Ausdehnung des modularen Trenners (101, 102) angeordnet ist,
- die Profile der Vorderwand der Basis (131) und der Rückwand (130) eine reziproke und gekrümmte Form aufweisen,
- die Erweiterung eine Parallelepipedform aufweist, die aus einem Profil mit einem zentralen Block im unteren Teil (30) besteht, der komplementär zur Form des Basiskanals (23) mit einer zentralen Rinne (38) ist und im oberen Bereich mit einem linearen oder konvexen Profil (35) ausgestattet ist,
- die miteinander verbundenen Basis- und Erweiterungselemente vertikale Durchgangslöcher für Befestigungsschrauben (63, 65) (24) (33) aufweisen, die nur dann miteinander fluchten, wenn eine obere Erweiterung (60) symmetrisch auf zwei unteren Basen (61, 62) aufliegt.

2. Modularer Trenner nach Anspruch 1, wobei der variable Krümmungsradius der Seitenwand, die zur Aufnahme des Fahrradwegs (94, 95) des Elements Basis ausgelegt ist, vom oberen Scheitelpunkt zum unteren Scheitelpunkt gemäß einem geometrischen Folgesetz (110) zunimmt.
3. Modularer Trenner nach Anspruch 1 und 2, wobei das Element Basis eine Schwächung von zwei gegenüberliegenden Abschnitten der Basisstruktur aufweist, die durch eine dreieckige Halterung (40) gebildet wird, die entlang der gesamten Höhe der Basis angeordnet ist, mit einer Länge von weniger als der Hälfte der Breite der Basis selbst (120), die

von der Körperstruktur des modularen Trenners (41) abnehmbar ist.

4. Modularer Trenner nach Anspruch 1, 2 und 3, wobei eine zentrale Rinne der Basis in der Nähe der Straße (34) entlang der Gesamtlänge des modularen Trenners angeordnet sein kann. 5
5. Modularer Trenner nach Anspruch 1, 2, 3 und 4 und wobei die Basis Löcher aufweist, die an der Basis der Seitenwand (15) angebracht sind und die für die Regenwasserableitung geeignet sind. 10
6. Modularer Trenner nach Anspruch 1, wobei die Erweiterung mit einem Innenvolumen (97) ausgestattet ist, das zum Halten von visuellen und/oder akustischen Straßeninfrastrukturvorrichtungen auch mit elektronischen und Funkkommunikationsfunktionen geeignet ist. 15 20

Revendications

1. Séparateur modulaire pour trajets à cycles ou autre application routière, constitué d'un élément inférieur dit « Base » (20) et d'un élément supérieur dit « Extension » (35), dans lequel : 25
 - la Base et l'Extension sont montées verticalement l'une sur l'autre et décalées horizontalement de sorte que l'Extension supérieure peut reposer symétriquement sur deux Bases inférieures, 30
 - la Base consiste en une forme de section trapézoïdale (20) constituée de deux rails latéraux supérieurs placés au bord du profil de Base (21,22) formant un canal central à l'intérieur de ceux-ci (23) capable de déterminer une surface pour l'emboîtement de l'élément d'Extension, 35
 - la Base est équipée d'une paroi latérale concave (93) réalisée par rayon de courbure variable à progression géométrique (110) du côté destiné à contenir le trajet à cycles, et d'une paroi latérale opposée (90) de profil orthogonal par rapport au plan de la chaussée (91) combiné en partie supérieure à un profil à courbure concave constante (92), 40
 - les parois latérales de côté (85, 86) sont équipées d'un système de désolidarisation du corps restant de la Base (81, 82) par un accouplement à enclenchement (84) et/ou une vis (83, 84), 50
 - la surface des parois latérales de la Base (100) présente une série de protubérances de forme arrondie agencées le long du développement horizontal du séparateur modulaire (101, 102), 55
 - les profils de la paroi avant de la Base (131) et de la paroi arrière (130) ont une forme réciproque et incurvée,

- l'Extension est constituée d'une forme parallélépipédique composée d'un profil avec un bloc central dans la partie inférieure (30) complémentaire de la forme du canal de Base (23) avec une canalisation centrale (38) et équipé en partie supérieure d'un profil linéaire ou convexe (35),
- les éléments de Base et d'Extension réunis présentent des trous traversants verticaux pour les vis de fixation (63, 65) (24) (33) qui s'alignent uniquement lorsqu'une Extension supérieure (60) repose symétriquement sur deux Bases inférieures (61, 62).

2. Séparateur modulaire selon la revendication 1, dans lequel le rayon de courbure variable de la paroi latérale destinée à contenir le trajet à cycle (94, 95) de l'élément de base augmente du sommet supérieur au sommet inférieur selon une loi de progression géométrique (110).
3. Séparateur modulaire selon les revendications 1 et 2, dans lequel la Base de l'Élément a un affaiblissement de deux sections opposées de la structure de Base fait par un support triangulaire (40) disposé sur toute la hauteur de la Base, avec une longueur inférieure à la moitié de la largeur de la Base elle-même (120) pouvant être détachée de la structure de corps du séparateur modulaire (41).
4. Séparateur modulaire selon la revendication 1, 2 et 3, dans lequel une canalisation centrale de la Base peut être placée à proximité de la route (34) sur toute la longueur du séparateur modulaire.
5. Séparateur modulaire selon la revendication 1, 2, 3 et 4, dans lequel la Base comporte des trous placés sur la base de la paroi latérale (15) adaptés au drainage des eaux pluviales.
6. Séparateur modulaire selon la revendication 1, dans lequel l'Extension est équipée d'un volume interne (97) adapté pour le maintien d'un dispositif visuel et/ou acoustique d'infrastructure routière également avec des fonctions de communication électronique et radio.

Fig1

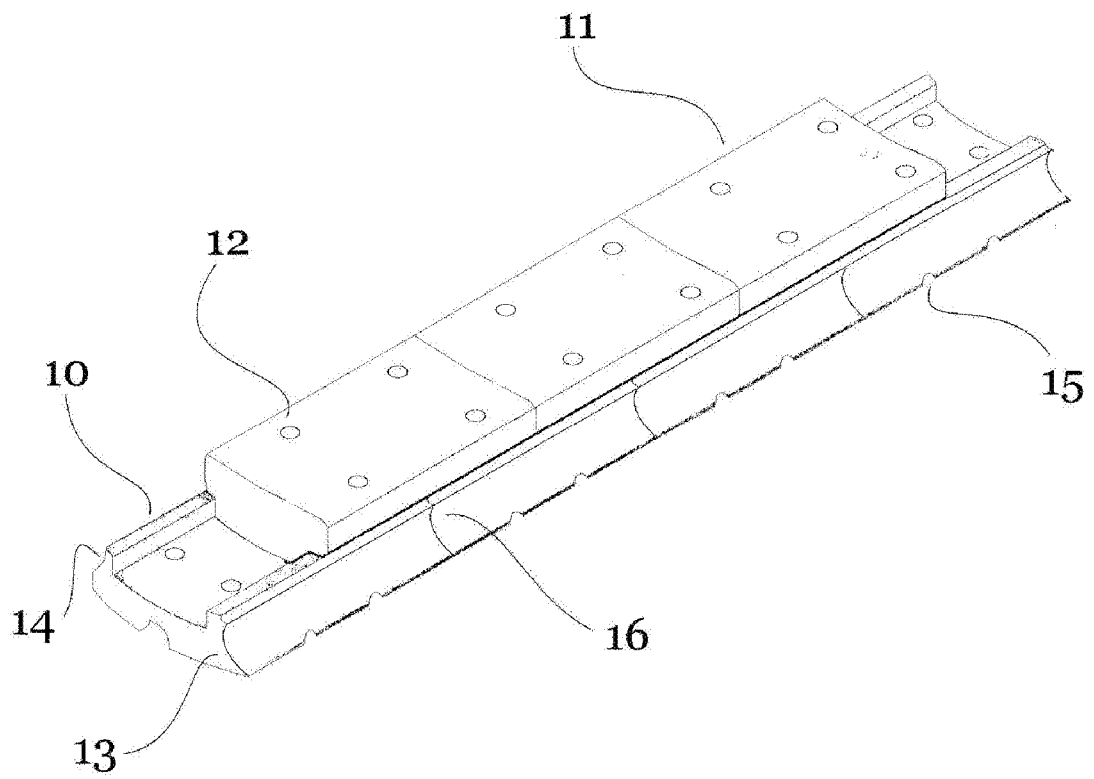


Fig2

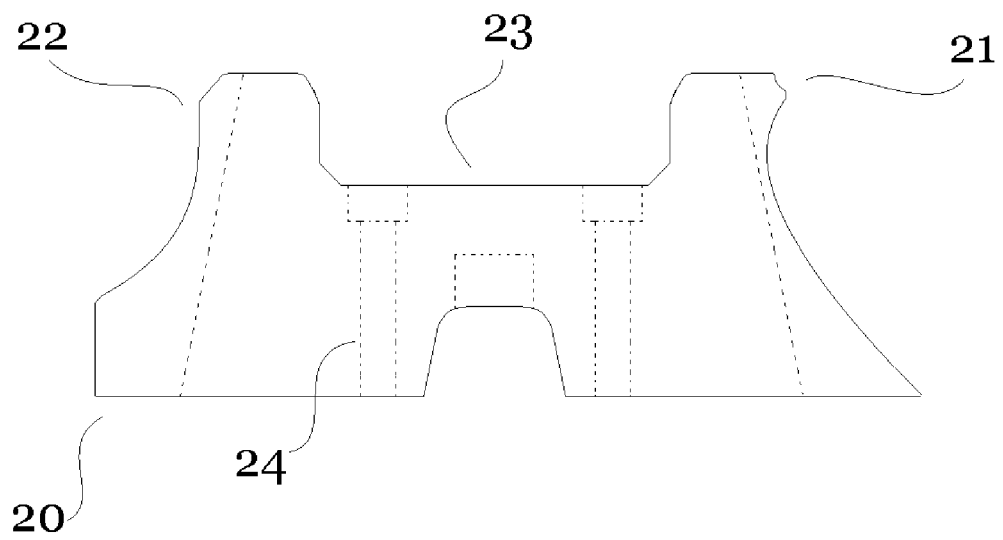


Fig3

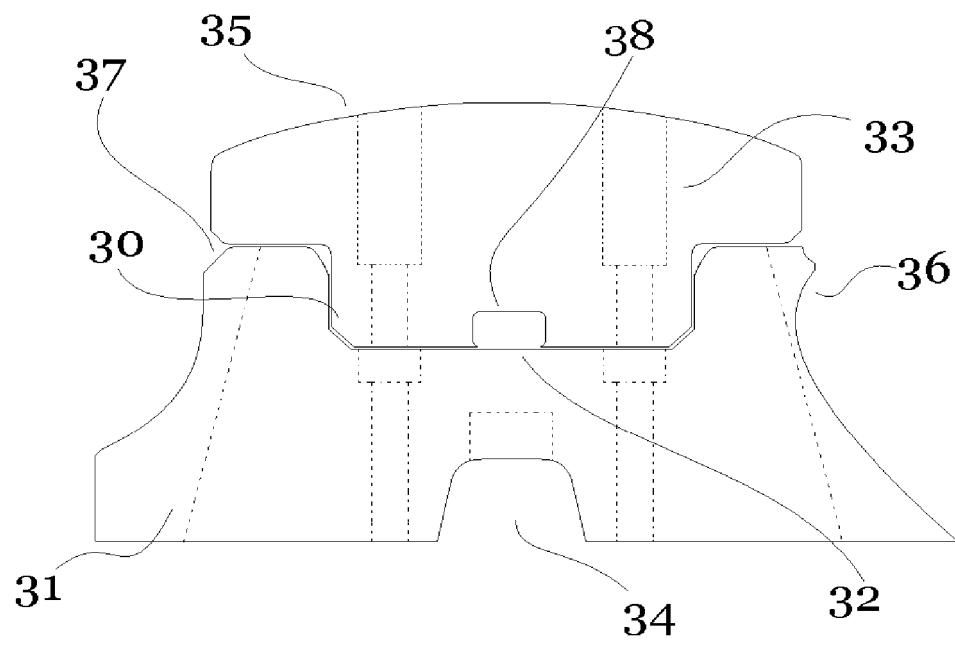


Fig4

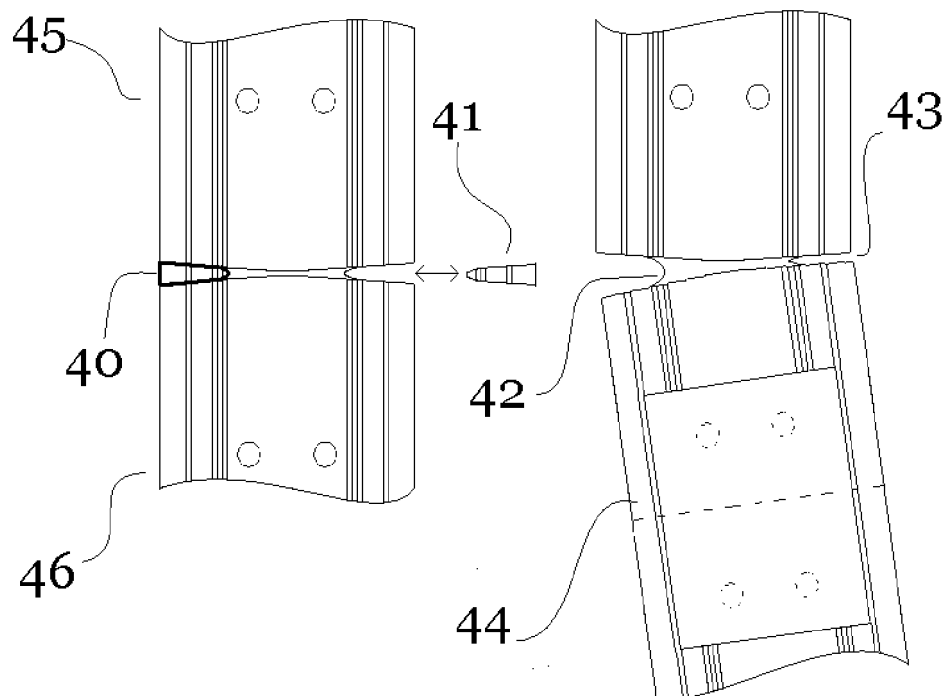


Fig5

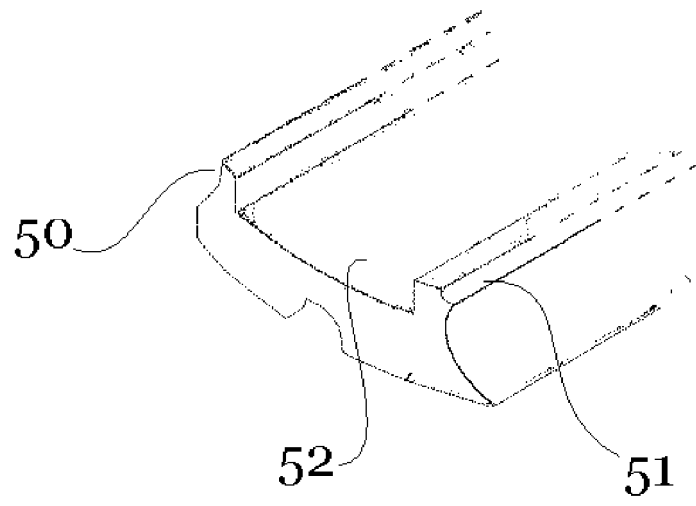


Fig6

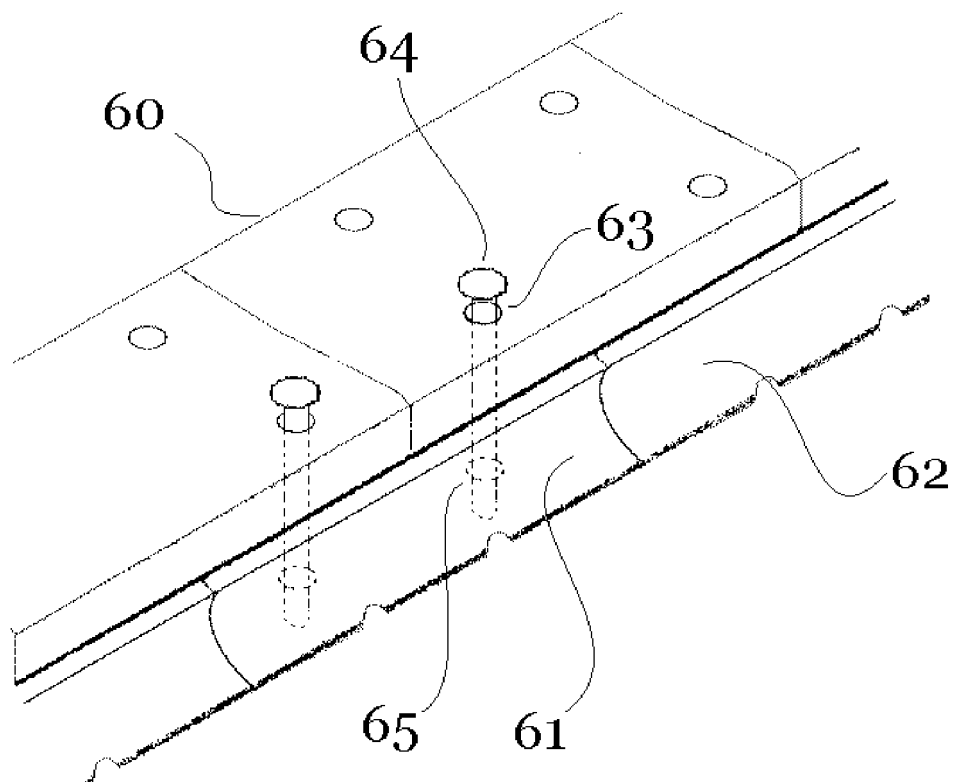


Fig7

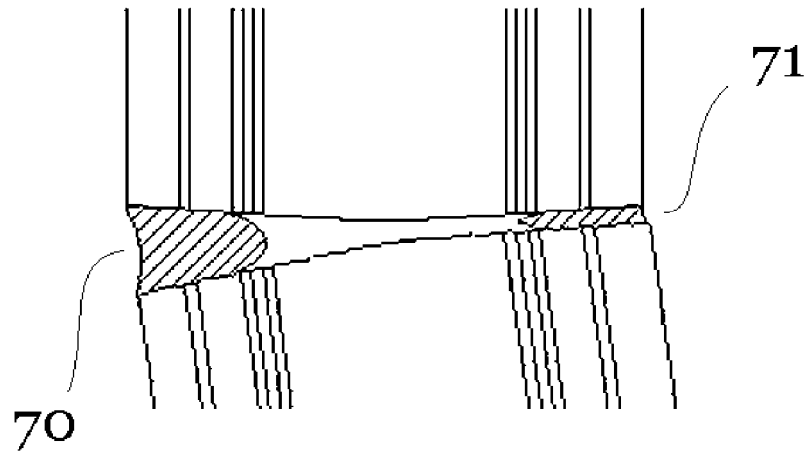


Fig8

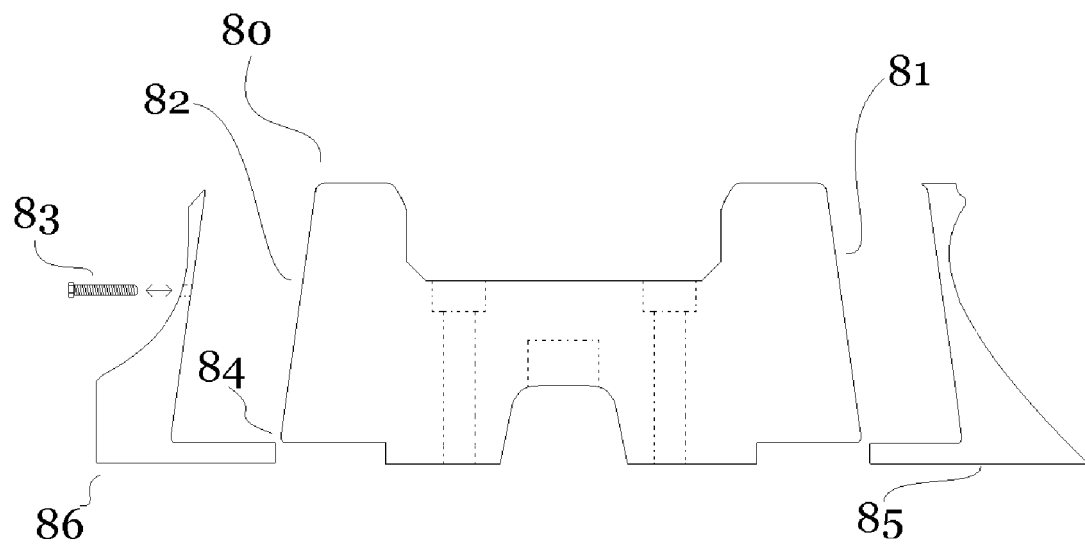


Fig9

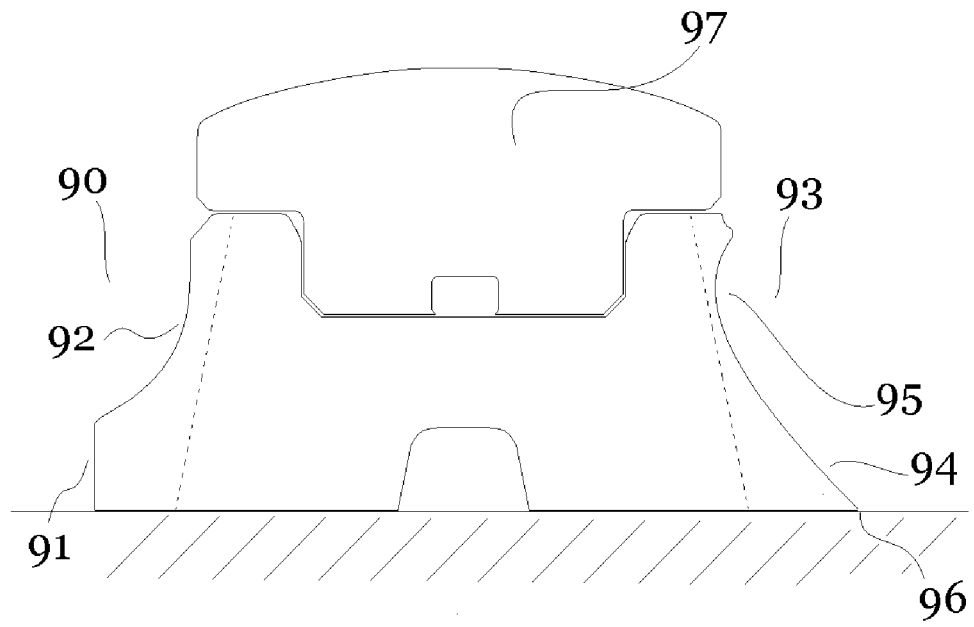


Fig10

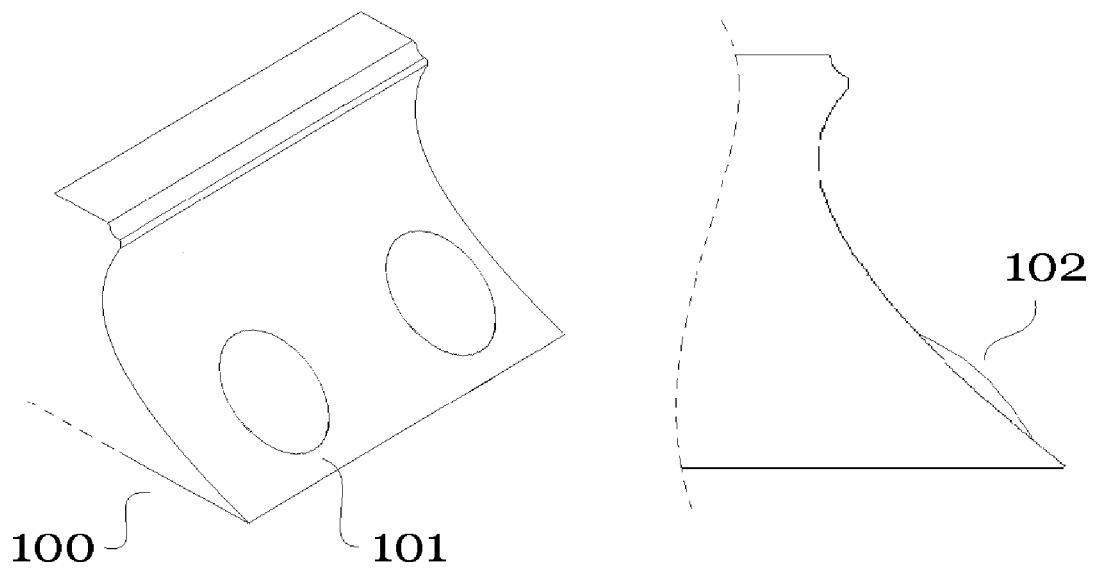


Fig11

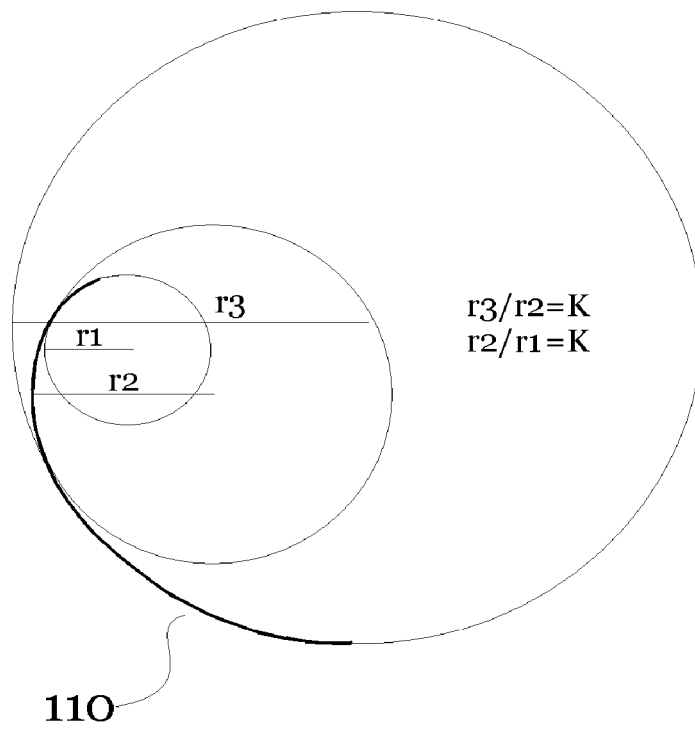
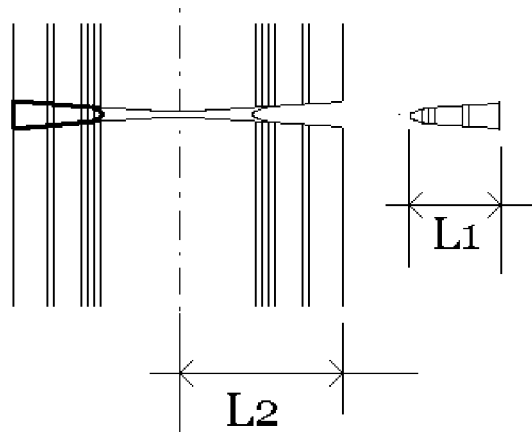


Fig12



$$L1 < L2$$

Fig13

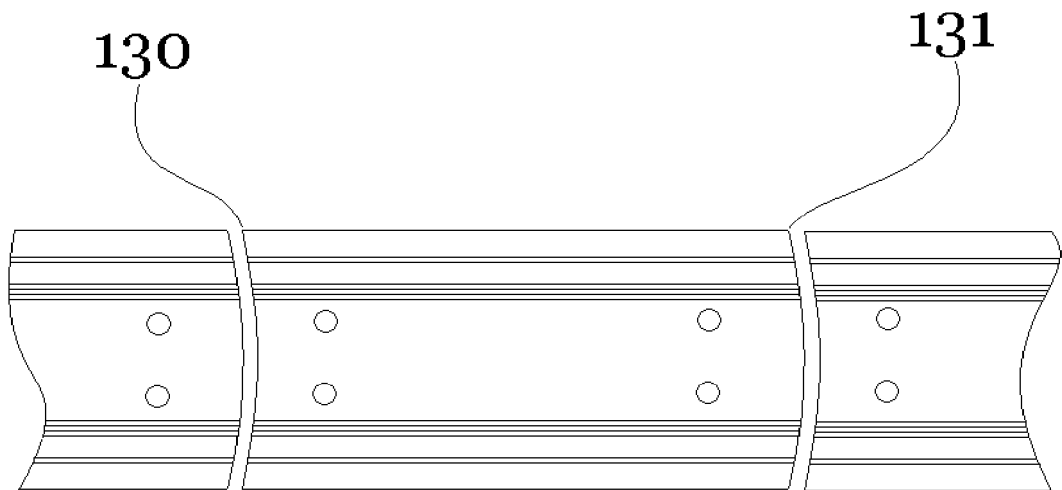
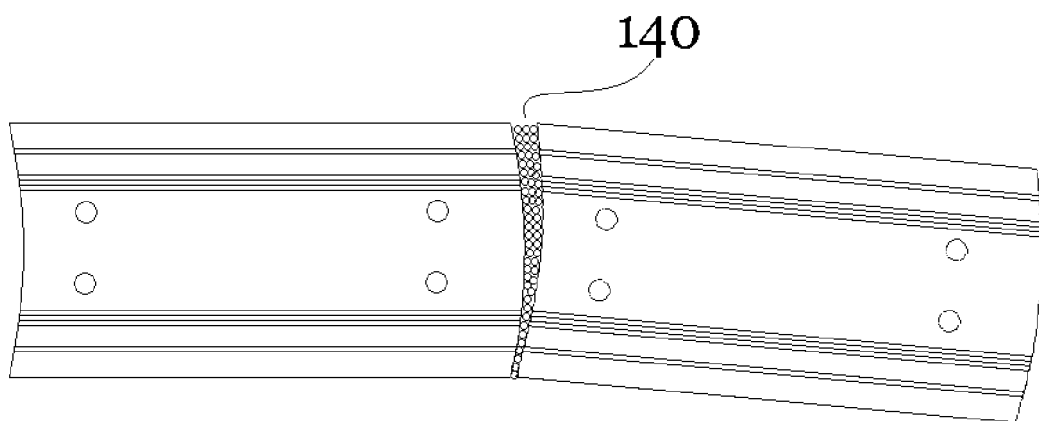


Fig14



Prior Art EP3138962A1, Fig2

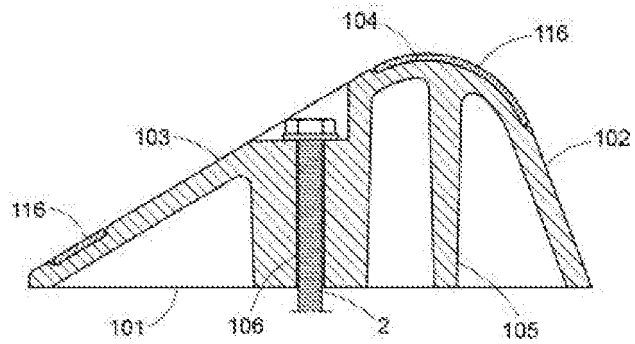
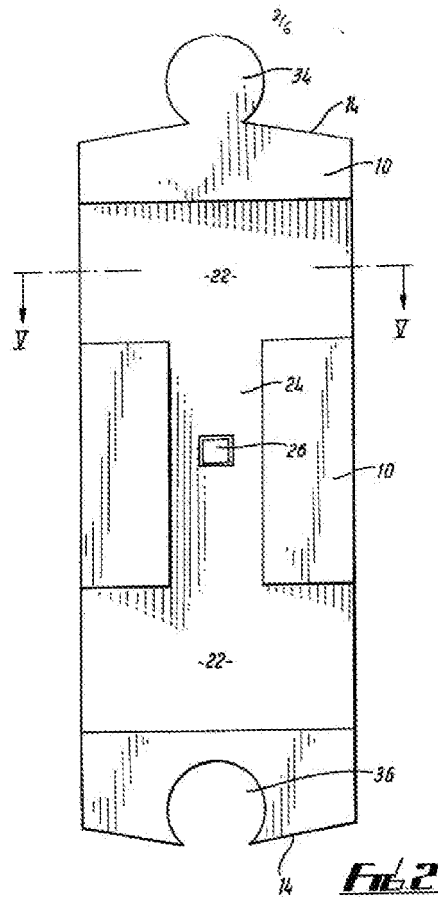
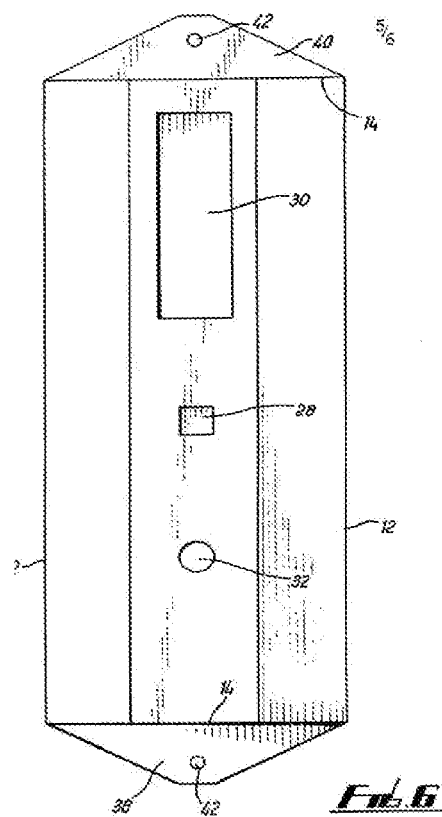


Fig. 2

Prior Art GB2235485A, Fig2



Prior Art GB2235485A, Fig6



REFERENCES CITED IN THE DESCRIPTION

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