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(54) **SYSTEM FOR PROTECTING INDIVIDUALS FROM IMPACTS AGAINST ROAD GUARD RAILS**

SYSTEM ZUM SCHUTZ VON PERSONEN VOR AUFPRALLEN GEGEN STRASSENLEITPLANKEN

SYSTEME DE PROTECTION CONTRE LES IMPACTS DE PERSONNES DESTINE A DES
GLISSIERES DE SECURITE

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(73) Proprietor: **Taexpa, S.L.**
50500 Tarazona (Zaragoza) (ES)

(72) Inventor: **TARAZONA DE LA ASUNCIÓN, Ramiro**
E-50500 Tarazona (Zaragoza) (ES)

(74) Representative: **Lehmann Novo, Maria Isabel**
Alvarez de Baena, 4
28006 Madrid (ES)

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EP 1 767 702 B1

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Description

FIELD OF THE INVENTION

[0001] This invention relates to a system for protecting persons, specifically motorists and cyclists, from impacts with road crash barriers as a result of an accident or a fall, or for any other reason. For this purpose the invention modifies the shape of the corrugated barrier rails and provides an impact-absorbing cladding around the posts supporting the said barrier rails.

[0002] As is known, the design of existing crash barriers has sharp edges on the barrier rails and on the posts which in the event of an impact act like guillotines, causing severe harm and also mutilating accident victims when they impact against them.

[0003] The protection system according to the invention offers the special feature that it can absorb impacts from all directions (270°) and can also break down the impact into three or more stages (with progressively lesser to greater resistance), at the same time diverting the accident victim's body from its trajectory towards the post of a crash barrier as a result of an "eccentric rotation" of the material comprising the said protection system as a result of which oscillation or back and forth movement of the "swing" type is created.

PRIOR ART

[0004] Systems for protecting the posts of crash barriers which are merely restricted to wrapping those posts with an impact-absorbing material, which do not provide for the possibility of diverting the impact away from the post, as a result of which the effectiveness of the alleged protection is greatly reduced, are known in the state of the art. As an example of the prior art mention may be made of the document ES-A-2 191 517. In particular, ES 2 208 119 discloses a system with the features of the preamble of claim 1.

SUMMARY OF THE INVENTION

[0005] There is therefore a need for a system for the protection of road crash barriers which overcomes the disadvantages of the prior art and which is cheap to manufacture and easy to install at the same time. This is achieved according to the invention through a system for protecting persons against impact with road crash barriers which comprises the features of the characterizing portion of claim 1.

[0006] According to the invention it is preferred that the number of the said concentric rings should be three.

[0007] Likewise, according to the invention, it is preferred that the deformable flexible material in those rings be preferably selected from the group of those in the nature of plastics. Protective cladding according to the invention may be manufactured by any normal processes, but use of the extrusion process is nevertheless pre-

ferred.

[0008] In a second embodiment this invention also provides that the concentric rings extending from the posterior half of the core have a slightly oval configuration and are attached to each other by means of a plurality of radial reinforcing walls whose imaginary extensions converge at the centre of the core, in this case the external ring also being slightly thicker than the other inner rings. Because the rings surround the posterior half of the protective cladding according to the invention and these rings are joined together by means of radial walls, the impact resistance of the said cladding is increased and at the same time the required characteristics for absorbing such impacts are preserved. Furthermore, this protective cladding will fully recover its original configuration after it has been deformed as a result of an impact received. Likewise the use of radial reinforcing walls makes it possible to reduce the thickness of the said rings, with a consequent saving in material.

[0009] Also, according to the invention, it is preferred that for a more secure attachment the opening housing the cladding on the supporting post is enclosed with steel supporting clamps which enclose the said cladding in clips provided for the purpose.

[0010] As an alternative, according to the invention, the desired greater security of attachment for the cladding can also be achieved by means of appropriate adhesive bonding.

[0011] According to the invention, the cladding of the protection system may also adopt any desired shape, for example a cylindrical or prismatic shape with a square, triangular, diamond, etc., transverse cross-section.

[0012] According to the invention the core of the protective cladding has been designed with a transverse cross-section which is suitable for attachment for posts of channel or I cross-section, or any other configuration.

[0013] Likewise, if the transverse cross-section of the post is different from a channel or I configuration, it is provided that the core of the protective cladding of the invention is mounted therein through an intermediate coupling module which fits it.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The above features and other features and advantages of the invention will be more clearly apparent from the following description with reference to the appended drawings which illustrate a non-restrictive embodiment of the new protection system and in which:

Figure 1 is a perspective view of the system for the protection of road crash barriers according to the invention,

Figure 2 is a view in elevation from one extremity showing the curved configuration of the top part of the barrier rail in the form of a corrugated crash barrier rail,

Figure 3 is a plan view from above, in partial cross-

section, showing the cladding applied to a post of the crash barrier, and

Figure 4 is a view corresponding to Figure 3 showing the manner in which the protection system according to the invention acts when suffering a lateral impact. Figure 5 corresponds to a second embodiment showing a plan view from above in partial cross-section.

DETAILED DESCRIPTION OF THE INVENTION

[0015] With reference to the drawings, it will be seen that the system protecting persons from impacts with road crash barriers according to the invention comprises barrier rails in the form of corrugated barrier rails 1 fixed to vertical supporting posts 2 anchored in the ground. Barrier rail 1 has a curved upper part 3 to prevent cuts in the event of anyone falling onto it and has a series of protuberances 4 in a longitudinal direction to absorb and decelerate the velocity of the vehicle or person striking it, and also to reduce the rebound effect.

[0016] Post 2 supporting barrier rail 1 is provided with a cladding 5 comprising various rings 6, 6', 6" of variable thickness which are open on one side and manufactured of material which deforms flexibly, but recovers immediately, and which incorporates a housing 7 designed to fit the post through pressure and a clamping effect, the inner surface 8 of the said housing having teeth or better attachment to the said post.

[0017] Although rings 6, 6', 6" may be of any number, it is preferred in the invention that there should be three.

[0018] Any material satisfying the flexibility, deformability or shape recovery requirements specified by the invention may be used as the deformable flexible material for rings 6, 6', 6". Nevertheless it is preferred that this material should be one selected from the group of plastics.

[0019] Even where the inherent elasticity of the cladding material 5 is sufficient to ensure satisfactory support of the latter on crash barrier post 2, for a more secure attachment housing opening 7 of the cladding may be secured with steel supporting clamps 9 engaging slots 10 provided for the purpose in said cladding 5.

[0020] As an alternative, appropriate adhesive bonding may be used instead of said supporting clamps 9 to improve the attachment of said cladding 5 to said post 2.

[0021] The method of operation of the protective system according to this invention will be seen from the illustration in Figure 4, in which it will be seen that a body striking cladding 5 in the direction of arrows F is deviated in the direction of arrow F'. Likewise it will be seen in Figure 4 that rings 6, 6', 6" deform along the corresponding thick lines 6a, 6b, 6c. This particular form of deformation of the said rings is due to their variable thickness design, which ensures more rigidity or more flexibility where these are required. This is a very useful feature of the system according to the invention, as it makes it possible to break down the impact into as many stages

of different hardness/intensity as there are rings comprising cladding 5 (three rings 6, 6', 6" in the embodiment illustrated) as a result of these being constructed of different thickness and diameters.

[0022] By modifying anchorage housing 7, the system according to the invention can be adapted to the various types of posts 2 in existence, such as posts having a channel, H, X, O, etc., cross-section. It is possible to apply the system according to the invention to street lights, traffic lights, etc. In this way, in addition to allowing easy and economical fitting to existing infrastructure, high impact energy absorption and an "eccentric rotation" deviating an impact against post 2 is achieved.

[0023] The abovementioned "eccentric rotation" effect, which is a consequence of the variable thickness of rings 6, 6', 6", has the effect that the impact received by cladding 5 on post 2 is deviated, and thus the body impacting against that cladding suffers less. In addition to this, the presence of various rings 6, 6', 6" in the system according to the invention (a triple ring in the embodiment illustrated) makes it possible to break down the impact into various partial impacts of lesser severity, replacing one deceleration peak by a number of peaks of lesser intensity, with the consequent benefits which this provides for the accident victim.

[0024] As already indicated, Figure 5 shows a second embodiment in which protective cladding 5 according to the invention is formed from a central core 8 which is open at its two extremities and is rounded off on its posterior external side by two flanges 11 opposite each other at right angles, designed to receive a short running attachment bar 12 to support the core on the post supporting the barrier rail (not illustrated). This core 8 has damping surfaces attached to it in the form of concentric rings 6, 6', 6" which extend from the posterior part thereof and have a slightly oval configuration and are attached to each other by means of a plurality of radial reinforcing walls 13, the imaginary extensions of which converge at the centre 14 of core 8, the outer ring 6" being thicker than the other inner rings 6, 6'.

[0025] As in the first embodiment in Figure 3, the number of cylindrical rings 6, 6', 6" is preferably three, although a different number of rings may be chosen if this is considered necessary.

[0026] Core 8 of protective cladding 5 according to the invention has been designed with a transverse cross-section suitable for attachment to channel and I section posts or posts having any other configuration, provision being made in the event of the transverse cross-section of the post differing from the channel or I configuration or core 8 to be mounted therein by means of a coupling module fitting it (not shown in the drawing).

[0027] As will be seen in Figure 5, side walls 15 of core 8 of protective cladding 5 according to the invention have outwardly flared extremities 16 to receive the flanges of posts having an I transverse cross-section.

[0028] Said Figure 5 illustrates seven radial reinforcing walls 13 in protective cladding 5 according to the inven-

tion, although these walls may be in any other number recommended by the circumstances of practical use.

[0029] The system according to the invention can adapt to the various impacts which occur on highways or roads with traffic in two directions. It may also be designed for a single direction, by varying the thicknesses, angles of rotation, radii, slots, projections, number of rings, etc., according to the materials used.

[0030] A significant factor in the protective system according to the invention is its ability to absorb impacts originating through an arc of 270°, as a result of which it is effective against impacts which it might receive from one direction or the other of the highway or road in which it is installed. Specifically the system mentioned is designed to receive impacts over an arc of 270° (symmetrical system) on roads with traffic in two directions and is also especially designed to receive impacts originating from a single direction (asymmetrical system) in roads with one-way traffic.

[0031] The following must be mentioned as the most important advantages of the protective system according to the invention, as already mentioned in the prior description: a first advantage lies in the fact that the body impacting against cladding 5 on post 2 is deviated away from it, thus reducing the effects of the impact received by the accident victims. Another advantage lies in the fact that the part of cladding 5 which absorbs most impact, as a result of its eccentric shape, lies in the trajectory of the impacts and breaks down the impact into a number of stages of different intensity (three stages in the case of the three rings 6, 6', 6" illustrated), decreasing the one maximum deceleration peak into as many lesser peaks. A third advantage lies in the fact that the system according to the invention prevents direct impact with post 2 because of its "eccentric rotation" or tilting effect. To sum up, what is achieved through the protective system according to the invention is that the direct impact of an accident victim against post 2 is deviated into another less harmful direction.

[0032] Although cladding 5 has been illustrated in the drawings as having a generally cylindrical ring shape for a better understanding of the protective system according to the invention, it will be understood that the principle of impact displacement, absorption and diversion can also be applied to claddings having a square, triangular, diamond, etc., transverse cross-section.

[0033] The essential features of the subject matter of this invention have been pointed out above. Nevertheless, it will be understood that the embodiment described in this description and illustrated in the drawings will permit a number of changes in detail without going beyond the scope of the invention. The scope of the invention is therefore defined solely and exclusively by the content of the appended claims.

Claims

1. System for protecting persons against impact against highway crash barriers comprising barrier rails in the form of corrugated barrier rails (1) attached to vertical supporting posts (2) anchored in the ground, the barrier rail (1) having a curved upper part (3) to prevent cuts in the event of anyone falling on to it and also, to reduce the shock effect each post (2) supporting the barrier rail (1) is provided with a cladding complex (5) comprising a succession of surfaces (6, 6', 6"), preferably three, arranged in the form of concentric rings emerging from a central core (8) provided for attachment of the cladding to the post (2) through pressure and a clamping effect, this core being open longitudinally and fitting the shape and size of the profile of the same, **characterised in that** the barrier rail has a series of protuberances (4) in the longitudinal direction to absorb and decelerate the velocity of the vehicle or person impacting thereagainst and, it being provided that the said cylindrical or oval surfaces mentioned (6, 6', 6") have the special feature that the thickness of each of them decreases progressively from the central core from which they emerge to reach its minimum thickness precisely in their frontal central and outermost parts, it being also provided that the inner surface of the said core (8) is toothed to achieve better attachment to the said post (2).
2. System according to Claim 1, **characterised in that** it is provided that the central core (8) is open at its two extremities and is rounded off on its posterior outer side by two clamps (11) emerging opposite each other at right angles designed to receive a short attachment bar (12) to support the core on the post supporting the barrier rail, and **in that** the concentric rings (6, 6', 6") originate from the posterior half of the core (8), have a slightly oval configuration and are attached to each other through a plurality of radial reinforcing walls (13) the imaginary extensions of which converge at the centre (14) of the core.
3. System according to Claims 1 and 2, **characterised in that** all the cladding for the posts (2) is constructed of deformable flexible material, with immediate capacity for recovery.
4. System according to the preceding claims, **characterised in that** the core (8) of the protective cladding (5) has a transverse cross-section which is suitable for attachment to posts having a channel, I or any other configuration.
5. System according to the preceding claims, **characterised in that** the protective cladding (5) is provided with a coupling module designed to mount it on a post whose transverse cross-section differs from a

channel or I configuration.

6. System according to any of the preceding claims, **characterised in that** the deformable flexible material of the said rings (6, 6', 6'') is preferably selected from the group of those of a plastics nature. 5
7. System according to Claim 1, **characterised in that** the housing opening of the cladding (5) of the post (2) is closed by steel supporting clamps (9) engaging in slots (10) provided in the said cladding. 10
8. System according to Claim 2, **characterised in that** the lateral walls (15) of the core (8) of the protective cladding (5) are outwardly flared (16) at their extremities to receive the flanges of posts having an I transverse cross-section. 15
9. System according to Claim 2, **characterised in that** the posterior external side of the core (8) has slightly projecting narrow linear mouldings opposite short corresponding slots provided in the inner surface of the attachment bar (12) coinciding with the lanes formed by the flanges (11) which emerge opposite to each other from the said surface at right angles. 20 25
10. System according to Claim 2, **characterised in that** the number of radial reinforcing walls (13) for the protective cladding (5) is preferably seven. 30
11. System according to any of the preceding claims, **characterised in that** the cladding (5) is attached to the post (2) by adhesive bonding. 35
12. System according to any of the preceding claims, **characterised in that** the cladding (5) has a cylindrical or prismatic configuration. 40
13. System according to Claim 12, **characterised in that** the cladding (5) is configured as a prism having a square, triangular, diamond or other transverse cross-section. 45

Patentansprüche

1. System zum Schutz von Personen vor Aufprall gegen Straßenaufprallbarrieren, umfassend Leitplanken in Form von Wellleitplanken (1), die an im Boden verankerten vertikalen Stützpfeilen (2) befestigt sind, wobei die Leitplanke (1) einen gekrümmten oberen Teil (3) zur Verhinderung von Schnitten, falls jemand darauf fällt, aufweist, und wobei zur Verringerung von Stoßwirkung jeder Pfeilen (2), der die Leitplanke (1) stützt, mit einem Verkleidungskomplex (5) versehen ist, der eine Folge von Flächen (6, 6', 6''), vorzugsweise drei, umfasst, die in Form von konzentrischen Ringen angeordnet sind, die von ei-

nem mittleren Kern (8) vorragen, der zur Befestigung der Verkleidung an dem Pfeilen (2) durch Druck und eine Klemmwirkung vorgesehen ist, wobei dieser Kern in Längsrichtung offen ist und mit der Form und Größe des Profils derselben zusammenpasst, **dadurch gekennzeichnet, dass** die Leitplanke eine Reihe von Vorsprüngen (4) in Längsrichtung aufweist, um die Geschwindigkeit des daran aufprallenden Fahrzeugs oder der daran aufprallenden Person zu absorbieren und zu verzögern, wobei vorgesehen ist, dass die genannte zylindrische oder ovale Fläche (6, 6', 6'') das besondere Merkmal aufweist, dass die Dicke jeder einzelnen vom mittleren Kern, von dem sie vorragen, allmählich abnimmt, um ihre minimale Dicke genau in ihren vorderen, mittleren und am weitesten außen liegenden Teilen zu erreichen, wobei des Weiteren vorgesehen ist, dass die Innenfläche des Kerns (8) mit Zähnen versehen ist, um eine bessere Befestigung an dem Pfeilen (2) zu erreichen.

2. System nach Anspruch 1, **dadurch gekennzeichnet, dass** vorgesehen ist, dass der mittlere Kern (8) an seinen beiden Enden offen ist und an seiner hinteren Außenseite durch zwei Klemmen (11) abgerundet ist, die einander gegenüberliegend im rechten Winkel vorragen und dazu ausgeführt sind, eine kurze Befestigungsstange (12) aufzunehmen, um den Kern an dem die Leitplanke stützenden Pfeilen abzustützen, und dass die konzentrischen Ringe (6, 6', 6'') von der hinteren Hälfte des Kerns (8) ausgehen, eine leicht ovale Konfiguration aufweisen und durch mehrere radiale Verstärkungswände (13) aneinander befestigt sind, wobei deren gedachte Verlängerungen in der Mitte (14) des Kerns konvergieren.
3. System nach Anspruch 1 und 2, **dadurch gekennzeichnet, dass** sämtliche Verkleidung für die Pfeilen (2) aus einem verformbaren, flexiblen Material mit unmittelbarem Rückstellvermögen hergestellt ist.
4. System nach den vorhergehenden Ansprüchen, **dadurch gekennzeichnet, dass** der Kern (8) der Schutzverkleidung (5) einen in Querrichtung verlaufenden Querschnitt aufweist, der zur Befestigung an Pfeilen geeignet ist, die eine kanalförmige, I- oder irgendeine andere Konfiguration aufweisen.
5. System nach den vorhergehenden Ansprüchen, **dadurch gekennzeichnet, dass** die Schutzverkleidung (5) mit einem Kopplungsmodul versehen ist, das dazu ausgeführt ist, sie an einem Pfeilen zu befestigen, dessen in Querrichtung verlaufender Querschnitt sich von einer kanalförmigen oder I-Konfiguration unterscheidet.
6. System nach einem der vorhergehenden Ansprü-

che, **dadurch gekennzeichnet, dass** das verformbare, flexible Material der Ringe (6, 6', 6'') vorzugsweise aus der Kunststoffe umfassenden Gruppe ausgewählt ist.

7. System nach Anspruch 1, **dadurch gekennzeichnet, dass** die Gehäuseöffnung der Verkleidung (5) des Pfostens (2) durch Stahlstützklemmen (9) geschlossen ist, die in in der Verkleidung vorgesehene Schlitz (10) eingreifen.

8. System nach Anspruch 2, **dadurch gekennzeichnet, dass** die Seitenwände (15) des Kerns (8) der Schutzverkleidung (5) an ihren Enden nach außen kelchend sind (16), um die Flansche der Pfosten, die einen I-förmigen in Querrichtung verlaufenden Querschnitt aufweisen, aufzunehmen.

9. System nach Anspruch 2, **dadurch gekennzeichnet, dass** die hintere Außenseite des Kerns (8) leicht nach vorne ragende, schmale, lineare Formteile gegenüber kurzen, entsprechenden Schlitz aufweist, die in der Innenfläche der Befestigungsstange (12) ausgebildet sind, die mit den durch die einander gegenüber von der Fläche im rechten Winkel vorragenden Flansche (11) gebildeten Bahnen zusammenfallen.

10. System nach Anspruch 2, **dadurch gekennzeichnet, dass** die Anzahl radialer Verstärkungswände (13) für die Schutzverkleidung (5) vorzugsweise sieben beträgt.

11. System nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Verkleidung (5) durch Klebverbindung an dem Pfosten (2) befestigt ist.

12. System nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Verkleidung (5) eine zylindrische oder prismatische Konfiguration aufweist.

13. System nach Anspruch 12, **dadurch gekennzeichnet, dass** die Verkleidung (5) als ein Prisma konfiguriert ist, das einen quadratischen, dreieckigen, rautenförmigen oder anderen in Querrichtung verlaufenden Querschnitt aufweist.

Revendications

1. Système de protection de personnes contre un impact contre des barrières de sécurité routière comprenant des glissières de sécurité en forme de glissières de sécurité ondulées (1) attachées à des poteaux de support verticaux (2) ancrés dans le sol, la glissière de sécurité (1) ayant une partie supérieure

incurvée (3) pour empêcher des coupures au cas où une personne tomberait dessus et, pour réduire aussi l'effet de choc, chaque poteau (2) supportant la glissière de sécurité (1) étant pourvu d'un système de bardage (5) comprenant une succession de surfaces (6, 6', 6''), de préférence trois, agencées en forme de bagues concentriques émergeant d'un noyau central (8) prévu pour la fixation du bardage au poteau (2) par pression et par effet de serrage, ce noyau étant ouvert longitudinalement et s'adaptant à la forme et à la taille du profilé du poteau, **caractérisé en ce que** la glissière de sécurité a une série de saillies (4) dans la direction longitudinale, pour absorber et décélérer la vitesse du véhicule ou de la personne la percutant et lesdites surfaces cylindriques ou ovales mentionnées (6, 6', 6'') ayant la caractéristique spéciale que leur épaisseur diminue progressivement depuis le noyau central duquel elles émergent pour atteindre une épaisseur minimale précisément dans leurs parties frontales centrales et les plus extérieures, la surface interne dudit noyau (8) étant dentée afin de permettre une meilleure fixation audit poteau (2).

2. Système selon la revendication 1, **caractérisé en ce que** le noyau central (8) est ouvert à ses deux extrémités et est arrondi sur son côté extérieur postérieur par deux pinces (11) émergeant en face l'une de l'autre à angle droit, conçues pour recevoir une courte barre de fixation (12) pour supporter le noyau sur le poteau supportant la glissière de sécurité, et **en ce que** les bagues concentriques (6, 6', 6'') partent de la moitié postérieure du noyau (8), ont une configuration légèrement ovale et sont fixées les unes aux autres par une pluralité de parois de renforcement radiales (13), dont les prolongements imaginaires convergent vers le centre (14) du noyau.

3. Système selon les revendications 1 et 2, **caractérisé en ce que** tout le bardage des poteaux (2) est construit en matériau flexible déformable, avec une capacité de récupération immédiate.

4. Système selon les revendications précédentes, **caractérisé en ce que** le noyau (8) du bardage (5) a une section transversale adaptée pour la fixation à des poteaux ayant une configuration en forme de canal, de I ou une autre configuration quelconque.

5. Système selon les revendications précédentes, **caractérisé en ce que** le bardage (5) est pourvu d'un module d'accouplement conçu pour le monter sur un poteau dont la section transversale diffère d'une configuration en forme de canal ou de I.

6. Système selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le matériau flexible déformable desdites bagues (6, 6', 6'') est

de préférence choisi parmi le groupe des matériaux à base de plastique.

7. Système selon la revendication 1, **caractérisé en ce que** l'ouverture de boîtier du bardage (5) du poteau (2) est fermée par des pinces de support en acier (9) s'engageant dans des fentes (10) prévues dans ledit bardage. 5
8. Système selon la revendication 2, **caractérisé en ce que** les parois latérales (15) du noyau (8) du bardage (5) sont évasées vers l'extérieur (16) à leurs extrémités pour recevoir les brides de poteaux ayant une section transversale en I. 10
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9. Système selon la revendication 2, **caractérisé en ce que** le côté externe postérieur du noyau (8) a des moulages linéaires étroits légèrement en saillie en face de fentes correspondantes courtes prévues dans la surface interne de la barre de fixation (12) et coïncidant avec les rainures formées par les brides (11) qui émergent en face les unes des autres depuis ladite surface à angle droit. 20
10. Système selon la revendication 2, **caractérisé en ce que** le nombre de parois de renforcement radiales (13) pour le bardage (5) est de préférence de sept. 25
11. Système selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le bardage (5) est attaché au poteau (2) par liaison adhésive. 30
12. Système selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le bardage (5) a une configuration cylindrique ou prismatique. 35
13. Système selon la revendication 12, **caractérisé en ce que** le bardage (5) est configuré sous forme de prisme ayant une section transversale carrée, triangulaire, en losange ou une autre configuration transversale. 40

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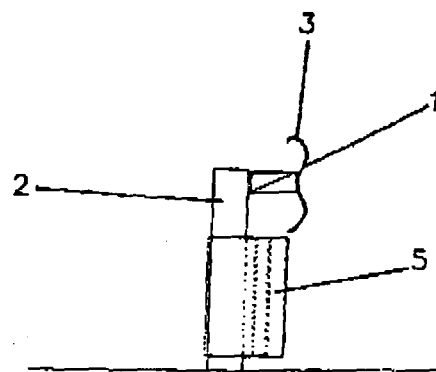
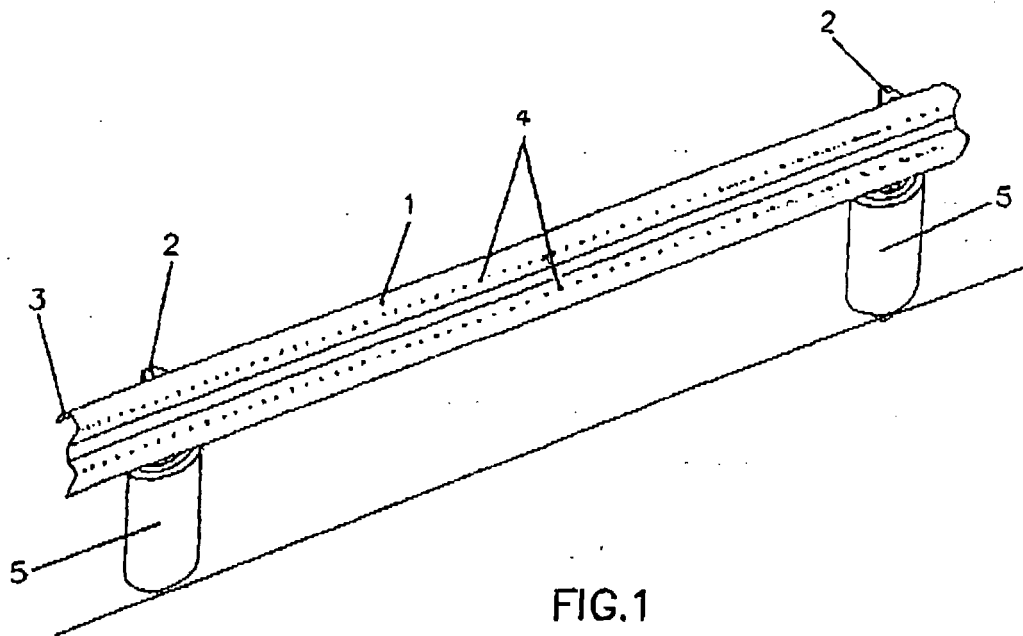


FIG. 2

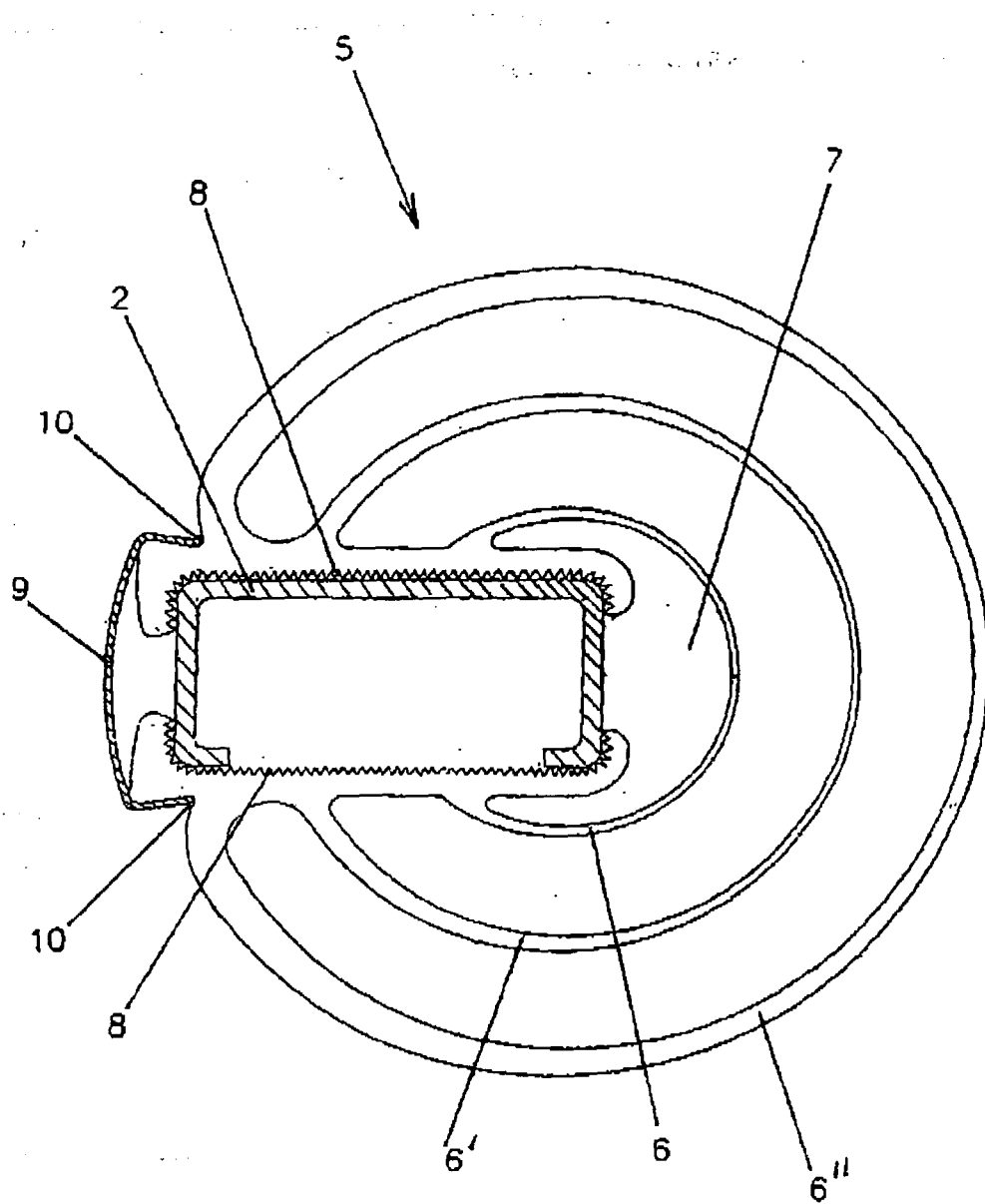
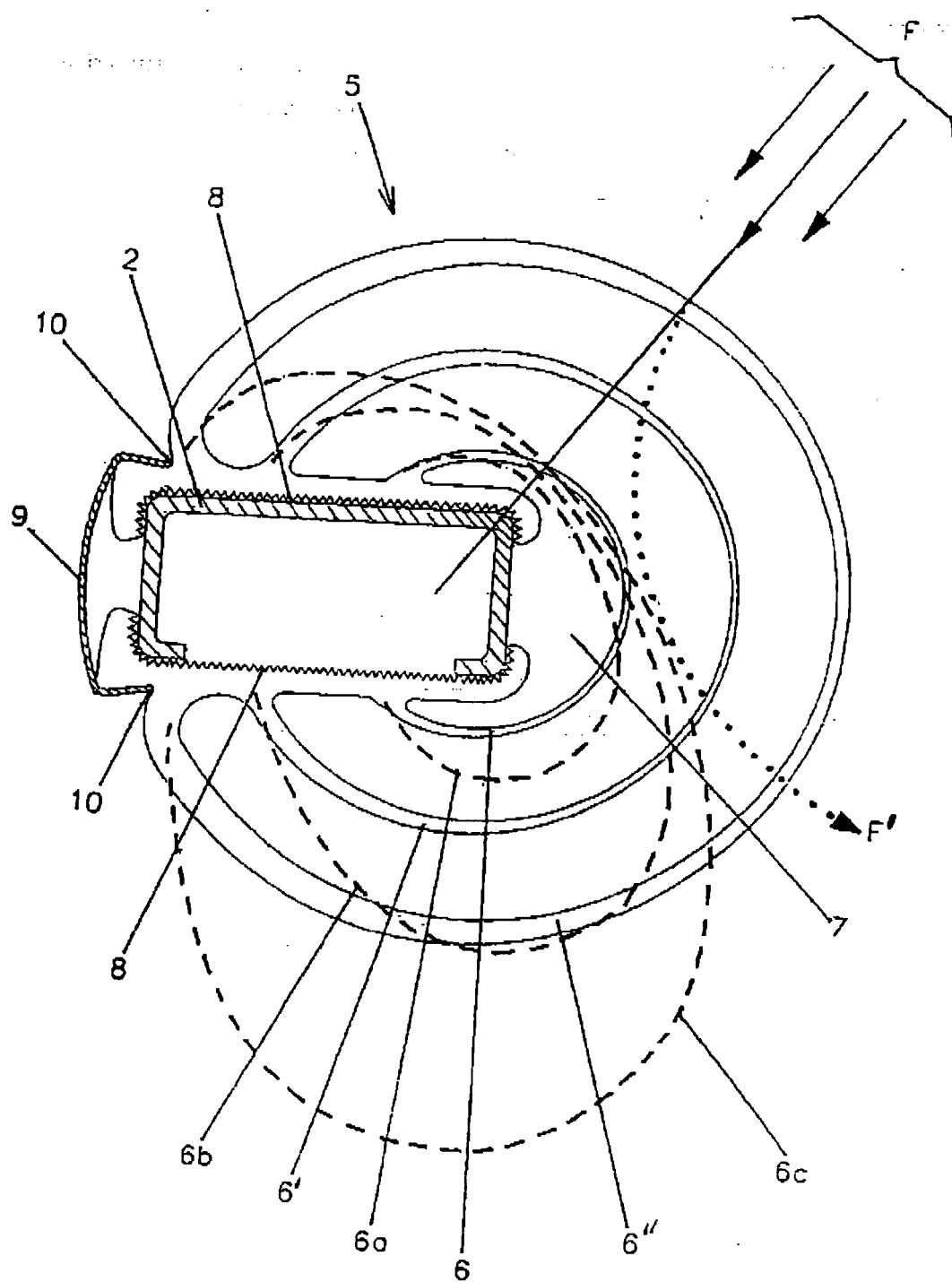


FIG.3



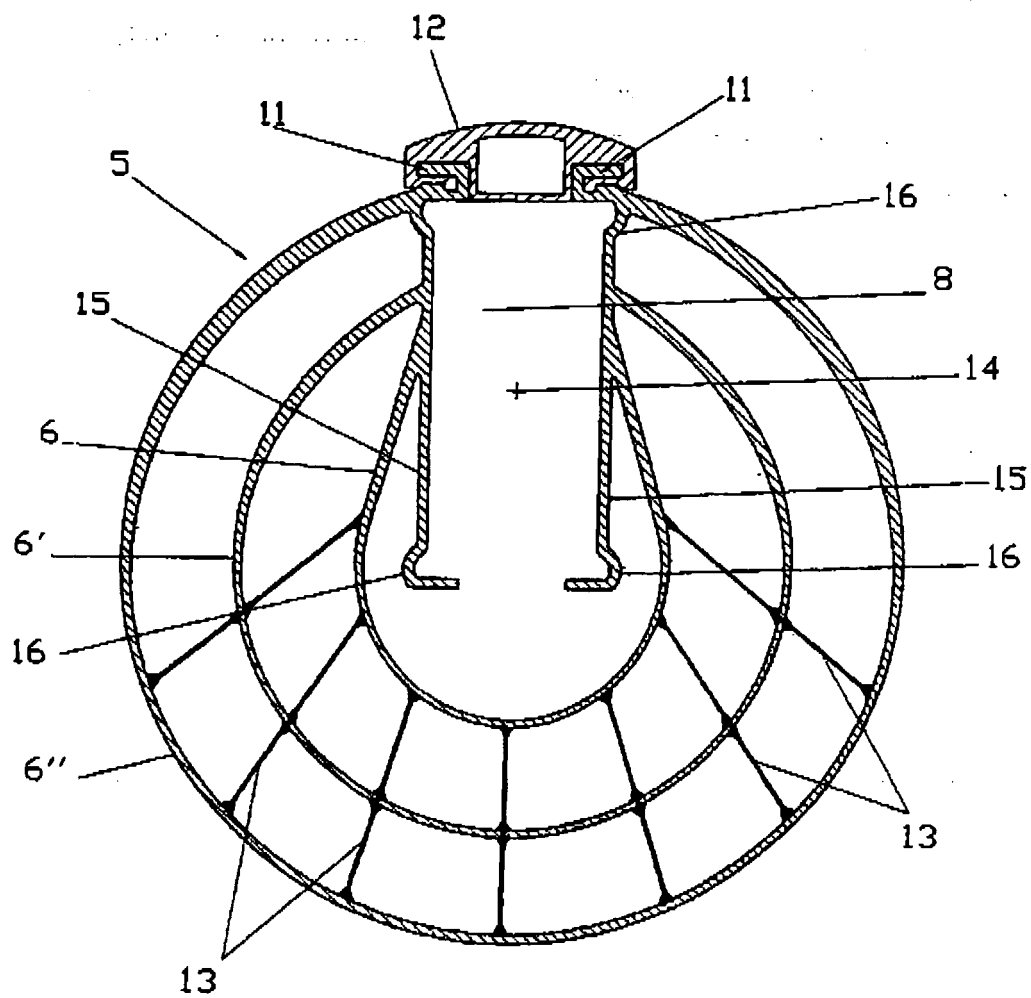


FIG 5

REFERENCES CITED IN THE DESCRIPTION

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