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(54) Impact resisting post

(57) An impact resisting post (10), comprising a first resilient portion (14) and a second resilient portion (18) spaced transversely from said first resilient portion. A connection portion (16) interconnects said first and second portions. An intermediate portion (20) extends from said second resilient portion into said space between said first and second resilient portions wherein said resilient and intermediate portions are configured to resiliently respond to an impact, such that when said impact exerts a force on said second resilient portion towards said first resilient portion, said second portion moves resiliently towards said first portion under the influence of said force, until said intermediate portion contacts said first resilient portion thereby to restrict further resilient movement of said second portion relative to said first resilient portion. The intermediate portion has shape and dimension configured to inhibit permanent deformation of said second resilient portion and/or connection portion after said contact occurs.

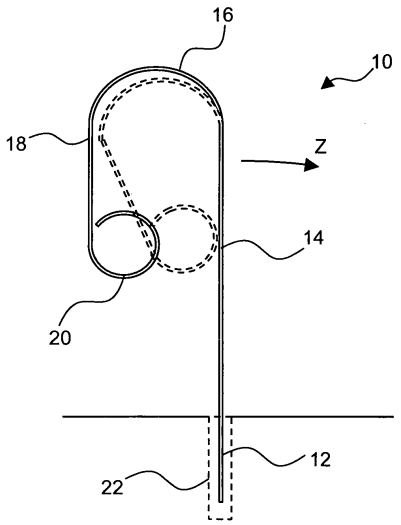

Fig. 1

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Description

[0001] The present invention relates to an impact resisting post for crash-barriers, stand alone applications or the like.

[0002] There is massive worldwide use of both temporary and permanent crash barriers and bollards to protect buildings, pedestrians and other road users from vehicular impact as well as to prevent vehicles from gaining access to roads and other areas.

[0003] Bollards and barriers are often used to provide protection to buildings and other structures likely to be hit by slowly moving vehicles. For example barriers are often placed around lamp posts that are situated in car parks so as to prevent them being damaged by parking vehicles. Conventionally these barriers and bollards are rigid and can be deformed or damaged relatively easily by an impact, especially by impacts from heavier vehicles such as HGVs and forklift trucks. Such bollards and barriers must be replaced after every significant impact. This can be a substantial expense especially if the bollards or barriers are situated in positions where collisions are fairly regular occurrences, such as lorry loading bays. Additionally the rigidity of the barriers and bollards tends to produce significant damage to the vehicle causing the impact.

[0004] To reduce this problem some bollards and barriers have soft buffers attached to their impacting surfaces. However this only reduces damage to the colliding vehicle and the impacting surface of the barrier or bollard and does not prevent plastic deformation of the barrier or bollard during most collisions. Therefore the use of rigid barriers and bollards tends to be restricted to situations where the potential cost of damage caused by vehicles colliding with the structure being protected is much greater than the cost likely to be incurred when a vehicle collides with a barrier or bollard.

[0005] A solution to these problems is the use of barriers which have supports made of spring steel. Current spring steel barriers are designed to absorb low speed impacts and so lessen damage to the vehicle and barrier. They differ from conventional barriers in that the barrier supports are made of rectangular cross section spring steel formed so as that it is able to flex in the horizontal direction perpendicular to the barrier length. Specifically the barriers are supported by generally vertical lengths of rectangular cross section spring steel that extends downwards to a securing point. This design means that upon impact the barrier is pushed backwards and rotates towards the floor as the steel flexes at one or more points below the barrier at which the stress is concentrated. Currently the barrier supports are made of thin sections of spring steel and this combined with their design means they will plastically deform at these stress concentration points under all but the lightest of impacts. After each collision in which the barrier support is plastically deformed it will need to be repaired or replaced and this may incur substantial cost or cause significant disruption. Indeed the supports will need to be replaced after a finite number of crashes in which they have been plastically deformed as their structural properties will have been diminished by each such impact.

[0006] These barriers are not used for high speed impacts for two reasons; firstly the materials currently used are too weak to be able to withstand impact from a high speed vehicle but secondly and perhaps more importantly the method of deformation is unsuitable for such applications. The fact the barrier will rotate backwards towards the ground about the securing point below the barrier can cause significant problems for an impacting vehicle. The force caused by a vehicle colliding with the barrier at high speed may be enough to cause the barrier to rotate back until it forms a sloping surface relative to the ground. This will either act as a ramp encouraging the colliding vehicle to pass over the barrier or, if the front of the vehicle does not slip over the barrier, may cause the rear end of the vehicle to rise off the ground which would cause the vehicle to either flip over or crash back down with significant force.

[0007] It is an object of the present invention to provide an improved impact resisting post suitable for use in stand alone applications or as part of a crash-barrier.

[0008] According to a first aspect of the present invention there is provided an impact resisting post, comprising: a first resilient portion; a second resilient portion spaced transversely from said first resilient portion; a connection portion interconnecting said first and second portions; and an intermediate portion extending from said second resilient portion into said space between said first and second resilient portions wherein: said resilient and intermediate portions are configured to resiliently respond to an impact, such that when said impact exerts a force on said second resilient portion towards said first resilient portion, said second portion moves resiliently towards said first portion under the influence of said force, until said intermediate portion contacts said first resilient portion thereby to restrict further resilient movement of said second portion relative to said first resilient portion; and wherein said intermediate portion has shape and dimension configured to inhibit permanent deformation of said second resilient portion and/or connection portion after said contact occurs.

[0009] The intermediate portion may comprise a rolled back portion which may depend from either said first or second portions. Alternatively, the intermediate portion may comprise a block or stop member attached to first or second portion and protruding into the space therebetween.

[0010] In one embodiment, the intermediate portion is connected to or integral with a free end of the second resilient portion. The first, second and connection portions may for a hook shape which may be oriented in an inverted condition for use.

[0011] The post may be formed from an elongate length of generally rectangular or square cross-sectioned resilient material, said length having at least one longi-

tudinally aligned elongate formation for providing additional strength per unit thickness of said resilient material. This has the advantage of allowing construction of a post having the same strength and resilience from a lower volume of material.

[0012] The rolled back portion is preferably configured such that after said contact, further impact force, results in resilient movement of said first resilient portion in unison with said second resilient portion and connecting portion. This ensures that the post provides additional flexibility thereby reducing potential damage to the impacting vehicle.

[0013] The rolled back portion is preferably configured such that after contact, when said first resilient portion moves resiliently, said rolled back portion slides against a surface of said first resilient portion. This reduces stress on the first portion during impact and maintains some flexibility in the second portion.

[0014] Preferably the rolled back portion is configured in the shape of a circle, such that during said contact said first resilient portion is tangential to said circle. This minimises the stress on the first portion during impact whilst maintaining some flexibility in the second portion.

[0015] Alternatively the rolled back portion may be configured in the shape of a box section having filleted corners.

[0016] Preferably the rolled back portion extends into said space at least 30% of the distance between said first and second resilient portions. This ensures contact between the rolled back portion and the first portion before significant permanent deformation occurs.

[0017] The rolled back portion may extend into said space approximately half said distance between said first and second resilient portions.

[0018] Preferably said rolled back portion has dimensions configured such that when said contact occurs said second resilient portion has moved through less than 45°.

[0019] Preferably said rolled back portion has dimensions configured such that when said contact occurs said second resilient portion has moved through approximately 30°.

[0020] According to a further aspect of the invention there is provided an impact resisting post comprising an elongate length of generally rectangular or square cross-sectioned resilient material arranged to form said post, said length having at least one longitudinally aligned elongate formation for providing additional strength per unit thickness of said resilient material.

[0021] Preferably said post comprises: a first resilient portion; a second resilient portion spaced transversely from said first resilient portion; a connection portion interconnecting said first and second portions; wherein: said resilient portions are configured to resiliently respond to an impact, such that when said impact exerts a force on said second resilient portion towards said first resilient portion; said second portion moves resiliently towards said first portion.

[0022] The formation may comprise a groove, may comprise a ridge, and/or may comprise a rib.

[0023] Preferably the formation extends the full length of said length of resilient material.

[0024] There may be a single formation provided in axial alignment with said length of resilient material. Alternatively, there may be a plurality of formations provided.

[0025] The invention will now be described by way of example only with reference to the attached figures in which:

Figure 1 shows a first embodiment of an impact resisting post according to the invention;

Figure 2 shows a second embodiment of an impact resisting post according to the invention;

Figure 3 shows a third embodiment of an impact resisting post according to the invention; and

Figure 4 shows a cross-section of a resilient material suitable for use in the embodiments shown in figures 1, 2 or 3.

[0026] In figure 1, a first embodiment of an impact resisting post is shown generally at 10. The post 10 comprises an anchorage portion 12, a first resilient portion 14, a resilient connection portion 16, a second resilient portion 18, and an intermediate portion in the form of rolled back portion 20, formed from a single elongated section of resilient material, having a preferred direction of resilience 'X'.

[0027] The resilient material may comprise any suitable material, but typically comprises spring steel having a generally rectangular cross-section, bent in the direction of resilience 'X' to form the post 10.

[0028] The first and second resilient portions 14, 18, each comprise a generally straight elongate portion of the resilient material. The resilient portions 14, 18 are arranged generally parallel to and spaced from each other, in the direction of resilience 'X', and are interconnected by the connection portion 16 to form an inverted hook shape, as seen in figure 1. The connection portion 16 extends arcuately in the direction of resilience 'X', from one resilient portion 14 to the other 16, to avoid the presence of angled corners between adjacent portions, which could represent points of weakness and/or deformation, during an impact.

[0029] The post 10 is configured such that in typical operational orientation, as seen in the figures, the first and second resilient portions are substantially vertical, the second portion 18 depending from the connection portion 16. It will be appreciated that orientation specific terminology used throughout the description, is intended to be relative to the typical operational orientation shown in the figures.

[0030] The rolled back portion 20 extends from a lower end of the second resilient portion 18, and comprises a

portion of the resilient material, which curves back on itself to form a generally circular eye, extending into the space between the resilient portions 14, 18.

[0031] The second resilient portion 18 has length 'A', and is shorter than the first resilient portion 14, which has length 'B'. The connection portion 16, is formed into a generally semi-circular arc of radius 'R', thereby separating the first and second portions by a distance 'D', which is substantially twice the radius 'R'. The rolled back portion 20 has a diameter 'E'.

[0032] The anchorage portion 12, comprises a section of the resilient material arranged for anchoring the impact post into the ground, in operation. In the embodiment of figure 1 the anchorage portion extends vertically downwardly from the first resilient portion, and is of sufficient length for secure fixing in the ground.

[0033] In operation, the anchorage portion 12 is set vertically in the ground to a significant depth such that the post 10 is securely fixed, in a desired location, with the intersection between intersection between the anchorage portion 12 and the first resilient portion 14 substantially flush with the surface of the ground. The post 10 is anchored such that the second resilient portion faces a direction of probable impact.

[0034] The post 10 may be set in the ground using a receiving bracket or sleeve 22, which is fixed in the ground, for example by setting in concrete, for receiving the anchorage portion 12 of the post 10. The post 10 may then slotted into the bracket/sleeve 22 such that it is generally vertical and facing the direction of probable impact. Conveniently, the anchorage portion may be received in the bracket / sleeve such that the anchorage portion 12 has some leeway to move within the bracket, on impact such that the stress exerted on the intersection between the anchorage portion 12 and the first resilient portion 14 is reduced. In this regard the anchorage portion can slip slightly during an impact in order to relieve the concentration of stress at a particular point in the post. This slippage occurs when the upward component of the impact force experienced by the barrier exceeds the friction between the anchorage portion and the sleeve.

[0035] Thus, in typical operation to resist an impact when the post is securely fixed in/to the ground, the second resilient portion 18 acts as an impact receiving portion. When a vehicle bumper or the like, impacts the impact receiving portion, the connection portion 16 begins to flex resiliently as shown in dashed lines in figure 1. Substantially at the same time, the impact receiving portion 18 begins to flex resiliently about an intersection with the connection portion 16 toward the first resilient portion 14. Where the impact is light, this resilient bending is typically sufficient to resist the impact and prevent significant damage to the vehicle and/or the post 10, before the rolled back portion comes into contact with the first resilient portion 14. Depending on construction the first resilient portion may also exhibit a degree of flexure, although the second resilient portion flexes preferentially.

[0036] Where an impact is heavier, however, the rolled back portion is pushed into contact with the first resilient portion 14 as shown in the dashed lines. At this point, further flexing of the connection portion 14, and the impact receiving portion 18, is inhibited by the rolled back portion. If the impact is sufficiently heavy, the first resilient portion 14 then begins to flex preferentially in the direction of arrow Z in figure 1. This provides a further resilient force resisting the impact without risking significant damage to either the connection portion 16, or the second resilient portion 18.

[0037] The circular shape of the eye 20, is particularly advantageous at this point because as the first flexes, the rolled back portion 20 slides against the first resilient portion 14, such that the resilient portion 14 is always tangential to the eye 20. This assists both in minimising the stress on the first resilient portion 14 at the contact point, and in maintaining a degree of flexibility in the second resilient portion 18.

[0038] It will be appreciated that any suitable dimensions may be used for the post 10. Typically however, the lengths 'A' and 'B' are arranged such that in operation the second resilient portion depends from a position above the typical height of a vehicle bumper or the like, to a position below it. Furthermore, the diameter 'E' of the eye 20 is typically such that the maximum angle of the first resilient portion, relative to the vertical, is in the region of 30° when the eye contacts the first resilient portion.

[0039] Typically, for example, the length 'A' is approximately one third of the length 'B', and the distance 'D' is slightly greater than the length 'A'. The diameter 'E' of the rolled back portion 20 is typically equal to the radius 'R' of the connection portion. For example, the length 'A' may be in the region 180mm, the length 'B' may be in the region 540mm, the radius 'R' and diameter 'E' may be in the region 100mm, and the distance 'D' may be in the region 200mm.

[0040] In an alternative embodiment, a block or stop may be attached to the second resilient portion 18 by way of conventional fixing means such as bolts or the like. In such an embodiment, the thickness of the block will typically retain the same relative dimensions to that of the rolled eye 20 shown in figure 1. That is to say that the stop or rolled eye would typically extend at least a third of the way across the gap between the first and second resilient portions. Preferably the stop or rolled eye extends approximately half the way across the gap. In the event that a block or stop member is used, it may be formed of a resilient material such as a rubber or the like.

[0041] An alternative arrangement of an impact resisting post is shown in figure 2, generally at 210. The post 210, is similar to the post 10 of the first embodiment and like parts are given like reference numerals. In the alternative arrangement the anchorage portion 212 extends perpendicularly away from the first resilient portion 14, in the same general direction as the connection portion 16 as shown in figure 2. The perpendicular anchorage

portion is particularly useful for installation of the post 10 in applications where it is difficult to set the post 10 directly into the ground at a sufficient depth. The perpendicular anchorage portion is, for example, particularly useful where there is an existing concrete surface, and/or where it is not possible to sufficiently deep hole.

[0042] In operation, a suitable bracket or sleeve is fixed to the ground using a plurality of bolts. The bracket /sleeve is formed such that the anchorage portion 212 of the post 210 may be slidably received in the sleeve / bracket with the first resilient portion 14 of the post substantially vertical.

[0043] A further alternative arrangement of an impact resisting post is shown in figure 3, generally at 310. The post 310, is similar to the posts 10, 210 of the first and second embodiments and like parts are given like reference numerals.

[0044] In the further alternative embodiment 310, a buffer portion 30 is secured to an outer face the second resilient portion 18, to provide a softer impacting surface that is less likely to damage a vehicle during a collision. Furthermore, the post 310 comprises an anchorage portion 312, which extends perpendicularly away from the first resilient portion 14, in a direction opposite the general direction of the connection portion 16. The perpendicular anchorage portion 12 extending in this direction is particularly useful for installation of the post 10 in applications where the post has to be installed adjacent a curb or the like. In such applications, a perpendicular anchorage portion extending in the same direction as that of the second embodiment 210, would overhang the curb or the like undesirably.

[0045] The embodiments 210, 310 shown in figures 2 and 3 operate in substantially the same manner as for the first embodiment and hence, operation will not be described again.

[0046] In order to significantly reduce the quantity of resilient material used to form the post 10 the material may be grooved as illustrated in figure 4, which shows a cross-section of the resilient material generally 40. The material is generally rectangular in cross-section, but rather than being completely planar, includes a groove formation 42 indented into a surface of the material. The groove formation 42 extends longitudinally along a central axis of the resilient material section forming the post 10, for its full length. The groove 42 has a corresponding ridge/rib 44 on the opposing surface of the resilient material section, which is formed as a result of the indentation of the groove 42. It will be appreciated that additional strength / resilience may be provided by a groove or a ridge/rib alone rather than by a formation including both a groove and a ridge/rib.

[0047] The presence of a single central groove of the type described contributes significantly to the strength and resilience of the resilient material in the direction 'X'. Typically, for example, the presence of the groove 42 and ridge/rib 44 formation can provide an additional 20%-30% strength for the same thickness of material.

[0048] It will be appreciated that a plurality of parallel groove-ridge/rib formations may be provided longitudinally along the resilient material section to provide yet more additional strength / resilience, thereby further reducing material requirements and hence, cost. Furthermore, the or each formation 42, 44, need not extend the full length of the post 10 but may, instead, extend over the sections of the post most in need of strengthening. For example, the or each formation 42, 44 could extend preferentially along all or part of any one of the first resilient portion 14, the connection portion 16, the second resilient portion 18 or combination thereof. The or each formation 42, 44 may also extend preferentially across the intersection between the first resilient portion and the anchorage portion 12, thereby providing additional strength at the intersection, which is particularly vulnerable to undesirable deformation.

[0049] It will be appreciated that although a generally circular rolled back portion is described, and is particularly advantageous, the rolled back portion may alternatively have a square or box shaped cross-section, with or without chamfered or filleted corners.

[0050] The impact resisting post has several applications. For example, the post may be used in a stand alone configuration in a car park to reduce the risk of significant impact damage to a vehicle during parking, to other vehicles that are already parked, to pedestrians and/or to other car park features such as building walls, pedestrian walkways, trees, or other similar features. Alternatively, the post may be used as part of a crash-barrier or the like, in a car park or along the side of a road. When configured as a crash barrier, a barrier member is secured to a plurality of posts to create a crash barrier of desired length. Such crash barriers could be used outside schools, in the central reservation of motorways/freeways, on bridges, or the like.

[0051] In an alternative embodiment, not shown in the figures, the second resilient portion may extend a greater distance towards the ground once installed for use. Thus the second resilient portion may be longer in length such that the free end of the second resilient portion clears the ground by approximately 100 mm or less. In this embodiment the second resilient portion will bend backwards over a smaller angle than in the embodiment of figure 1 and with slightly less impact force. In addition, the contact point between the intermediate portion and the first resilient member is closer to the ground, resulting in a reduced bending moment being applied to the first resilient portion. Thus the movement of the first resilient portion of this embodiment may be reduced when placed under the same impact conditions as that of figure 1.

[0052] Thus the dimensions of the second resilient portion can be tailored to alter the point of contact between first and second resilient portions and also the component of the force acting to bend the first resilient portion backwards. These factors can be altered to suit an optimum design for a given implementation.

Claims

1. An impact resisting post, comprising:

   a first resilient portion (14);
   a second resilient portion (18) spaced transversely from said first resilient portion (14);
   a connection portion (16) interconnecting said first and second portions;
   and an intermediate portion (20) extending from said second resilient portion (18) into said space between said first and second resilient portions (14, 18)

   wherein:

   said resilient and rolled back portions (14, 18, 20) are configured to resiliently respond to an impact, such that when said impact exerts a force on said second resilient portion (18) towards said first resilient portion (14), said second portion (18) moves resiliently towards said first portion under the influence of said force, until said intermediate portion (20) contacts said first resilient portion thereby to restrict further resilient movement of said second portion (18) relative to said first resilient portion (14);
   and wherein said intermediate portion has shape and dimension configured to inhibit permanent deformation of said second resilient portion and/or connection portion after said contact occurs.

2. An impact resisting post as claimed in claim 1 wherein said post is formed from an elongate length of generally rectangular or square cross-sectioned resilient material, said length having at least one longitudinally aligned elongate formation for providing additional strength per unit thickness of said resilient material.

3. An impact resisting post as claimed in claim 1 or 2, wherein said intermediate portion is configured such that after said contact, further impact force, results in resilient movement of said first resilient portion away from said impact.

4. An impact resisting post as claimed in claim 4, wherein said intermediate portion is configured such that after contact, when said first resilient portion moves resiliently, said rolled back portion slides against a surface of said first resilient portion.

5. An impact resisting post as claimed in any preceding claim, wherein said intermediate portion of formed by a rolled back portion of said second resilient portion configured in the shape of a circle, such that during said contact said first resilient portion is tangential to said circle.

6. An impact resisting post as claimed in any of claims 1 to 4, wherein said intermediate portion comprises a block or stop attached to said second resilient portion.

7. An impact resisting post as claimed in any preceding claim, wherein said rolled back portion extends into said space at least 30% of the distance between said first and second resilient portions.

8. An impact resisting post as claimed in any preceding claim, wherein said rolled back portion extends into said space approximately half said distance between said first and second resilient portions.

9. An impact resisting post as claimed in any preceding claim, wherein said rolled back portion has dimensions configured such that when said contact occurs said second resilient portion has moved through less than 45°.

10. An impact resisting post as claimed in any preceding claim, wherein said rolled back portion has dimensions configured such that when said contact occurs said second resilient portion has moved through approximately 30°.

11. An impact resisting post as claimed in any preceding claim wherein the first, second and connecting portions take the form of an inverted hook.

12. An impact resisting post as claimed in claim 11, wherein the intermediate portion extends from the free end of the hook.

13. An impact resisting post as claimed in any preceding claim wherein the first, second and connecting portions are integrally formed from a length of spring steel material.

14. An impact resisting post comprising an elongate length of generally rectangular or square cross-sectioned resilient material arranged to form said post, said length having at least one longitudinally aligned elongate formation for providing additional strength per unit thickness of said resilient material.

15. An impact resisting post as claimed in claim 14 wherein said post comprises: a first resilient portion; a second resilient portion spaced transversely from said first resilient portion; a connection portion interconnecting said first and second portions; wherein: said resilient portions are configured to resiliently respond to an impact, such that when said impact exerts a force on said second resilient portion towards said first resilient portion; said second portion moves

resiliently towards said first portion.

16. An impact resisting post as claimed in claim 14 or 15, wherein said formation comprises a groove.

17. An impact resisting post as claimed in any of claims 14 to 16, wherein said formation comprises a ridge or rib.

18. An impact resisting post as claimed in any of claims 14 to 17, wherein said formation extends the full length of said length of resilient material.

19. An impact resisting post as claimed in any of claims 14 to 18, wherein a single formation is provided in axial alignment with said length of resilient material.

20. An impact resisting post as claimed in any of claims 14 to 18, wherein a plurality of formations are provided.

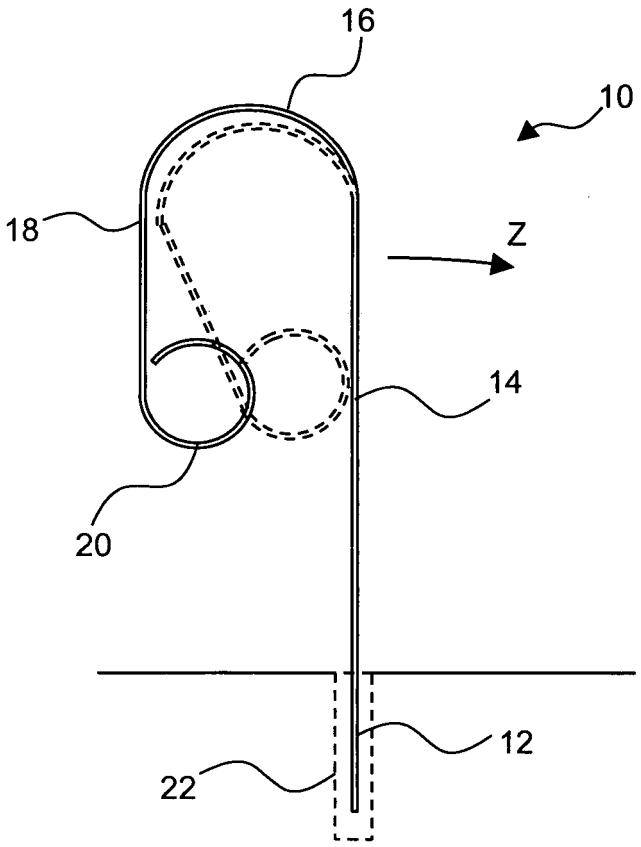

Fig. 1

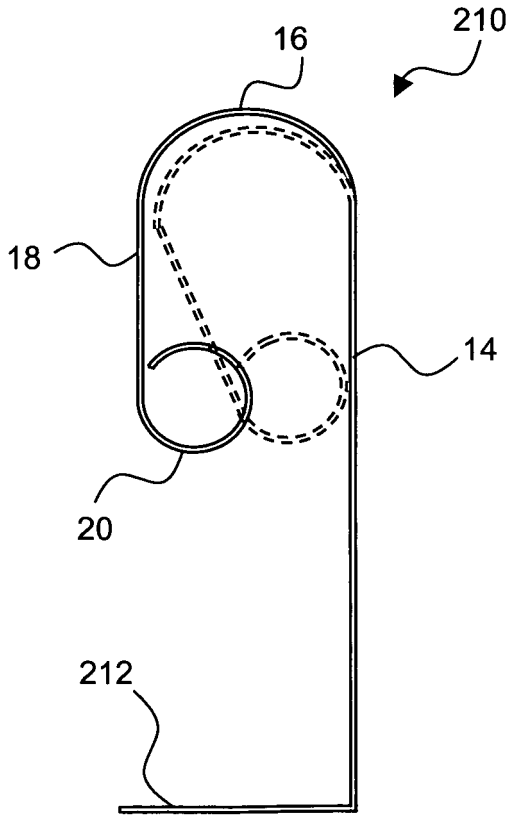

Fig. 2

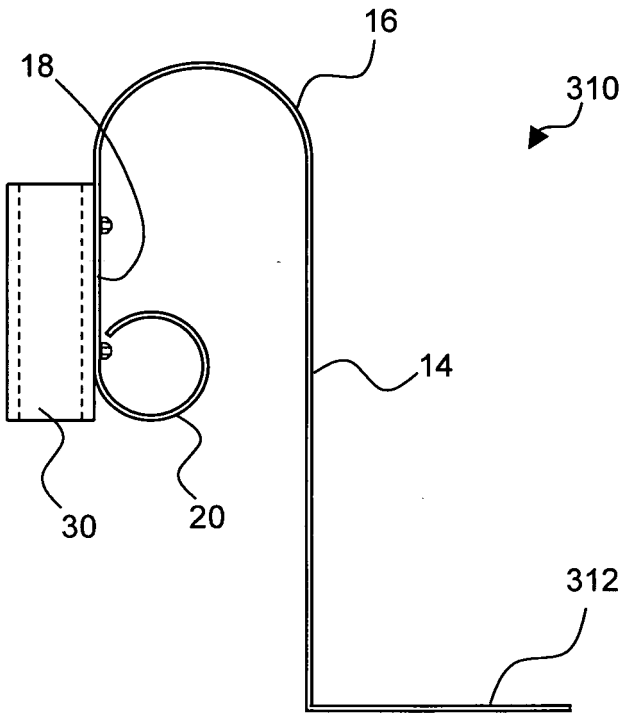

Fig. 3

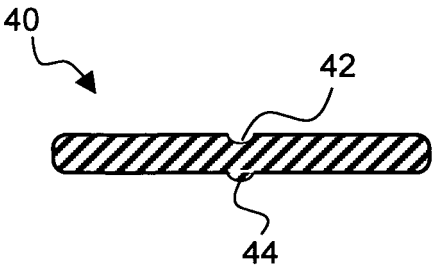

Fig. 4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 25 3255

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	GB 2 112 040 A (BROCKHOUSE BERRY LIMITED) 13 July 1983 (1983-07-13) * the whole document *	1,3,4,7, 13 2	INV. E01F15/04
X	US 2 988 332 A (GIULIO BINETTI ET AL) 13 June 1961 (1961-06-13) * the whole document *	1,3,4, 11-13	
X Y	GB 470 464 A (JOHN HENRY HODGE) 12 August 1937 (1937-08-12) * the whole document *	14,18,19 2,15	
Y	US 6 234 437 B1 (CABO RICARDO F [US]) 22 May 2001 (2001-05-22) * column 6, lines 21-67; figures 10,12 *	15	
A	US 4 092 081 A (SCHMANSKI DONALD W) 30 May 1978 (1978-05-30) * column 7, lines 15-48; figures 5-6b *	2,14	
			TECHNICAL FIELDS SEARCHED (IPC) E01F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	11 December 2007	FLORES HOKKANEN, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

European Patent Office

Application Number
EP 07 25 3255

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☒ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

European Patent Office

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 07 25 3255

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-13

impact resisting post with portions configured for movement towards each other on impact

1.1. claims: 14-20

impact resisting post with elongate formation for additional strength

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Please note that all inventions mentioned under item 1, although not necessarily linked by a common inventive concept, could be searched without effort justifying an additional fee.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 25 3255

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

11-12-2007

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