2009

PATENT ATTORNEYS

EXAMINATION

PAPER E

The New Zealand Law and Practice
relating to Interpretation and Criticism of Patent Specifications

Regulation 158 (1) (e)

Duration: 4 hours (plus 10 minutes for reading)

When considering answers to the questions in this year's examinations, no account is to be taken of any provisions of the Patents Bill, the Trade Marks (International Treaties and Enforcement) Amendment Bill, the Regulatory Improvement Bill (as it relates to amendment of the Designs Act 1953), or any other bill that may be before the New Zealand Parliament.

Your answer should be in the form of a comprehensive report including your opinion and recommendations. You should cover all relevant matters even where you consider one aspect may not need to be decided because of your opinion on another aspect.

Your answer should demonstrate that you can correctly apply the relevant New Zealand law to this fact situation and marks will be awarded for this and for clearly explained reasoning in support of the conclusions reached. Marks will not be awarded for unexplained conclusions, unsupported opinion, long restatements of the law or for detailed explanations of High Court or IPONZ procedure.

You may choose to write on the documents forming the examination script and include these in your answer. If so, please ensure you attach the relevant pages to your answer script.

Your client has long been irritated by speed bumps and tells you how concerned he was about the underside of his Ferrari on the way to your office. Your client has children and appreciates road calming measures are a necessary evil but has long sought a satisfactory alternative.

Some time was spent researching existing options. Conventional speed bumps reduce vehicle speed, but require a minimum ground clearance and cause additional wear and tear. Also, they provide for no real flexibility. For example, some roads may only require a reduced speed limit at certain times, such as those near to schools. Conventional speed bumps do not enable the profile and hence speed reduction impact to vary which can be frustrating to drivers and also increase pollution levels.

As an alternative to speed bumps, your client identified other road calming measures including road narrowing and the addition of obstructions which require a vehicle to deviate from its normal path. Narrowing of a road can be problematic in preventing wider vehicles from using a particular road. Obstructions are not possible for all roads since they require a relatively large amount of space. Furthermore, both these alternatives generally restrict traffic to one lane, making them unsuitable for busier roads.

After considerable thought, your client has devised an alternative to conventional speed bumps which is described in Document 1 (D1). Your client's speed bump has a resiliently deformable body having a profile similar to that of a conventional speed bump. The body is hollow and depresses when a vehicle drives over it. The extent to which the body deforms is related to the speed of the vehicle crossing it. More particularly, the faster a vehicle passes over your client's speed bump, the less it deforms such that the speed bump has a greater effect on speeding vehicles. To enable the speed bump to deform, at least one outlet is provided through which air in the hollow body may be expelled.

A short while ago, your client worked as a materials scientist at a leading tyre manufacturer (Tyre Company Ltd - TCL) and he informs you that there were no real problems in him identifying materials that would be suitable to form the body. However, while he knew the required functionality for a valve, the specific design required to achieve that functionality was beyond him.

Your client therefore approached Mr V who was a colleague of your client at TCL. Using the details provided by your client, Mr V designed the valve for the speed bump described in D1.

With further assistance from Mr V and using TCL's extensive facilities, your client built a prototype of his new speed bump and installed it in his driveway approximately 3 or 4 months ago. After some initial

teething problems over the appropriate setting for the valve to enable the desired functionality at particular speeds, no further problems were identified.

Your client says that he had been intending to see you about a potential patent application for his speed bump but that it had slipped his mind until Mr V passed him a copy of NZ patent 555555 (D2). From a review of the IPONZ Register, you see that NZ 555555 was filed with a complete specification-in-the-first instance on 22 September 2008 and was granted (sealed) on 30 June 2009.

From a review of online patent databases, you see that a US application corresponding to NZ 555555 is pending and that a number of documents (D3 to D5) have been cited by the US examiner. You have obtained a copy of these documents and were unable to find any others of great relevance.

Your client asks you to advise on the following. If further information would be required to advise your client on any points you raise, please briefly comment on what would be required.

1. Infringement of NZ patent 555555 by your client's proposed arrangements - **40 marks**
2. Validity of NZ patent 555555 (candidates are not to consider possible amendments to the claims of NZ patent 555555) - **40 marks**
3. Any other IP issues or risks he should be aware of based on the facts provided, and an outline of the forms of IP protection available to prevent others marketing a similar speed bump to that described in D1. You should include comments of any relevant problems or difficulties you envisage in relation to the different forms of protection you advise on. If patent protection is recommended, candidates are asked to advise on any significant features or combinations of features which may be patentable but not to prepare claims - **20 marks**

Documents:

D1 – client's invention disclosure

D2 – NZ patent 555555

D3 – US 5,419,537

D4 – WO 2007/060442

D5 – WO 2007/046753

DOCUMENT 1 - CLIENT'S ARRANGEMENT

Speed bumps are generally accepted as a relatively inexpensive means for reducing vehicle speed. However, they are problematic in that they inconvenience drivers who do not speed, even at times when there is no significant danger to pedestrians. They result in increased journey times and additional car and road maintenance.

We have addressed these problems by providing a deformable speed bump. In summary, if a vehicle is driven over our speed bump below a set speed limit, the speed bump depresses and becomes flatter, resulting in a smoother traversal of the obstruction. On the other hand, if a vehicle is driven above the set speed limit, the speed bump does not deform or at least deforms less, and it essentially acts as a conventional speed bump.

Figures 1 and 2 are perspective and sectional views of a preferred configuration of our speed bump device D. As can be seen, it has a relatively conventional profile. While this profile is preferred, other profiles may be used, such as that shown in Figure 3.

Device D may be formed from an extruded or compressed recyclable rubber compound.

Device D of Figures 1 and 2 includes a solid run up portion 14 and hollow portion 16. Device D further includes vent means (see Figures 4 and 5) which enables air to move in and out of the hollow portion 16 in a regulated manner. Thus, vehicles pass over the run up portion 14 onto the upper wall of the hollow portion 16. The force of the vehicle on the hollow portion 16 urges air out of the vent means, causing the device D to deflate.

Figures 3 and 4 show an alternative embodiment in which the profile is substantially hemispherical. Figure 4 is a plan view and Figure 3 is a sectional view along the line A-A of Figure 4. Device D is preferably formed in sections and fixed to a road surface using bolts 2 that are inserted through holes 6. The bolts 2 engage anchoring devices 1 located in the road surface. While other fixing means may be used, the use of bolts has the advantage of enabling the speed bump to be easily removed or replaced with minimal disruption and without any excavation. Consequently, if device D is damaged, it or at least the section in question is simply unbolted and replaced.

As shown in Figure 3, device D may include a helical spring 4 encasing a sleeve 5 to assist in shape retention. The fixing arrangement and spring may be incorporated in the Figure 1 and 2 embodiment.

Also shown in Figure 4 are holes 3 which may form part of the vent means, allowing air to vacate the hollow portion 16 during passage of a vehicle over a speed bump.

The vent means may include the holes 3 provided in a wall of the hollow portion 16. Through appropriate selection of the number and size of the holes 3, the hollow portion may be evacuated of air when a vehicle passes over device D, such that it is deflated by the wheels of a vehicle, providing the vehicle is not exceeding a predetermined speed. Should the vehicle be traveling at a speed exceeding the predetermined maximum, the device does not deflate (at least not to the same extent) and acts substantially as a rigid speed bump.

Figure 5 shows a further embodiment in schematic cross-section. This Figure shows how air is expelled out of the hollow portion 16. In this embodiment, the vent means includes a two-way valve 13 provided to control deflation and re-inflation. While Figure 5 shows holes 3 and valve 13, only one of these is required. The holes 3 have the advantage of being relatively straightforward to form, but valve 13 provides for the possibility of adjusting the operational speed limit through adjustment of the valve 13 opening. We have achieved this by manual adjustment so far but Mr V is looking at the possibility of remote control whereby an actuator would receive an electronic control signal instructing the valve to open or close (either partly or fully). This would make adjustment (i.e., of the effective speed limit) far cheaper and simpler, and allow emergency vehicles to deactivate speed bumps along their path.

Development

We are considering providing a rigid insert in the form of a plate in a portion of the upper wall of the hollow portion 16. The insert will preferably extend from proximate the run up portion 14 to or beyond the crest of device D.

The insert should improve distribution of the force of the wheels on the speed bump, better controlling the depression of the upper wall. We believe that the insert will be particularly effective when it has one edge near an edge of the run up portion, enabling it to effectively pivot.

Where a rigid insert is provided, the helical spring 4 or something similar is likely to be essential in view of the additional weight of the upper wall of the device D requiring lifting back to the raised position.

It is our current view that the various alternatives we have described will enable us to tailor the set up we use at a particular site, based on, for example, traffic volume and average traffic speed. We are therefore keen to be able to work any of the described embodiments.

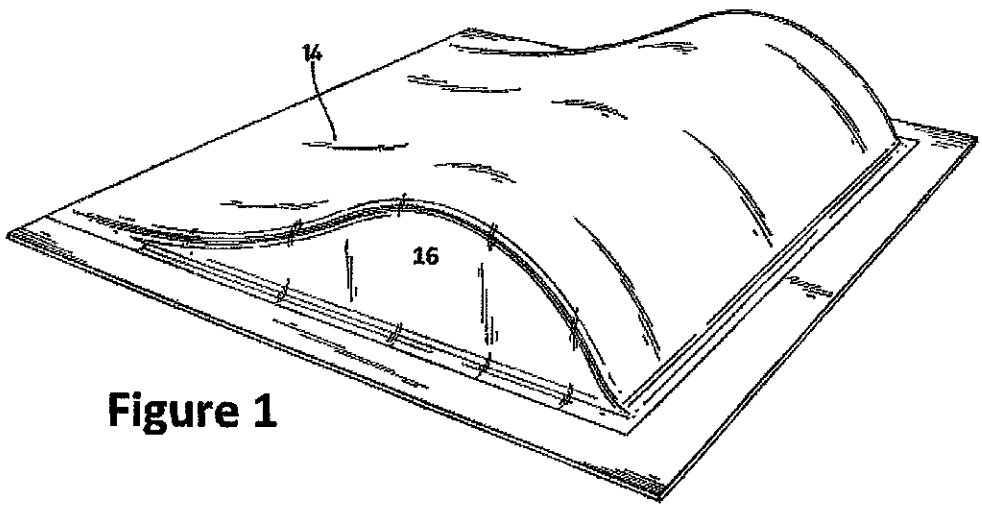

Figure 1

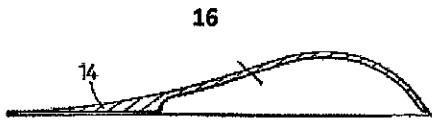

Figure 2

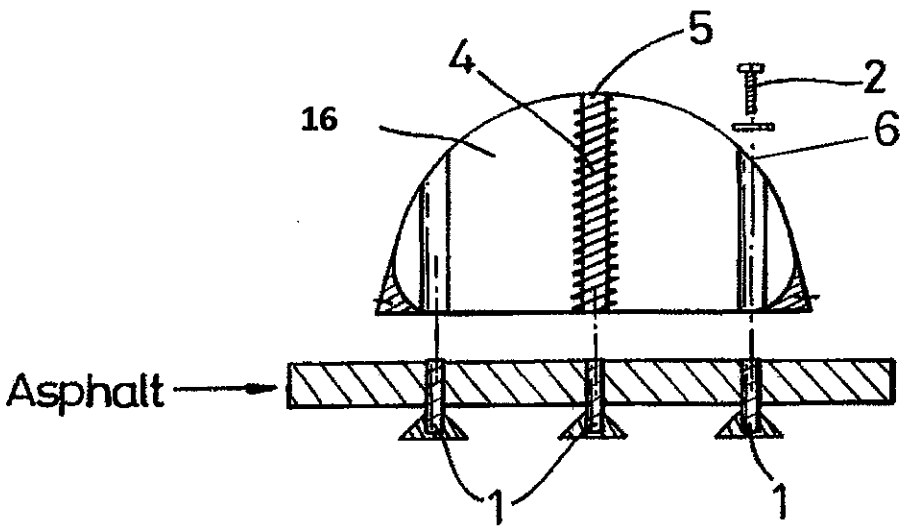

Figure 3

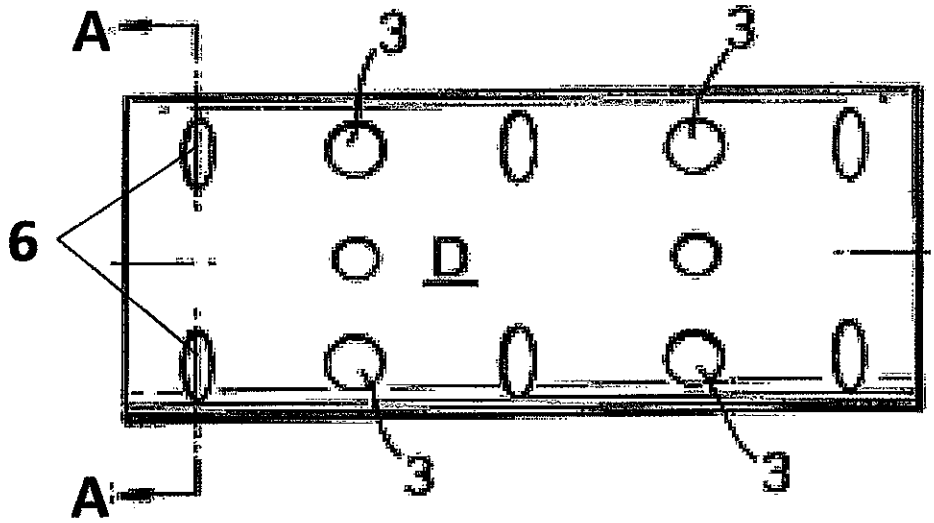

Figure 4

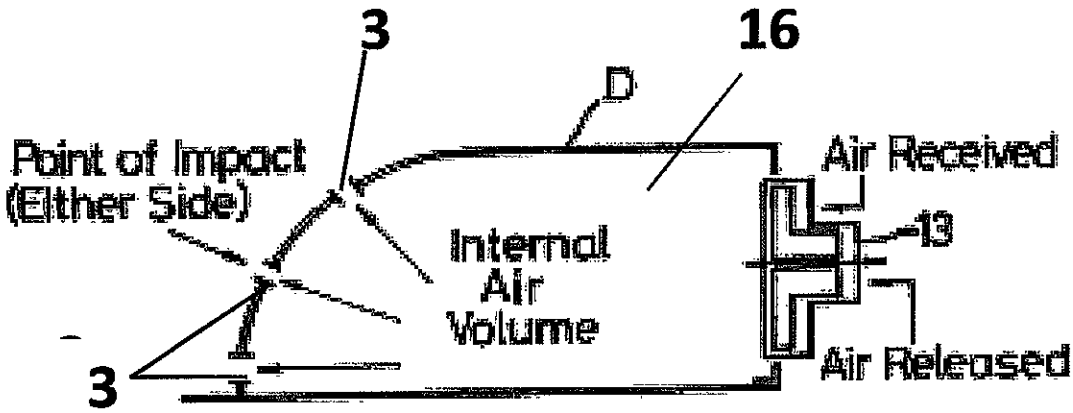

Figure 5

NZ 555555

Filing Date: 22 September 2008
Sealed: 30 June 2009

SPEED BUMP

The invention relates to a deformable speed bump whose height decreases under the influence of the weight of a passing vehicle. More particularly, the invention relates to a speed bump whose height decreases significantly only when the passing vehicle observes the maximum speed, or only for vehicles with an exceptional weight (for instance trucks).

It is an object of the invention to provide a speed bump with a variable height, having a simple and maintenance-low construction that causes little noise.

It is a further object of the invention to provide a speed bump that does not react linearly to cars driving over the bump.

The speed bump according to the invention is described in claim 1. According to the invention, the surface of the speed bump is formed by a hard plate, preferably of metal, that is supported at one transverse edge and preferably on both transverse edges, by only an elastically deformable support or supports. The rigidity of the plate and the supports is chosen such that, when loaded, the plate flattens without buckling, resulting in the ends of the plates essentially stretching. This stretching of the plate is absorbed at the edges by deformation of the supports. The rigidity of the plate combined with the elasticity of the deformable supports define the extent to which the plate lowers when subjected to a force.

The plate deforms to a greater or lesser extent depending on the load, so that the speed bump remains active for lighter vehicles (passenger cars) but is depressed by heavier vehicles (for instance trucks). Noise nuisance is avoided since the plate rests only on the supports without movement being allowed that enables the edge of the plate to make contact with the road surface next to the plate. Preferably, the combination of the supports and the plate is designed such that virtually only displacement of the edge parallel to the driving direction is allowed, while no vertical displacement of the edge is allowed that is so great that contact with the road surface next to the plate occurs.

Preferably, the speed bump contains a discrete damper element with a housing which is coupled on one side to the plate and on the other side to the ground. The damper element has a damping characteristic with an increasing reaction force at increasing speed of compression. In this manner, a behaviour is realized with which the speed bump lowers with cars driving slowly, but stays upright with cars driving too fast. Preferably, the damper element is designed such that upon increasing loading force, the reaction force saturates. In this manner, the speed bump also lowers with heavier vehicles driving too fast, which prevents damage to such vehicles or their cargo. This property results in important advantages for fire engines and ambulances which have to operate rapidly. Labour conditions of bus drivers improve as their bodies are exposed less to regular shocks. A further advantage is that vibration nuisance and/or damage to houses bordering speed bumps are prevented.

In one embodiment, the speed bump comprises an elastically resilient surface (for instance a rubber mat) lying under the plate but, with the speed bump in a condition of rest, not making contact with the plate. Only when loaded heavily, the plate lowers so far that it comes to rest on the rubber mat. Through the use of a resilient surface, excessive noise nuisance is prevented.

These and other objectives and advantages of the invention will become clear from the description of non-limitative exemplary embodiments, with reference to the accompanying Figures. Fig. 1 shows a cross-section of a speed bump; Fig. 2 shows a depressed speed bump; Fig. 3 shows a speed bump with a damper; and Fig. 4 shows a damper characteristic.

Fig. 1 shows a cross-section of a speed bump provided on a road 4, in a condition of rest. The driving direction over the road is indicated with an arrow 7. The speed bump comprises a metal plate 1, supports 2 and a rubber mat 3. Metal plate 1 may be pre-folded such that in cross-section, it has the shape of the upper part of a trapezium as shown in Figures 1 and 3.

The transverse edges of the plate 1 (the edges that are transverse to the driving direction 7) at the extremities of the obliquely ascending surfaces bear on supports 2, provided in recesses in the road 4. With the speed bump in the condition of rest, supports 2 form the entire, or virtually entire support of the metal plate 1. In other respects, in the condition of rest, the plate 1 hangs completely or virtually completely clear.

Rubber mat 3 lies under metal plate 1 on the ground. In the condition of rest, metal plate 1 makes no or virtually no contact with rubber mat 3.

Each support 2 is for instance designed with a first metal part which is secured to metal plate 1 and a second metal part secured in the recess to the ground. A rubber connection connects the first and second metal parts, so that the two metal parts can move relative to each other while elastically deforming the rubber connection. In particular, each support 2 is designed such that the support allows at least elastic displacement of the transverse edge of metal plate 1 relative to the road parallel to the driving direction 7 (that is to say in the driving direction or counter thereto). In one embodiment, each support extends in this form, with elastic connection, almost over the entire length of a transverse edge of the metal plate (perpendicular to the plane of the drawings). In another embodiment, use can be made of a plurality of discrete supports along a transverse edge, supporting the transverse edge preferably over its entire length. To this end, commercially available vibration isolators may be used.

Fig. 2 shows how metal plate 1 is depressed when a car with a wheel 5 drives over metal plate 1, thereby depressing metal plate 1. The car wheel 5 causes metal plate 1 to flatten by bending at the joins or fold lines between the horizontal and sloped portions along the length of metal plate 1, transverse to the driving direction 7. As a result, the metal plate stretches, so that the distance between the transverse edges increases. This increase is elastically absorbed by supports 2. The rigidity of metal plate 1 and the rigidity of supports 2 for deformation parallel to the driving direction are chosen relative to each other such that, with increasing force, metal plate 1 stretches and flattens to an increasing extent, but does not permanently bend.

Bending of metal plate 2 other than at the joins or fold lines between the horizontal and sloped portions is undesired because it leads to unpredictable behaviour and possible permanent deformation of metal plate 1. Prevention of such bending is achieved through selection of appropriate elasticity (rigidity) of supports 2 and metal plate 1. If supports 2 are too stiff, metal plate 1 would, under weight, sooner buckle than flatten in the desired manner, and the same applies if metal plate 1 is not rigid enough. The rigidity of the metal plate 1 can be adjusted through selection of a suitable thickness and/or type of material, and the rigidity of supports 2 can be adjusted through selection of the weight of the rubber connection or the number of supports. Control of the deformation can be further aided by scoring a surface of metal plate 1 at desired bending locations along its length (i.e., the joins between the horizontal and sloped portions) such that metal plate 1 is thinner at such locations.

As metal plate 1 rests completely, or virtually completely, on supports 2, the noise nuisance owing to the speed bump is minimized. The transverse edges of metal plate 1 do not contact

the road, which would otherwise lead to noise nuisance. Preferably, the rigidities of the different parts are selected such that under the weight of the wheels of relatively lighter cars (for instance ordinary passenger cars), metal plate 1 remains clear of rubber mat 3 and only under the weight of relatively heavier cars (for instance trucks or buses) lowers so that metal plate 1 comes into contact with rubber mat 3. The fact that for most vehicles there is no contact between metal plate 1 and the road, noise nuisance is prevented. For heavier vehicles where metal plate 1 does contact the road, noise nuisance is limited by rubber mat 3. Rubber mat 3 ensures that above a particular weight, a strongly increasing reaction force is realized. This prevents damage to (the cargo of) heavy vehicles and excessive noise nuisance. This property also results in important advantages for fire engines and ambulances having to do their job rapidly. Labour conditions for bus drivers improve as their bodies are exposed less to regular shocks. Also, vibration nuisance or damage to houses bordering speed bumps is prevented.

Fig. 3 shows an embodiment of the speed bump in which one or more dampers 6 are added. The damper 6 is provided between the metal plate 1 and the ground. Damper 6 is designed so that it provides a limited reaction force against compression when compressed relatively slowly, and a higher reaction force when compressed relatively faster. Such dampers are known per se and are commercially available. In one embodiment, the one or more dampers 6 are arranged to receive the highest part of metal plate 1. Without deviating from the invention, the one or more dampers can be connected to the metal plate 6 at other or various locations.

Fig. 4 shows a damper characteristic curve representing the reaction force of damper 6 as a function of the speed of compression. Dampers with such a damper characteristic are commercially available and may be constructed with a pipe having a piston therein moving through a liquid and provided with flow channels for passage of the liquid. If necessary, a part of the flow channels may be provided with valves which open or close at a specific pressure difference across the valve so as to realize the desired damper characteristic.

Fig. 4 shows a damper characteristic in which the reaction force for low speeds increases by a small gradient. This defines the effect on cars driving over the bump below a maximum speed. Above a first threshold speed (around 0.5 m/s in Fig. 4), the reaction force increases strongly. This defines the effect on cars driving over the bump above the maximum speed. Above the second threshold speed (around 0.8 m/s in Fig. 4), the reaction force saturates (it becomes virtually constant). The reaction force occurring with this second threshold speed is selected such that it is higher than the force passenger cars with a normal weight apply on damper 6 (as a result of the axle pressure, taking into account the number of dampers 6 present in the

damper and the resilience of metal plate 1). In this manner, the second threshold speed only plays a part for heavier vehicles such as trucks or buses. Preferably, the reaction force occurring with this second threshold speed is so low that it has no real influence on these heavier vehicles so that they are not inconvenienced by the bump. In one example, use is made of a damper 6 wherein at a speed of 0.5m/s, a threshold speed occurs at a reaction force of 500 Newton, and at around 0.8 m/s, a threshold speed at a reaction force of 1000 Newton. Other threshold speeds can be chosen, depending on the speed limit. The forces are chosen so that the lowest force is hardly inconvenient to passenger cars and the highest is inconvenient to passenger cars but not to heavier vehicles.

In another embodiment, use is made of a damper that has no saturation (where the reaction force continues to increase with increasing speed above the lowest threshold speed). In this case, heavier vehicles too are compelled to observe a maximum speed.

In operation, damper 6 gives no or virtually no support to the metal plate 1 in the condition of rest. This is the function of the supports 2. Damper 6 has effect primarily when a car drives (too) rapidly over the speed bump. In that case, the bump is not or hardly depressed because of the great reaction force of damper 6 that is generated.

Preferably, one end of damper 6 is provided in a recess with respect to rubber mat 3 so that the maximum depression of the bump is determined by rubber mat 3. Rubber mat 3 is arranged such that it prevents damage to the road surface and undesired driving and noise effects.

As dampers available on the market can be utilized, it is not necessary for the entire bump to be filled with liquid. As a result, the bump needs not be entirely watertight or airtight. When damage occurs to the driving surface, the bump is therefore not immediately unusable and, when the damper is damaged, only the damper needs to be replaced. In the embodiment shown, the damper cannot be reached or damaged by vandals, or only with great difficulty.

It is preferred that the bump is supplied as a prefab unit as shown in Figs. 1-3. The prefab unit is provided with a ground plate 8 (e.g. a concrete slab) on which, prior to installation, metal plate 1, supports 2, rubber mat 3 and, optionally, damper 6 are provided. Upon installation, a recess is made in the road surface in which the bump unit is laid, ground plate 8 included.

Although the invention is described with reference to advantageous embodiments, it will be clear that these embodiments are not limiting. For instance, instead of metal plate 1, a plastic

plate with sufficient rigidity can be used. Also, a plate is possible which is built up from several layers of different materials to obtain a desired combination of properties. However, a metal plate 1 of for instance steel provides a simple, low-maintenance and cost-effective solution.

In the Figures, the plate has (the upper side of) a trapezium shape with two folds on both sides of a central part but the invention is not limited thereto. A continuously bent plate can be used (in the shape of a sector of a cylinder). The folded trapezium shape is however easily made.

It will further be clear that although the Figures show supports 2 on both sides of the speed bump, as an alternative, the bump can also be attached with one side hinged to the road. This is preferably done on the side where the traffic approaches from. In these cases, a support 2 (or supports) on one transverse edge of metal plate 1 receives all horizontal movement of the plate. However, the embodiment with elastically deformable supports on both transverse edges has the advantage that no maintenance-prone and potentially noisy hinge is required and that per support less movability is required.

It will further be clear that the invention is not limited to the embodiment with supports containing a rubber connecting part. Other elastically deformable supporting elements such as springs (e.g. leaf springs) can be used, or other resilient materials. It will also be clear that although the supports are described connected to the transverse edge at the extremity of plate 1, they can be connected to the plate 1 at a small distance from the edge. It suffices that the distance is so small that the wheels of a car do not deform the overhanging part.

CLAIMS

1. A speed bump having a body that defines a profile whose height decreases from a raised position to a lower position under a passing vehicle, wherein the height decreases significantly when the passing vehicle observes a speed limit but not when the speed limit is exceeded, and the decrease in height is effected by deformation along the length of the body in a direction substantially transverse to the driving direction.

2. The speed bump of claim 1, wherein the body controllably deforms.

3. The speed bump of claim 1 or 2, wherein the body portion is formed from a resiliently deformable material.

4. The speed bump of any one of the preceding claims, including at least one elastically deformable support connected at one end to the body and at the other to the ground, wherein the or each support is provided in a recess of a road surface under an extremity of the body, which recess includes sufficient space for allowing the support to absorb stretch of the plate parallel to the driving direction.

5. The speed bump of any one of the preceding claims, including damping means for increasing resistance to movement of the speed bump from the raised position to the lower position and/or improving movement from the lower position to the raised position.

6. The speed bump of claim 5, wherein the damping means is adjustable such that the increase in resistance is dependent on a predetermined speed limit.

7. The speed bump of claim 5 or 6, wherein the damping means includes one or more valves for restricting flow of a fluid to realise desired damping characteristics.

8. The speed bump of any one of the preceding claims, wherein the body is formed from a plate.

9. The speed bump of claim 8, wherein the plate includes one or more fold lines along the length of the plate transverse to the driving direction and about which the plate deforms such that the height of the speed bump decreases when a vehicle observing said speed limit passes thereover.

10. The speed bump of any one of the preceding claims, wherein one side of the body is hinged and deformation to the lower position is effected at least in part through rotation of at least a portion of the body about the hinge.

11. A prefab bump unit for use in a road surface including a speed bump according to any one of the preceding claims.

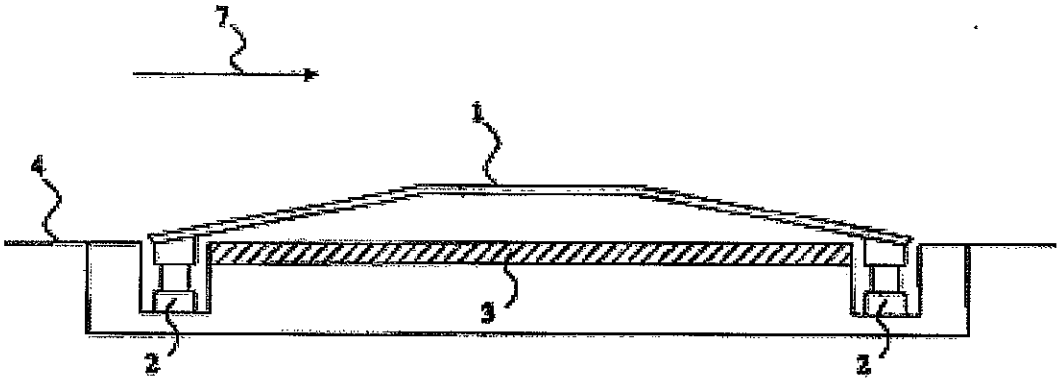

Fig.1

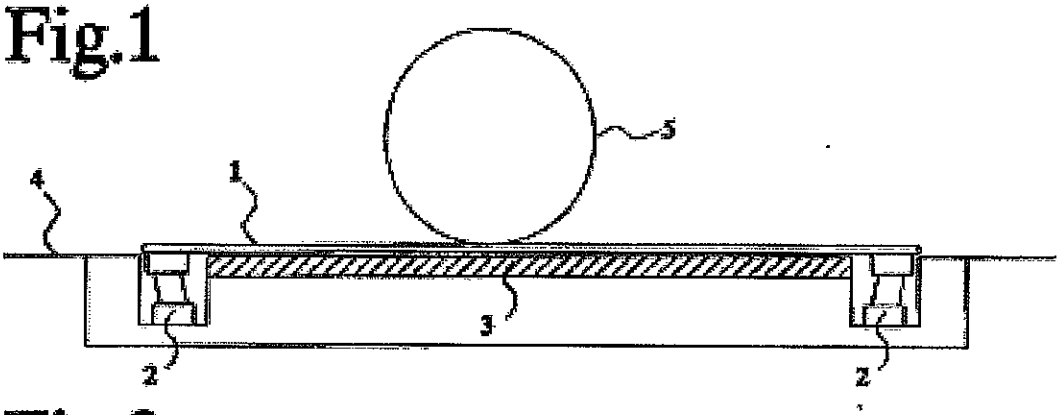

Fig.2

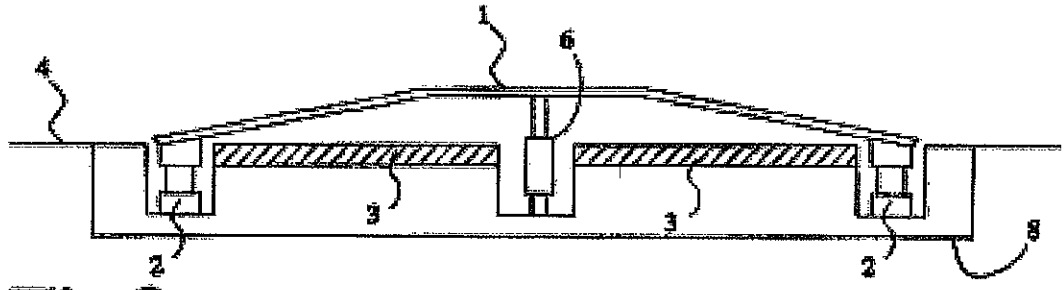

Fig.3

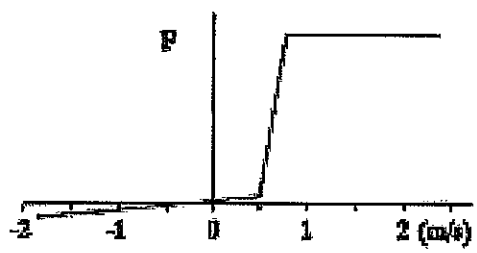

Fig.4

US005419537A

United States Patent [19]

Thompson

[11] Patent Number: 5,419,537

[45] Date of Patent: May 30, 1995

[54] **POP-UP STOCK GUARD**

[76] Inventor: **Richard M. Thompson**, 1219 4th Ave., Canyon, Tex. 79015

[21] Appl. No.: **210,686**

[22] Filed: **Mar. 18, 1994**

[51] **Int. Cl.**[6] **A01K 3/00**

[52] **U.S. Cl.** **256/17**; 256/14; 49/58; 49/131

[58] **Field of Search** 256/14, 15, 16, 17, 256/13, 1; 49/131, 132, 133, 134, 58; 404/6, 10, 7, 8, 9

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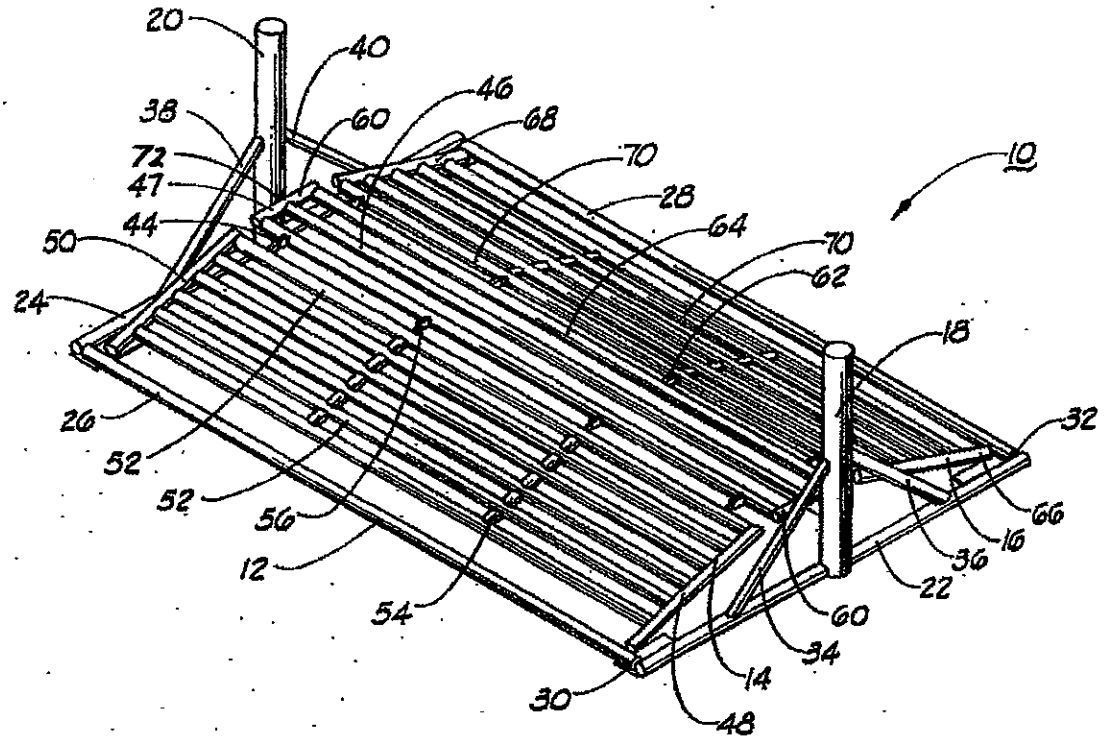
Primary Examiner—Randolph A. Reese
Assistant Examiner—Harry C. Kim
Attorney, Agent, or Firm—Dougherty, Hessin, Beavers & Gilbert

[57] **ABSTRACT**

A portable cattle guard is provided which includes an assembled rectangularly shaped base member. Contained within the confines of the base member are a pair of inclined cattle ramps movably connected along their longitudinal axis to a smaller, spring biased center ramp. The base member includes a pair of hollow vertical posts having inwardly facing guide slots cut therein. Each hollow post contains a coil spring assembly fixed to support the center ramp in normally upward attitude and depressible to a flat ramp configuration to allow vehicle passage.

10 Claims, 3 Drawing Sheets



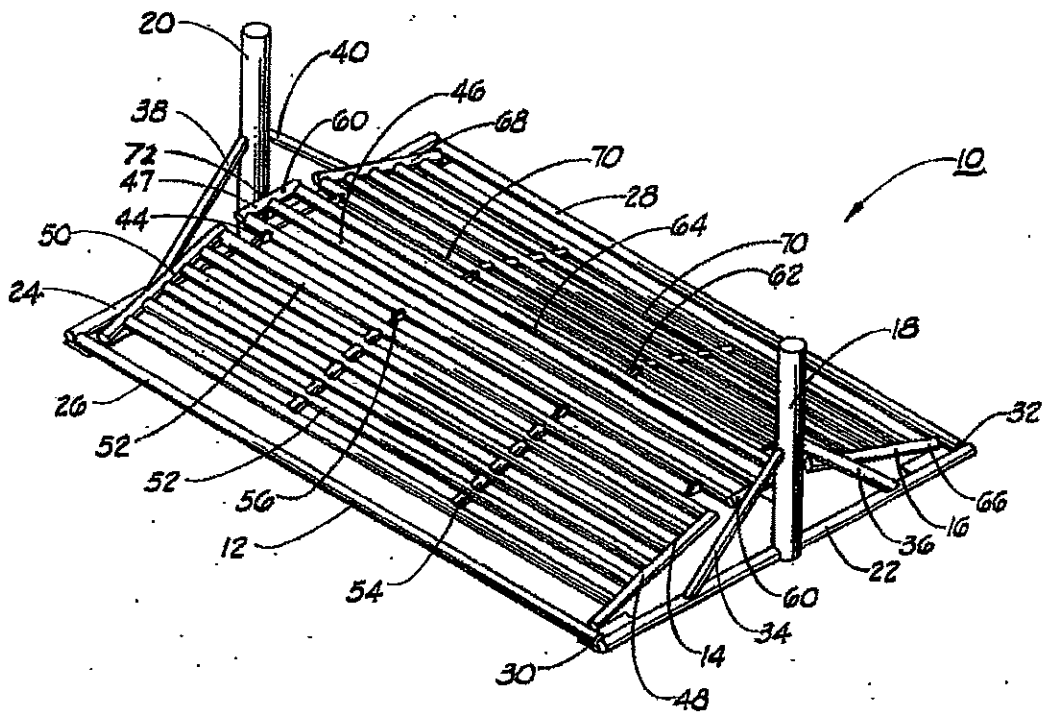

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FIG. 1

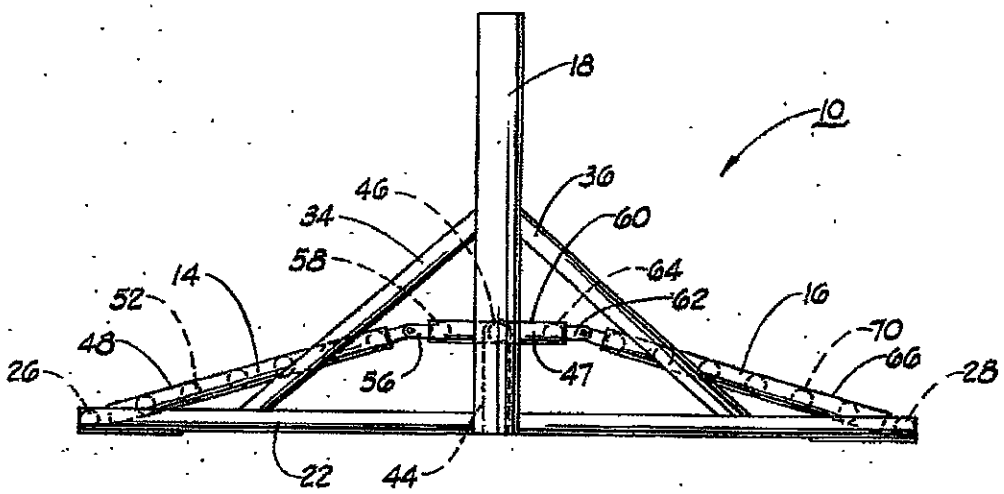
18
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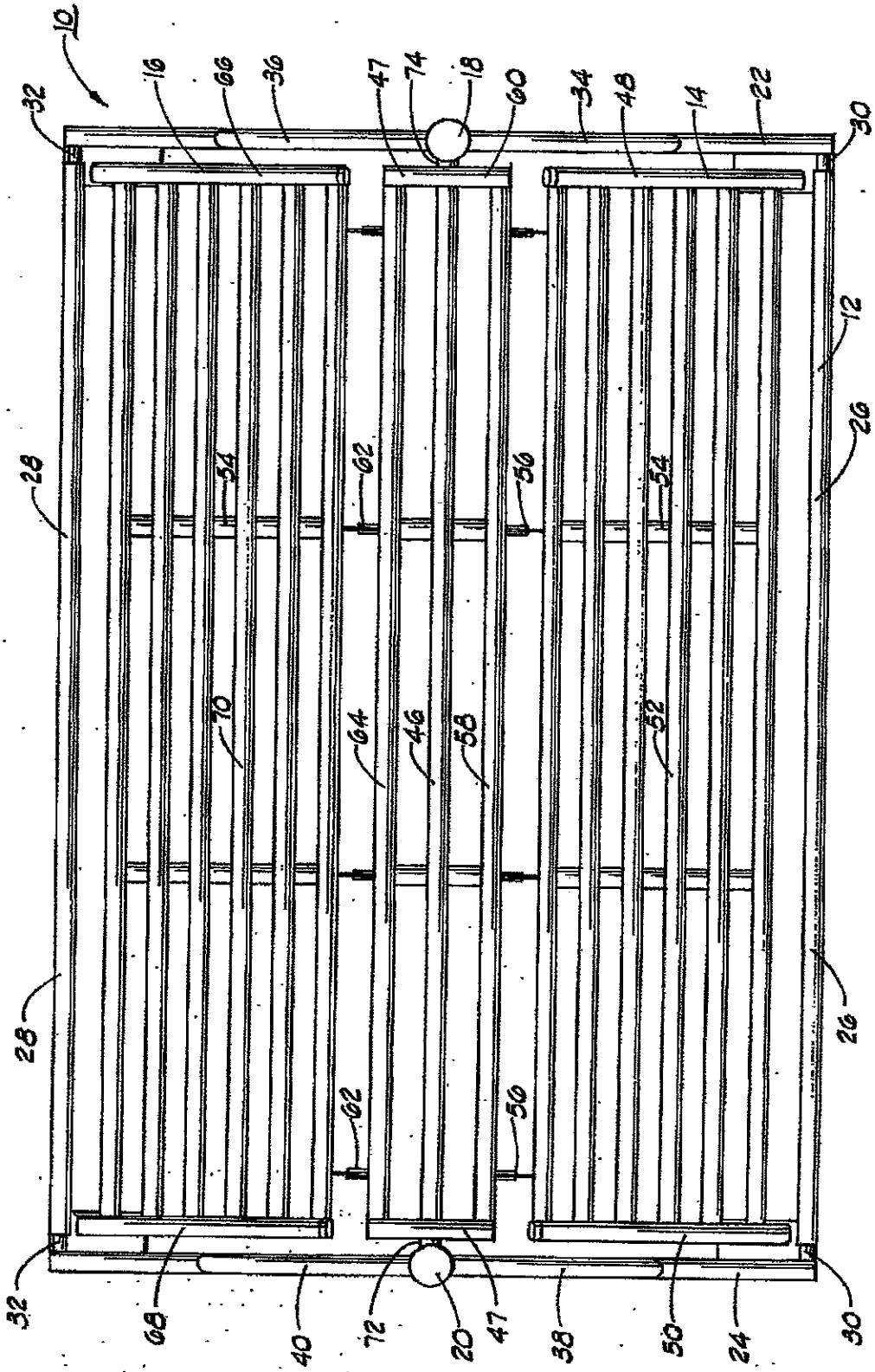
FIG. 2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74
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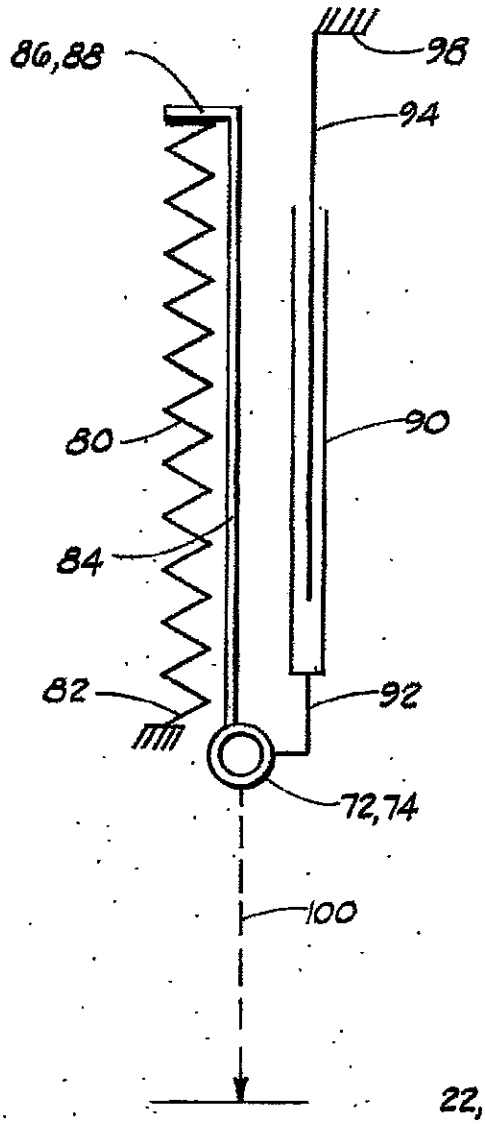
FIG. 3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80
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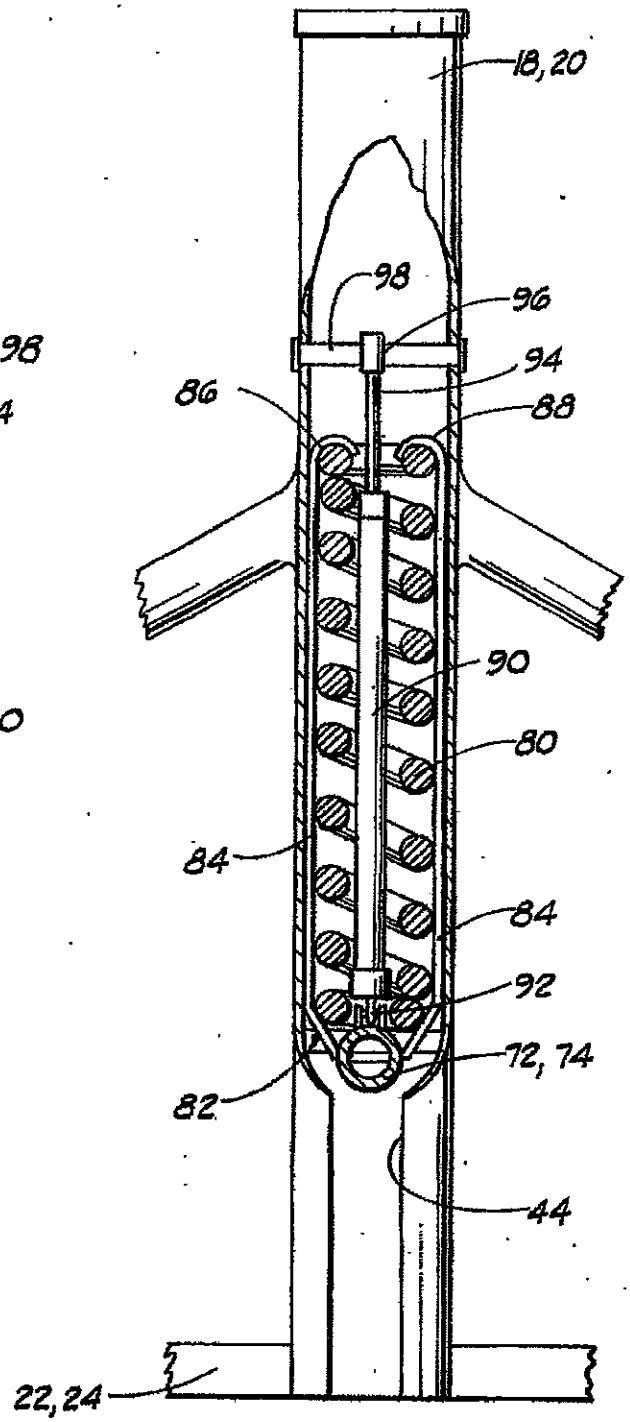
72,74
100

FIG. 3


18,20
98
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72,74
82
44
22,24

FIG. 4

POP-UP STOCK GUARD

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an improved type of portable cattle guard; specifically an improved structure of a type disclosed in U.S. Pat. No. 4,844,423 in the name of Combs as issued on Jul. 4, 1989.

2. Description of the Prior Act

Cattle are normally enclosed within the confines of a fixed fence line area. In most cases, there are several openings along the fence line to permit vehicles and farm equipment to pass into the enclosed area. When gates are used to close the openings, it is necessary for the driver of a vehicle to get out and open or close the gate upon entering or leaving the confined area. In order to avoid the above, cattle guards are provided in openings in a fence line to facilitate movement therethrough.

Cattle and other farm animals are reluctant to pass over parallel, spaced apart bars forming a cattle guard as it is normally placed over a ditch thereby to create an unstable footing area. If the cattle guards are substantially flush with the ground surface, cattle will, after a period of time, learn to cross over and not fear the cattle guards. Therefore, most cattle guards are placed over ground areas that are sunken or where a trench has been cut. This type of arrangement necessitates that the cattle guards be constructed from heavy gauge steel capable of supporting vehicles passing thereover.

Accordingly, a need exists for a type of cattle guard that is capable of providing a space between the ground surface while at the same time being constructed of a material that is light weight and can be easily assembled and placed into fence openings. In addition, the locations of fence openings may be changed from time-to-time and may require additional cattle guards.

Cattle guards have been in use for over a hundred years, along fence openings, across roads and to inhibit cattle from crossing onto railroad tracks and the like. Examples of various types of cattle guards including their general structural and operational features can be found in U.S. Pat. Nos. 117,600, 1,529,460, 1,620,348, 322,399 and 4,609,184.

SUMMARY OF THE INVENTION

The portable cattle guard, the present invention, incorporates a rectangularly shaped base member comprising two side members and two end members secured by conventional securing means. Each of the side members of the rectangular base member has a vertical, hollow tubular post member centrally fixed thereto and each of the tubular posts has a lower guide slot cut in the inward side. Within the tubular member is a spring assembly seated within the hollow tubular post member. The device includes opposite side ramp members and a center ramp member which are each constructed as parallel grating structures, and the center ramp is supported by the spring assemblies in the opposite side post members. In normal support attitude, the two side ramps are inclined at equal but opposite angles to the supporting ground and they are pivotally interconnected to the flat center ramp.

As a vehicle moves up onto the center ramp, the ramps are lowered flat to rest upon the surface of the ground. When the vehicle passes over the ramps, the ramps are automatically raised by the spring assemblies in delayed action to reform the original cattle guard shape. The main object of this invention is to provide a cattle guard that is portable and can be readily moved and reassembled at any desired fence line opening.

Another object of this invention is to provide a cattle guard which appears to approaching animals to be suspended over an open area thereby to create the illusion that there is nothing below the parallel spaced bars or rods creating the cattle guard.

It is another important object of this invention to provide a structure that will permit vehicles to pass thereover without damaging the cattle guard system.

It is still another object of this invention to provide a cattle guard that is aesthetically pleasing and does not require a trench or ditch to be dug at the fence line prior to installation of the cattle guard.

Yet another very important object of this invention is to provide a portable cattle guard that can be constructed from inexpensive, light-weight materials thereby to substantially reduce the costs and number of cattle guards that might be required.

A final object of this invention is to provide a cattle guard that can be used over a flat ground area.

These, along with other objects and advantages of this invention will become more readily apparent when construing the specification and drawings accompanying the specification wherein like numerals refer to like parts throughout.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view from a forward quarter of a cattle guard constructed in accordance with the invention, shown fully assembled and in its operating position;

FIG. 2 is a side view in elevation of the device;

FIG. 3 is a top plan view of the device;

FIG. 4 is an elevational side view of a vertical post and spring assembly of the device with parts shown in cutaway; and

FIG. 5 is a schematic illustration of the spring assembly of FIG. 4.

DETAILED DESCRIPTION OF THE INVENTION

Referring now more specifically to FIGS. 1 and 2, the numeral 10 designates generally the portable cattle guard of this invention. The cattle guard device 10 comprises generally a rectangular shaped base or support number 12 with two inclined side ramps 14 and 16 movably connected to a flat center ramp 60 all of which are positioned within the confines of the base member 12.

The base member 12 includes a pair of opposite side bars 22 and 24, which are normally constructed from steel tubes or rods, joined to a pair of tubular end members 26 and 28, respectively. Each of the side bars 22, 24 has metal pegs or dowels 30 and 32 welded to its end sections so that they can be inserted into the open ends of the tubular frame end members 26 and 28. The end and side members are secured to each other by any conventional means such as welding or other conventional fasteners. Attached centrally to each of the side bars 22, 24 of the rectangular base member are two hollow tubular post members 18 and 20. Each of the hollow tubular post members contain an opposing guide slot 44 cut into an inside lower portion of the post members 18 and 20. The guide slots 44 provide for vertical

movement (about thirteen inches) of the extended (middle) bar 46 of the center ramp 60. Contained within the hollow tubular post member 18, 20 is a coil spring and damping assembly, as will be further described below.

The tubular post 18 is secured vertically on side bar 22 and further secured by diagonal braces 34 and 36. Similarly, the opposite side tubular post 20 is braced by diagonal brace members 38 and 40. The guide ramp 14 consists of opposite side rails 48 and 50 which are secured to support a plurality of longitudinal bars 52 which are spaced about three inches apart for optimum cattle guarding efficiency. One or more spacing bars or stiffeners 54 may be suitably affixed between the successive longitudinal bars 52.

A plurality of pivotal hinges 56 are welded between the uppermost longitudinal bar 52 of ramp 14 and an outer bar 58 of center ramp 60, and similar pivotal hinges 62 are secured between the remaining outer bar 64 of center ramp 60 and the uppermost bar 70 of opposite side ramp 16. The side ramp 16 is constructed identically to the side ramp 14 as it includes side rails 66 and 68 supporting a plurality of spaced[longitudinal bars 70. Here again, spacer inserts or the like (not shown) may be secured between adjacent longitudinal bars 70 to maintain rigidity.

As shown in FIG. 3, the center ramp 60 is pivotally supported between vertical posts 18 and 20 by means of the central longitudinal bar 46 which is extended to expose opposite ends 72 and 74. That is, the ends 72 and 74 are extended through the opposite side bars 47 of center ramp 60 for insertion and support into the respective cut-out portions 44 at the lower, inner ends of upright posts 18 and 20. A spring assembly internal to the upright posts 18 and 20 allows selected vertical movement of center ramp 60 relative thereto. The structure and function of vertical posts 18 and 20 is identical in all respects and only differs in the mirror-image orientation.

Referring now to FIG. 4, the upright post 18, 20 (shown cut-away) receives the respective center ramp support end 72 of center ramp 60 into the respective cut-out 44 of vertical post 18. See also FIG. 1. The same would also be true for center ramp support end 74 as it is inserted in the lower cut-out 44 of vertical post 18. Within the respective vertical upright post 18, 20 there is disposed a coil spring 80 of elongate shape that is supported at the lower side by an internal collar 82 disposed approximately one foot from the lower end of the upright post 18, 20. A U-shaped steel strap 84 is disposed for insertion through support end 72, 74 of center ramp 60 to extend upward on each side of coil spring 80 and to include hook ends 86 and 88 for capture and retention of the upper end of coil spring 80. A dash-pot type of cylinder 90 is disposed down through the axial center of coil spring 80 for pivotal affixture at a pivot eye 92 secured on the top surface of the respective support ends 72, 74. The cylinder 90 also extends an actuator rod 94 upward such that a rod end 96 is secured at a selected height by means of a pivot pin 98 connected through the upright post 18, 20.

Thus, when a heavy weight is placed upon support end 72, 74, the center ramp 60 is rapidly depressed to ground level as strap hooks 86 and 88 compress the coil spring 80 downward, and cylinder 90 is drawn rapidly from the rod end 94. Upon removal of the downward force on support end 72, 74, coil spring 80 will return rapidly to its pre-stress condition; however, the cylinder 90 interjects a slight time delay in raising of the support end 72, 74 thereby to assure vehicle clearance when driving off of the device.

FIG. 5 shows schematically the effective components of the spring assembly of FIG. 4. The respective center ramp 60 support ends 72 and 74 traverse up and down along line 100 between ground level and the expanded center ramp level, and the center ramp 60 under, for example vehicle weight, compresses coil spring 80 by means of the steel strap 84 and upper hook ends 86, 88. The coil spring 80 is secured at the lower end by means of the support collar 82 within the vertical upright 18, 20. The dash pot effect for slowing spring return is accomplished by cylinder 90 being pivotally secured by pivot link 92 to the support end 72, 74 and a rod end 94 extends upward therefrom for secure affixture at pivot pin 98.

In operation, the portable cattle guard 10 may be delivered to and readily assembled at a fence opening or crossing where it is desired to exclude cattle movement. The device 10 may be moved by means of a light hauling vehicle to the site of usage and placed in operative position whereupon suitable anchors are applied to the rectangular frame 12 to maintain the device 10 in position. The device 10 is in the attitude shown in FIGS. 1 and 2 in normal cattle prohibition function as a center ramp 60 is maintained fully upward as support ends 72 and 74 are maintained uppermost in the respective guide slots 44 of vertical posts 18 and 20. The coil spring 80 maintains its uppermost position by assuming its unstressed position. The opposite side ramps 14 and 16 are hingedly connected to the center ramp 60 and rest in opposite angular disposition as the outer edges rest on the supporting surface. Thus, there is provided a slight incline of guard grating (14 and 16) on each side of a center ramp grating 60 that is disposed about one foot off of the supporting surface, and no trenching or other digging has been required along the guard line.

This proves to be a very effective cattle guard with few errant crossings. It is believed that this is due primarily to the fact that approaching cattle are only able to see the nearest ramp side and center ramp 60 without knowledge of what hazards may be on the immediate other side of the=center ramp 60. In addition, the combination of distances of the near side approach ramp 14 and center ramp 60 is such that an animal is much less likely to attempt to jump, and this is especially so when the animal does not know what structure or hazards are on the other side of center ramp 60.

When a vehicle approaches the device 10 it is merely necessary to drive up on the center ramp 60 so that support ends 72 and 74 depress downward to the support surface (see FIG. 4) and opposite side ramps 14 and 16 as hingedly affixed will also seek flat or ground level thereby to allow passage of the vehicle. As shown in FIG. 2, a slight space is allowed between the side ramps 14 and 16 and the respective longitudinal frame bars 26 and 28 to allow flattening. After the vehicle weight is removed from the center ramp 60, the coil spring 80 returns to its pre-stressed condition raising the support ends 72, 74 upward to their cattle guard operational level. The pressure cylinder 90, either air or hydraulic, provides a damping effect whereby the center ramp 60 cannot raise so quickly that it makes contact with or otherwise impedes vehicle progress as it leaves the cattle guard.

The coil springs 80 are selected in accordance with intended usage and present designs call for 0.437 inch diameter and .0.625 inch coil springs, depending on

intended loads to be handled. The steel coil springs are on the order of approximately 40 inches in length as they are disposed in the vertical post 18, 20 so that they allow about a 13 inch traverse of center ramp support ends 72, 74.

The foregoing is considered as illustrative only since numerous modifications and changes readily occur to those skilled in the art. There is no intent to limit the invention to the exact construction, operation or materials shown and described. Thus, all suitable modifications and equivalents that might reasonably be employed would fall within the scope of the invention.

What is claimed is:

1. A portable cattle guard, comprising:
a substantially rectangular base frame having opposite side members;
first and second tubular vertical posts affixed centrally of respective base frame side members and each having a centrally facing vertical guide slot at a lower end;
a center ramp having at least two longitudinal bars defining longitudinal edges and opposite sides and having axial support ends on each side, each of said support ends being supported in respective said first and second vertical post guide slots;
first and second ramps pivotally affixed to said opposite longitudinal edges of said center ramp; and
first and second spring assemblies of preselected compressibility disposed in respective first and second vertical posts to support the center ramp support ends at a predetermined height above said base frame as said first and second ramps rest adjacent the base frame;
whereby weight on said center ramp exceeding the spring assembly compressibility depresses the center ramp and first and second ramps to the level of the base frame.

2. A portable cattle guard as set forth in claim 1 wherein each of said spring assemblies comprises:
a coil spring normally supporting a respective center ramp support end approximately one foot above the base frame.

3. A portable cattle guard as set forth in claim 1 which further includes:
a dash-pot cylinder and actuator rod connected between said respective center ramp support end and the upper end of said respective vertical post.

4. A portable cattle guard as set forth in claim 2 which further includes:
a dash-pot cylinder and actuator rod connected between said respective center ramp support end and upward point in said respective vertical post.

5. A portable cattle guard as set forth in claim 1 wherein said center ramp comprises:
first and second opposite side bars; and
an odd number plurality of equi-spaced, longitudinal bars secured between said opposite side bars with a said centermost longitudinal bar extending through the respective side bars to form said center ramp axial support ends.

6. A portable cattle guard as set forth in claim 1 wherein said first and second ramps each comprise:
first and second ramp side bars; and
a plurality of equi-spaced, longitudinal bars secured between said respective ramp side bars.

7. A portable cattle guard as set forth in claim 5 wherein said first and second ramps each comprise:
first and second ramp side bars; and
a plurality of equi-spaced, longitudinal bars secured between said respective ramp side bars.

8. A portable cattle guard as set forth in claim 1 wherein each of said spring assemblies comprises:
a coil spring having upper and lower ends with said lower end secured to said respective vertical post at a point proximate said center ramp support end and at normal, unstressed height; and
steel strap means secured through said center ramp support end and extending upward for secure affixture to said coil spring upper end;
whereby the center ramp support end under downward stress depresses with said steel strap means pulling the coil spring upper end downward thereby to compress the spring.

9. A portable cattle guard as set forth in claim 8 which further includes:
a dash-pot cylinder and rod connected between the respective center ramp support ends and upward in said vertical post to delay rapidity of coil spring recovery to its unstressed attitude.

10. A portable cattle guard comprising:
a center ramp consisting of at least two parallel longitudinal bars and two larger side ramps confined within a rectangular base member;
vertical post members fixed to said rectangular base member;
first and second spring biasing means operatively housed within said vertical post members;
means for connecting said center ramp with said respective spring biasing means; and
means for pivotally connecting said two larger side ramps with said center ramp so that said two cattle guard side ramps are normally oppositely inclined from said center ramp.

* * * * *

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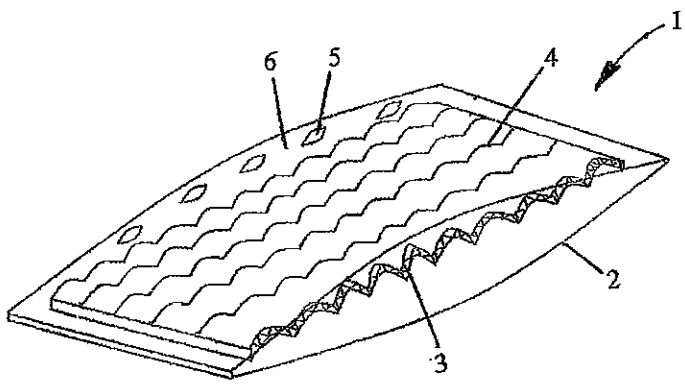

(57) Abstract: The present invention provides a vented cushion pack 1 which is either biodegradable allowing subsequent composting, or water- soluble/dispersible allowing subsequent repulping, methods of making such packs and the use of such packs to protect packaged goods. The cushion pack (1) has vents (5) to allow air to escape from within the pack to provide pneumatic cushioning when the pack (1) is compressed, and contains a corrugated fibreboard lattice (3) that is resiliency deformable to provide physical cushioning when the pack (1) is compressed and allows the pack (1) to return at least partially to its original shape when the compression is removed.

WO 2007/060442 A1

Cushion Packs

This invention relates to cushion packs, to methods of producing cushion packs and to use of cushion packs to protect packaged goods.

The name commonly given to the protection of goods or articles from shock, impact or vibration is "cushioning" and cushioning materials are often placed within what are known as cushion packs. In turn, cushion packs are placed upon or around different types of goods or articles, described herein as packaged goods, whilst being transported in transit packaging. In this context, packaged goods include fragile items such as wine bottles, glassware as well as fresh fruit and vegetables.

One of the main principles of cushioning is that a cushion pack mitigates shock, impact or vibration simply because the packaged goods sink or otherwise move into the cushion pack, decelerating progressively during the movement and therefore absorbing the kinetic energy of the packaged goods.

In order to understand the present invention, it is necessary to describe the fundamental principles governing what happens when a package is subject to shock, impact or vibration. The more rapidly that packaged goods are brought to rest, the greater the shock that they experience. It is also necessary to understand how packaged goods are damaged when they are subjected to shock, and how much shock packaged goods can withstand before they are damaged. The cause of damage may be simple to ascertain but becomes complicated as soon as the damage needs to be explained, quantified and methods of prevention proposed. We may say that a packaged article will break when some part of it is displaced beyond its "limit" as once displaced beyond this limit, the article will not, by this definition of limit, return to its initial position or to its original condition. The amount of cushioning required to prevent the packaged article from breaking as a result of the pack being subjected to shock is difficult to calculate theoretically, but it can be assessed and measured in practice by trial and error.

It is well known that the material known as corrugated fibreboard offers particularly good resistance to shock and hence corrugated fibreboard boxes are widely used for the protection of goods packed within them. Many different grades of corrugated fibreboard are in use, each one having its own performance parameters.

It is also well known that there is increasing pressure from legislation around the world to recycle or re-use waste packaging in order to reduce the impact upon the environment. Paper and fibreboard of all types can conveniently be recycled by means of re-pulping in water at different temperatures, but even so, the environment is affected as firstly, a certain amount of virgin fibres need to be added to the slurry, and secondly, the liquid effluent from the repulping process needs to be treated before discharge into river courses, and thirdly, energy is required to transport the materials to the repulping plant and to process them, thereby releasing additional carbon dioxide into the atmosphere. It is therefore useful to find ways to re-use repulpable packaging materials as many times as possible before they are repulped.

The present invention has been made from a consideration of the foregoing and seeks to provide a cushion pack, a method of making such cushion pack and the use of such cushion pack to protect packaged goods, that overcomes or mitigates at least some of the problems of existing cushion packs.

Thus, according to one aspect of the invention, there is provided a cushion pack comprising a corrugated fibreboard lattice within a flexible polymeric envelope which is vented to allow the air contained within the envelope to escape when the cushion pack is subjected to compression.

The present invention takes into account the key parameters of shock or impact which are:

- The distribution of shock throughout the packaged goods
- The localisation of shock
- The rate of absorption of shock by the packaged goods
- The impact time, being defined as that time during which the packaged goods are moving within the package following shock or impact.

The impact time will vary according to the characteristics of the cushion pack being used. For example, packaged goods which are broken or otherwise damaged by a certain impact time may be undamaged by a shorter impact time. In the event of such a short impact time, damage is prevented due to the fragile part of the packaged goods not having time to become damaged. The impact time has been reduced as a result of dissipating the external forces throughout the package, thereby limiting the magnitude and duration of forces acting upon the packaged goods.

At the end of its useful life, all components of the cushion pack are preferably repulpable in hot or cold water.

Alternatively, the cushion pack may be disposed of by composting in which case, all components of the cushion pack are preferably compostable in compliance with the European Norm EN13432.

Preferably, the flexible polymeric envelope is vented by such means that no material is removed from the envelope during the formation of the vents. The vents in the polymeric envelope may be provided in a variety of ways, including interrupted sealing of one or more of the seals at the boundaries of the envelope.

The flexible polymeric envelope may have an area free of vents which is deliberately placed in direct contact with the packaged goods in order to avoid the ingress of contaminants from the packaged goods into the cushion pack.

The flexible polymeric envelope may, at least in part, for example its surface, be static dissipative in order to facilitate the packaging of sensitive electronic components.

The flexible polymeric envelope may, at least in part, provide a barrier to the ingress of contaminants such as oils, greases and hydrocarbon solvents.

Preferably, the polymeric envelope provides a contact surface that is non-abrasive to vulnerable packaged goods.

The flexible polymeric envelope may be woven from polymeric materials, thereby providing vents formed by the interstices within the weave.

According to another aspect of the invention there is provided a cushion pack comprising a corrugated fibreboard lattice within a flexible polymeric envelope which is vented to provide pneumatic cushioning by escape of gas within the envelope and/or physical cushioning by deformation of the fibreboard lattice when the cushion pack is subjected to compression.

The fibreboard lattice is preferably deformable resiliently so that the cushion pack can at least partially return to its original shape when the compression force is removed.

The polymeric envelope is preferably provided with one or more vents configured to allow gas within the envelope to escape in a controlled manner.

The polymeric envelope preferably exhibits good elasticity.

According to yet another aspect of the invention there is provided a method of making a cushion pack comprising the steps of providing a corrugated fibreboard lattice, and enclosing the corrugated fibreboard lattice within a flexible polymeric envelope which is vented to allow air contained within the envelope to escape when the cushion pack is subjected to compression.

The cushion pack can be used to protect items in storage or transit either as a single cushion wrapped around the article to be protected, or as multiple layers of cushion. The cushion pack can be adapted so that when subsequently folded over itself and resealed, it can be used as a biodegradable (compostable) or water-soluble (repulpable) cushioned mailing bag, pockets or envelopes. Accordingly, such an embodiment allows the cushion pack to be used as a bag, pocket or envelope providing the benefits of a "padded" mailing bag, pocket or envelope incorporating the properties described in this application.

Preferably, the method employs recycled corrugated fibreboard to produce the corrugated fibreboard lattice. Accordingly, this invention provides a method of re-using waste corrugated fibreboard a number of times before it is repulped.

Corrugated fibreboard of any type may be employed to form the corrugated lattice by cutting the corrugated fibreboard into interconnected strips typically having a web width of between 2 and 25mms. The best results are obtained by cutting the corrugated fibreboard in a similar manner to that used in the manufacture of expanded metal in which the corrugated fibreboard is cut in a pattern in which all the cuts are made in the machine direction but without any cut being long enough to separate the corrugated fibreboard into separate pieces. Each piece of corrugated fibreboard fed into the cutting process therefore remains a single inter-connected piece after cutting, retaining approximately its initial weight. In this description of the present invention, we have chosen to describe the product resulting from this particular method of cutting and configuring corrugated fibreboard to produce interconnected strips as "a corrugated fibreboard lattice". Once the corrugated fibreboard has been

converted into such a lattice, it is preferably crinkled by which term we mean given a wave format in the machine direction of varying amplitude. This is done by adjusting the degree of compression of the corrugated fibreboard lattice in the machine direction.

The lattice is then separated into convenient web widths (transverse direction) and convenient lengths (machine direction) in order that it can then be packed into cushion packs by enclosing it within any flexible polymeric envelope capable of withstanding the required cushion pressure.

It has been found that by making transverse cuts across the central portion of the corrugated fibreboard web before it is converted into a lattice, the resulting cushion pack exhibits greater three dimensional flexibility, lending itself to be more easily "moulded" around the packaged item. The depth of the transverse cuts can vary up to a maximum of 50% of the thickness of the corrugated fibreboard and the length of the transverse cuts can extend across up to 80% of the web width, leaving approximately 10% of the web width uncut at either edge of the web. The transverse cuts may easily be made by means of rotating cutter blades or die cutting knives.

The cushion packs according to this invention may be made in a number of different ways and in a number of different places. Amongst the many options for the location of facilities to manufacture cushion packs, they may be made in a location where virgin corrugated fibreboard is produced, they may be made in a re-cycling centre where corrugated fibreboard is being collected and they may be made where the goods to be protected during transit are being packaged.

Polymeric films of any practical thickness may be used as long as they are flexible as this term is understood in the packaging industry. Thicknesses in the range 15-200 microns are usable, more especially preferred are film thicknesses in the range 25-100 microns. Any flexible film can be used and particularly useful are those films that have good elasticity, by which term we mean that the film will extend its dimensions under tension and will regain its original dimensions when the tension is removed. Inelastic films can be used provided that the contained ambient air can escape in a controlled manner by means of the vents without film rupture.

It is important that in each cushion pack, the flexible polymeric envelope contains a means of venting the contained ambient air following shock or

impact to the transit pack within which one or more cushion packs are being used. The means of venting includes punctures, slits, and interrupted seals although these methods are by no means limiting. The means of venting is located in a certain pattern, in a sufficient number of places, in order to allow air to escape from the cushion pack in a controlled manner, by which term we mean that the rate of escape of the ambient air contained within the cushion pack is restricted in order that the packaged goods are optimally cushioned by the cushion pack following shock or impact to the transit package. It will be understood that the shape and weight of the packaged goods or articles will determine the size, number and arrangement of the means of venting the cushion pack.

The vents allow the cushion pack to dampen the acceleration of the packaged goods following shock or impact to the transit package and allow air to refill in whole or in part the cushion when the forces arising from shock or impact have been dissipated. In so doing, the cushion packs made according to this invention offer a degree of volume recovery or memory, which is particularly evident at high rates of crinkle of the corrugated fibreboard. The type, size and number of vents per unit area are selected in order that the cushion pack provides an optimal initial pneumatic cushioning effect which causes the packaged goods to decelerate optimally prior to utilising the additional cushioning effect provided by the corrugated fibreboard lattice. In this way the vents allow the air (or other gas contained within the envelope) to escape in a controlled manner and the corrugated fibreboard lattice deforms to achieve a desired cushioning effect when the pack is compressed.

Unexpectedly, it has been found that the cushion factor provided by cushion packs made according to this invention is higher than the sum of the cushion factors of empty punctured envelopes made from flexible polymeric substrates according to the methods described herein and the corrugated fibreboard lattice used in isolation. In other words, the two cushion effects are unexpectedly synergistic.

The release of dust or airborne fibre particles from the envelope of the cushion pack can be deleterious to certain classes of packaged goods, for example, electronic components or fresh produce for ingestion. This can be of particular concern where the corrugated fibreboard lattice has been made from post-consumer waste material, such as is collected in municipal waste recycling centres. In a preferred embodiment of the invention, the vents in the material of the envelope are puncture holes made by a sharp needle such that no material is removed from the flexible

polymeric material. In puncturing the flexible polymeric material in this way, it ensures, as far as is possible, that no dust or airborne fibres from the corrugated fibreboard lattice, created during the cutting of the lattice or otherwise, pass through the puncture holes in the envelope (along with the ambient air contained within the envelope, thereby contaminating the packaged goods), when the cushion pack is compressed by an external shock or impact to the transit package.

The penetration of the envelope by contaminants such as oil, grease, or hydrocarbon materials can be deleterious to eventual repulping or composting of the cushion pack. Accordingly, where the packaged goods are protected from corrosion or for other reasons by oil, grease or hydrocarbon materials, the vents are preferably provided in an area of the envelope that is not in direct contact with the packaged goods. As an example which is by no means limiting, for the above reasons, the vents may be located in the side walls of the flexible polymeric envelope. By the term side walls, we include gusseted envelope constructions.

The vents are made in the flexible polymeric substrate used to form the envelope either during the manufacture of the substrate, typically by extrusion casting, solution casting or extrusion into a bubble, or in the conversion process by which the flexible polymeric substrate is by some means formed into an envelope around the corrugated fibreboard lattice to produce a cushion pack. Many of the machines used for fabricating packages from polymeric substrates may be used to practise this invention including, but not limited to, vertical or horizontal form-fill-seal machines, flow wrappers or L-sealers. Thus, the cushion pack may be sealed by whatever means on two sides, three sides or four sides according to the complexity of the design of the cushion pack and the degree of automation available for its manufacture.

Cellulose based materials are generally the most economical cushioning materials. However, some paper based products, including shredded paper and corrugated fibreboard, promote tarnishing and are therefore not suitable for use in packaging bare metal parts. This is because all cellulose based materials are hygroscopic and the risk of tarnishing bare metal parts at high humidity is thereby increased. In addition, many cellulose based materials, particularly corrugated fibreboard, are abrasive and can scuff and hence damage polished surfaces. Thus, the use of a corrugated fibreboard lattice enclosed within a flexible polymeric envelope to form cushion packs according to this invention provides economic and environmental benefits as well as enhanced cushioning performance.

In an embodiment of the invention, the flexible polymeric envelope is biodegradable so that the entire cushion bag is compostable after use in compliance with the European Norm EN13432.

In a further embodiment of the invention, the flexible polymeric envelope is water-soluble (which term is taken to include water-dispersible) so that the entire cushion bag is repulpable after use, the dissolution temperature of the water-soluble film being selected according to whether the repulping process takes place in cold water or hot water. In this embodiment, the water-soluble polymeric envelopes will assist in the repulping process as water-soluble polymeric materials such as, by way of example only, polyvinyl alcohol or carboxy methyl cellulose, are added during the repulping process as binders in the manufacture of recycled board or paper products.

The flexible polymeric envelope may be manufactured from films that are able to absorb moisture vapour until such time as they are in equilibrium with the moisture in the atmosphere to which they are exposed. As an example which is by no means limiting, the flexible polymeric envelope may be made from a water-soluble film containing polyvinyl alcohol. Such a film will contain a percentage of water as part of the plasticiser system. Typically this percentage will vary between 3% and 12% depending upon the particular application to which the polymeric envelope is destined. In any hermetically sealed space such as that which exists within a sealed package, the moisture content of the film will be in equilibrium with the moisture contained within the enclosed atmosphere. Should the temperature surrounding the package fall, as might be expected during transport or unheated storage, the relative humidity of the enclosed atmosphere will rise, possibly as far as the dew point when condensation would occur. It will be easily appreciated that this would be an undesirable situation as the packaged items may well experience damage from the condensation. The water-soluble envelope, due to its relatively large surface area, will absorb moisture from the enclosed atmosphere in seeking to maintain an equilibrium and thereby limit the rise in relative humidity and the risk of the dew point being reached with subsequent damage to the packaged items. It will be apparent that the use of water-soluble materials to form the flexible polymeric envelope can avoid the use of moisture absorbing products such as silica gel.

A similar moisture equilibrium will also establish itself within the flexible polymeric envelope, thereby reducing the risk of any moisture present in the corrugated lattice from contaminating or damaging the packaged

items, or conversely, reducing the risk of the corrugated fibreboard lattice losing its structural properties due to ingress of moisture from the atmosphere surrounding the envelope.

The flexible polymeric envelope may also be manufactured from films that emit substances which affect, change or modify the atmosphere to which the envelope is exposed. The change in the atmosphere to which the envelope is exposed may be used to beneficial effect. As an example which is by no means limiting, the envelope may be made from a film containing a volatile corrosion inhibitor (VCI). The VCI is released from the envelope as a vapour into the atmosphere surrounding the envelope. Such a film is marketed under the trade mark Zerust®. Where the envelope is used to protect metallic items which are subject to tarnish, corrosion or rust in any hermetically sealed space such as that which exists within a sealed package, the release of VCI from the envelope will enable the packaged items to be both chemically and physically protected during storage or transit.

The invention will now be described in more detail by way of example only with reference to the accompanying drawing in which Figure 1 is a perspective view of a cushion pack embodying the invention.

The cushion pack 1 shown in the drawing comprises a flexible polymeric envelope 2 containing a corrugated fibreboard lattice 3. The cushion pack 1 as shown in Figure 1 is of generally rectangular shape but it will be understood that the pack may be of other shapes according to the packaging requirements of the goods to be protected.

The envelope 2 is made of a polymeric material that may be soluble in hot or cold water to assist eventual re-pulping of the cushion pack 1. A suitable water-soluble material is a mixture of thermoplastic starch and polyvinyl alcohol having a thickness in the range of 15-200 microns.

The corrugated fibreboard lattice 3 is produced from a sheet of corrugated fibreboard by cutting in the manner described above to produce a series of slits 4 extending in the machine direction and defining a plurality of interconnected strips extending in the machine direction (cutting or longitudinal direction).

The cut sheet is then crinkled to produce an undulating wave-form shape giving the corrugated fibreboard lattice 3 a desired thickness and increased resilience in absorbing shock or impact and subsequently returning at least in part to its original shape. In Figure 1, the cushion bag

has been sectioned in the machine direction along the line X-X to show the preferred disposition of the corrugated fibreboard lattice within the envelope.

The envelope 2 is provided with vent openings 5. The vents 5 are formed preferably without removing material from the envelope by means of puncturing or perforating the envelope material or by means of interrupted seals or by any other suitable means.

The vent openings may be located such that they are not in direct contact with the packaged goods, for example in a side wall 6. In this way, any airborne contaminants carried by air exhausted from within the envelope to assist in cushioning shock or impact is directed away from the packaged goods. Also the risk of contamination of the corrugated fibreboard lattice 3 by oil, grease, hydrocarbon solvents or the like from the packaged goods is reduced.

The number, size and shape of the vent openings 5 is chosen so that air is exhausted from the envelope in a controlled manner to provide an initial pneumatic cushioning effect and the fibreboard lattice 3 is configured to compress resiliently to provide an additional cushioning effect before returning fully or partially to its original configuration. In this way, the cushion pack can absorb or dampen more than one impact.

It will be understood that the invention is not limited to the embodiment above-described. Various changes falling within the scope of the following claims will be apparent to those skilled in the art and the invention is deemed to include all such changes as well as any features equivalent to and/or performing the same function as any feature recited in the claims.

Claims

1. A cushion pack comprising a corrugated fibreboard lattice within a flexible polymeric envelope which is vented to allow the air contained within the envelope to escape when the cushion pack is subjected to compression.

2. A cushion pack according to claim 1 in which all components are compostable.

3. A cushion pack according to claim 1 in which all components are repulpable in hot or cold water.

4. A cushion pack according to any preceding claim in which the flexible polymeric envelope is vented by such means that no material is removed from the envelope during the formation of the vents.

5. A cushion pack according to any preceding claim in which the vents are made by puncturing or slitting the polymeric envelope.

6 A cushion pack according to any preceding claim 1 wherein the vents are made by interrupted sealing.

7. A cushion pack according to any preceding claim wherein the vents are configured so that air contained within the envelope escapes in a controlled manner when the cushion pack is subjected to compression.

8. A cushion pack according to any preceding claim wherein the vents are configured to inhibit escape of particulate material from within the envelope.

9. A cushion pack according to any preceding claim in which an area of the polymeric envelope which, in use, is in direct contact with the packaged goods is free of vents.

10. A cushion pack according to any preceding claim wherein at least the surface of the polymeric envelope is static dissipative.

11. A cushion pack according to any preceding claim in which the polymeric envelope provides a barrier to the ingress of oils, greases and hydrocarbon solvents.

12. A cushion pack according to any preceding claim wherein the

polymeric envelope provides a contact surface that is non-abrasive to vulnerable packaged goods.

13. A cushion pack according to any preceding claim in which the material of the polymeric envelope absorbs moisture vapour from the atmosphere to which the envelope is exposed and/or from the materials within the envelope until an equilibrium is reached.

14. A cushion pack according to claim 13 in which the material of the polymeric envelope includes polyvinyl alcohol.

15. A cushion pack according to any preceding claim in which the material of the polymeric envelope emits substances which affect, change or modify the atmosphere to which the envelope is exposed.

16. A cushion pack according to claim 12 in which the material of the polymeric film emits a volatile corrosion inhibitor.

17. A cushion pack according to any preceding claim in which the corrugated fibreboard lattice is configured to deform resiliently when the cushion pack is subjected to compression.

18. A cushion pack according to claim 17 in which the corrugated fibreboard lattice is crinkled to impart resilience.

19. A cushion pack according to any preceding claim in which the lattice is made from corrugated fibreboard that is partially cut in a transverse direction prior to being converted into the lattice in order to improve its three dimensional flexibility around a packaged item.

20. A cushion pack according to any preceding claim in which the flexible polymeric envelope has elasticity.

21. A cushion pack according to any of claims 1 to 18 in which the flexible polymeric envelope is inelastic.

22. A cushion pack according to claim 1 wherein the polymeric envelope is woven from polymeric materials, thereby providing vents formed by the interstices within the weave.

23. A cushion pack comprising a corrugated fibreboard lattice within a flexible polymeric envelope which is vented to provide pneumatic cushioning by escape of gas within the envelope and/or physical

cushioning by deformation of the fibreboard lattice when the cushion pack is subjected to compression.

24. A cushion pack according to claim 23 wherein the fibreboard lattice is deformable resiliently so that the cushion pack can at least partially return to its original shape when the compression force is removed.

25. A cushion pack according to claim 23 or claim 24 wherein the polymeric envelope is provided with one or more vents configured to allow gas within the envelope to escape in a controlled manner.

26. A cushion pack according to claim 25 wherein the polymeric envelope has elasticity.

27. A method of making a cushion pack comprising the steps of providing a corrugated fibreboard lattice, and enclosing the corrugated fibreboard lattice within a flexible polymeric envelope which is vented to allow air contained within the envelope to escape when the cushion pack is subjected to compression.

28 A method according to claim 27 wherein the corrugated fibreboard lattice is made of re-cycled corrugated fibreboard.

29. A method according to claim 27 or claim 28 wherein the fibreboard lattice is resiliently deformable to allow the cushion pack to return at least partially to its original shape when the compression is removed.

30. A method according to claim 29 wherein the fibreboard lattice is configured to impart resilience to the lattice.

31. A method according to any of claims 27 to 30 wherein the polymeric envelope is vented to allow air to pass into and out of the envelope.

32. A method according to any of claims 27 to 31 wherein the polymeric envelope is vented to inhibit passage of contaminants into or out of the envelope.

33. A method according to claim 31 or 32 wherein the polymeric envelope is vented by puncturing or slitting.

34. A method according to claim 31 or 32 wherein the polymeric envelope is vented by partial sealing of the envelope.

35. A method according to claim 31 or 32 wherein the polymeric envelope is vented by a woven construction providing interstices.

36. A method according to any of claims 27 to 35 wherein the polymeric envelope is vented to direct air exhausted from within the envelope away from packaged goods protected by the pack.

37. Use of the cushion pack according to any one of claims 1 to 26 to protect packaged goods.

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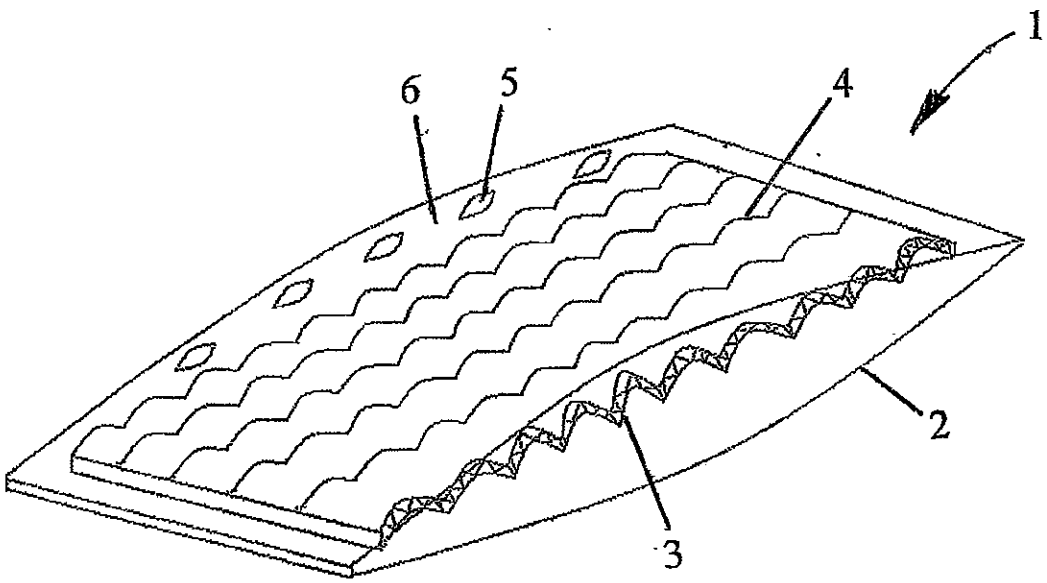

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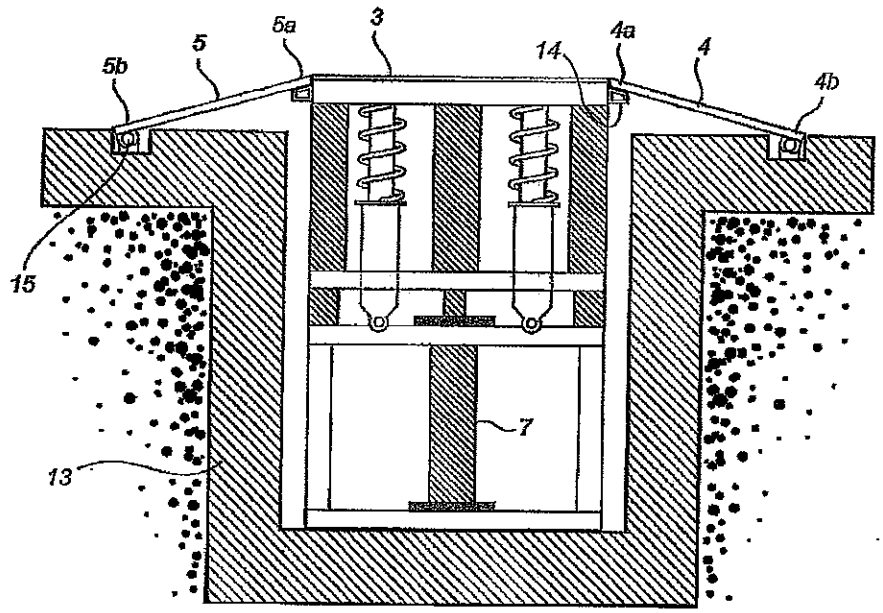
Declaration under Rule 4.17:
— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

[Continued on next page]

(54) Title: TRAFFIC CALMING SYSTEM



(57) Abstract: The present invention relates to a controllable traffic calming device (20) which in its normal position remains in the raised position. The traffic calming device can be lowered when certain authorised vehicles approach the traffic calming device. The traffic calming device is also provided with a safety cover and seal (6) to prevent squeezing of objects, animals and individuals when the traffic calming device is being activated.

WO 2007/046753 A1

TRAFFIC CALMING SYSTEM

Field of the Invention

The present invention relates to a controllable traffic calming device consisting of an upper part, two ramp parts and seals located between the upper part and the ramp parts, the traffic calming device in the lowered position being substantially flush with the surrounding road surface, and in the raised position the upper part being located at a raised level and substantially parallel to the road surface, the ramp parts being positioned at an angle to the upper part and the lower parts of the ramp parts being pivotally arranged flush with the road surface.

Background Art

Traffic calming devices in the form of bumps are used at a large number of places in the road network to reduce the speed along stretches of road where the ambition is that vehicles should travel at a particularly low speed, for example in the vicinity of schools, daycare centres etc. The idea of a speed bump is that road users should be alerted to the demand for lower speed and then reduce the speed of the vehicle to such an extent that the effect of the speed bump will not be greater than necessary. Studies performed indicate that physical traffic calming devices are the only active measures to ensure lower speeds. Thus they serve an important purpose in terms of reaching the goals set up by the European Union within the scope of the common traffic policy. At the same time there are a number of negative secondary effects of the existing speed bumps.

An ordinary stationary traffic calming device usually consists of a raised area in the transverse direction of the road. The raised area may have an arched upper surface or a three-piece surface consisting of an

upward ramp, a plane surface and a downward ramp. A stationary traffic calming device is in most cases made of asphalt or stone. Such stationary traffic calming devices result in a reduction of the speed in the areas around the traffic calming devices, but also create great problems for buses in regular services and emergency vehicles. A bus must keep a very low speed when passing a traffic calming device so as not to cause damage to the bus, but above all repetitive strain injury to the bus driver who on countless occasions every day must pass stationary traffic calming devices. A bus driver is exposed to significantly greater physical stress than a car driver when passing traffic calming devices. The traffic calming devices also generate increased emissions since bus drivers under stress, who have a tight timetable, are forced to make vigorous accelerations after the traffic calming devices. The main drawback of the stationary traffic calming devices is, however, their effect on emergency vehicles. Paramedics cannot, for example, start the treatment in the ambulance before it is obvious that there are no traffic calming devices between the position of the ambulance and the hospital, or in any case that there are no such devices within a certain distance. The vibrations and jerks caused by the speed bumps can, in fact, cause severe injuries to patients suffering from, for instance, spinal fractures and can also damage the equipment of the emergency vehicles. As a result, patients who could be given adequate treatment in the ambulance frequently do not receive the required treatment until the ambulance has arrived at the hospital.

To solve the problems with the stationary traffic calming devices, there are a large number of different solutions involving flexible traffic calming devices which in their normal position are located flush with the road surface. As a rule, these solutions are based on sensors which sense a vehicle driving beyond the stipulated speed limits, in which case the traffic calming

device is raised from its normal position and thus constitutes an obstacle to the vehicle. In the prior art solutions, the sensors consist of radar, IR, pressure sensors or switches. A drawback of these solutions is that the sensors must detect the speed of the vehicle at a distance from the traffic calming device which is sufficient for the device to be raised from the ground to its obstructing position. This may imply that also a vehicle that has not been speeding will be punished by the traffic calming device being raised when a vehicle in front is positioned on or just in front of the device. Nor do these solutions solve the problem with emergency vehicles that must be allowed to pass the traffic calming devices without the paramedics having to interrupt the treatment of a patient or the like.

Practically all existing flexible traffic calming devices have a punishing effect. By punishing is here meant that the traffic calming devices are raised because a vehicle exceeds the speed limit that is valid in the area.

GB-A-2 079 356 discloses a simple design of a variable traffic calming device in which a horizontally positioned cylinder presses a vertical rod upwards when raising the traffic calming device. The traffic calming device has a timer function which controls the points of time at which the device is to be raised and when it is to be flush with the road surface. The two parts which are raised by the cylinder are the actual traffic calming member and a flap between which there is no seal. This means that, for example, melt water, gravel, salt and other dirt will be collected between these movable parts. There is also an obvious risk that an individual positioned on the traffic calming device is squeezed between the traffic calming member and the flap when the device is activated.

US-A-6 010 277 discloses a speed bump consisting of two articulated cover plates, one cover plate sliding

directly on the other cover plate which is controlled pneumatically or hydraulically. Also this solution may result in dirt etc getting between the movable parts. There is also a risk that individuals positioned on the speed bump are squeezed when the speed bump is activated.

WO-A2-2005/010845 discloses variants of punishing speed bumps and vehicle barriers. Sensors in front of the barriers can detect speed, type of vehicle and weight and, based on this detection, raise the barrier from a horizontal position. The barrier may consist of three parts, a central part which is always horizontal and two ramp parts which are arranged at an angle to the central part. Each part of the barrier is connected to a damper and a spring system, and between the different parts there are rubber seals to prevent dirt and water from getting between the parts. Since these speed bumps use a spring system and a damper for each part of the barrier, high initial costs for the equipment are incurred, and the operational reliability is reduced since there are several parts which affect the raising and lowering of the barrier and can break. There is also a risk that individuals are squeezed between the different parts when the barrier is activated.

Consequently there is a need for a traffic calming device which is easy to operate, increases the operational reliability of the traffic calming device in spite of considerable influence from dirt, water etc and which can be mounted in areas with a large number of pedestrians with no risk of their being squeezed when raising and lowering the device.

There is also a need for a traffic calming device that has a speed reducing effect on the traffic while at the same time it does not have an obstructive effect, for example, on emergency vehicles and specific heavy vehicles.

Summary of the Invention

The object of the present invention thus is to provide a device which solves the above problems. This object is achieved by a device which is characterised in claim 1. Advantageous embodiments are defined in the dependent claims.

Brief Description of the Drawings

The invention will in the following be described in a non-limiting way and for illustrative purposes with reference to the accompanying drawings in which

Fig. 1 is a cross-section of a traffic calming device according to the invention seen from the front,

Fig. 2 is a cross-sectional view of a traffic calming device in the raised position according to the invention seen from the side,

Fig. 3 is a detailed view of the transition between the upper part of the traffic calming device and a ramp part in the raised position,

Fig. 4 is a detailed view of the transition between the road surface and the lower part of the ramp part, and

Fig. 5 is a cross-sectional view of a traffic calming device in the raised position seen from the side according to a second embodiment of the invention.

Detailed Description of the Invention

Fig. 1 is a cross-sectional view of a traffic calming device 20 according to a first embodiment of the invention seen along the roadway. The traffic calming device consists of an upper frame part 1 and a lower frame part 2. The upper frame part has a coating on the upper part 3 of its upper side. The upper part 3 is the part that constitutes the roadway and is preferably parallel to the surrounding roadway both in the raised and in the lowered position. In this way, the traffic calming device can also serve as a pedestrian crossing.

On both sides of said upper part there are ramps 4 and 5. The ramps are in their lower parts 4b, 5b arranged or mounted in bearings in a concrete foundation 13 and are in their upper parts 4a, 5a, facing the upper part 3, connected to the upper part only by a seal 6 in order to eliminate the risk of a person being squeezed and dirt getting into the hinge. The concrete foundation 13 is recessed in the roadway and supports the frame parts 1 and 2 and protects the entire device from being affected by the surrounding ground. In the lowered position, the three parts - the upper part 3 and the ramps 4 and 5 - are parallel and flush with the roadway or road surface. The upper part 3 and the ramps 4 and 5 are preferably made of a substantially rigid material.

The two frame parts 1 and 2 are connected to a system consisting of a single-acting, or alternatively double-acting, actuator 7, sliding rods 8 and shock absorbers 9. The actuator 7 is used to move the upper frame part 1, and thus also the upper part 3, up and down in the vertical direction and preferably consists of a hydraulic piston, but may, for example, also be a pneumatic piston or bellows. As a result, the angular position of the ramp parts 4, 5 is simultaneously affected and the entire traffic calming device moves as one unit. The sliding rods serve to guide the upper frame part 1 so that it moves merely vertically. The shock absorbers 9 have a double-acting movement-equalising function in the vertical movement of the upper part 1. The hydraulic piston 7 is attached to the upper frame part 1 in a housing 10 which has an elongate clearance groove 17 located in the centre of the housing 10. The hydraulic piston 7 is operated by means of an ordinary hydraulic system consisting of a hydraulic piston and, (optionally), an associated hydraulic tank 11. A layer 12 is applied to the exterior parts 3-5 of the traffic calming device, preferably consisting of SafeGrip™, which is a mix of a

polyurethane mixture and a ceramic stone, which results in a wear-resistant and practically non-skid surface.

In its normal position, the traffic calming device will be in the raised position. When the system is deactivated, the upper frame part 1 will be pulled down to the lower frame 2 to provide a flat roadway. The deactivation of the system will be described in more detail below. This movement is performed by a piston 7 pulling down the upper frame part 1. To return to the raised position, the pressure in the piston 7 is released and the return to the raised position occurs in a controlled manner, on the one hand by the springs of the shock absorbers 9 pressing up the upper frame 1 while at the same time the substance (liquid, gas) in the shock absorbers 9 prevents an excessive movement. Preferably the traffic calming device is symmetrical, that is the ramps are the same size and have substantially the same inclination in the raised position. For various reasons, one of the ramps may, however, be smaller than the other, for example if the traffic calming device is located on a hill or the like.

When a heavy truck, bus or some other large vehicle passes without the system being deactivated, the dead weight of the vehicle will press down the upper frame part 1. This movement is controlled by the springs of the shock absorbers making resistance while at the same time the material of the springs ensures that the return to the raised position takes place in a controlled manner and at an appropriate speed. In this case, the piston has no effect whatsoever on the system. The piston 7 is attached to the upper frame 1 in such a manner that a movement of the upper frame 1 to the lowered position can occur without the piston being actuated. This function is accomplished by the piston being attached to the upper frame 1 in a vertical oblong hole 17 which gives the upper frame part liberty to move the intended distance also when the piston is in its raised position.

The deactivation of the system preferably occurs by GSM or some other RF-based technology. Transmitters are placed in the vehicles which are authorised to pass deactivated (lowered) traffic calming devices. When such a vehicle approaches a traffic calming device 20, the transmitter sends a signal which is received by a decision device which is placed in the traffic calming device and which actuates a controlling device which lowers the traffic calming device to make the roadway flat for passing. The decision device is a device that receives signals and can be in the form of, for instance, a detecting means for receiving electronic signals, acoustic signals, light signals or radiowaves etc. The decision device then evaluates the signal and instructs the controlling device to actuate the actuator 7 to lower the traffic calming device.

The traffic calming device can, for example, be adapted to be lowered when a vehicle provided with a SIM card that is authorised is located within a certain distance from the traffic calming device and, after that, be raised when said vehicle is located beyond said distance. A further alternative, or a supplement, is to deactivate the traffic calming device at appointed hours and then let different traffic calming devices be raised or lowered depending on the hour.

An alternative of deactivating the traffic calming devices is based on GPS technology or the like. This system can advantageously be used by the emergency service which thus can locate its emergency vehicles and lower all the traffic calming devices along the turnout road of the vehicles. The system can also be used, for example, by buses in regular services where the system continuously registers the location of the bus and lowers traffic calming devices along the route of the bus as the bus approaches an area with traffic calming devices.

A signalling device should be arranged in connection with the traffic calming device, said signalling device

being adapted to visually indicate when the traffic calming device is out of operation. This can take place, for example, using a light with a certain colour to inform a driver that the traffic calming device will not be lowered although the vehicle of the driver is authorised to pass the traffic calming device in its lowered position, and he can thus prepare himself for the traffic calming device in an appropriate manner.

An alternative solution in connection with the passing of heavy vehicles, such as heavy trucks and buses, that are not capable of deactivating (that is lowering) the traffic calming device is that the device is lowered when a vehicle with a certain weight approaches or passes. This is achieved by installing sensors, either in one of the ramps 4, 5 or just in front of the traffic calming device, which detect the weight of the vehicle and, if the weight exceeds a certain value, the traffic calming device is deactivated. The purpose of this function is, inter alia, to reduce wear on the traffic calming device and unnecessary strain on the driver. However, it is important for the traffic calming device not to be lowered too quickly so that the function is misused. The optimal situation is if the traffic calming device is flush with the road surface just as the front tyres of the truck reach the front ramp 4 of the traffic calming device and remains flush with the road surface until the truck has completely passed the traffic calming device. Deactivation should take place at such a speed that if the heavy vehicle keeps too high a speed, the vehicle should be affected, but if the speed is the maximum speed or slower, the traffic calming device should not affect the vehicle. Different types of sensors can be used to determine whether a vehicle has completely passed a traffic calming device or not.

Fig. 3 is a detailed view of a portion of the traffic calming device in its raised position. In the lowered position, the ramp part 4 is in direct contact

with the vertical part 6c of the seal 6. While raising the traffic calming device, its circumference becomes greater, in which case the ramp part 4 is removed from the vertical part 6c of the seal 6. The vertical part 6c is attached to the side of the upper part 3 by an adhesive or some fastening means, and the side 6a of the seal 6 which abuts against the upper side of the upper part 3 is also attached to the upper part 3 by an adhesive or some fastening means. This part of the seal is also pressed against the upper part 3 by the coating 12 thereof. The seal 6 is preferably made of rubber or some other similar flexible material which follows the inclination of the ramp part 4. It is advantageous if the ramp part 4 in its upper part 4a is freely movable in the space formed between the seal 6 and the support 14 on which the ramp part 4 mainly rests with the traffic calming device in its raised position. The upper side of the support 14 preferably has an inclination which corresponds to the inclination of the ramp part 4 with the traffic calming device in its raised position. The sealing part 6b that overlaps the ramp part 4 is not attached to the same but only abuts against the upper part 4a of the ramp part and flexibly follows the movement of the ramp part. The sealing part 6b that overlaps the ramp part 4 could enclose the upper part 4a of the ramp part also on the underside, that is a sealing part corresponding to the sealing part 6b could be attached to the lower part of the vertical part 6c of the seal 6 and from there extend along the upper side of the support 14. The coating 12 on the ramp parts 4 and 5 extends preferably from the lower seal 16 all the way to, or just in front of, the upper seal 6 with the traffic calming device in the lowered position, which means that in this embodiment there will be a gap between the coating 12 of the ramp parts 4, 5 and the seal 6 with the traffic calming device in the raised position.

The sealing part 6b abutting against, and overlapping, the upper part 4a, 5a of a ramp part 4,5 may also consist of an expandable elastic material and be attached to the upper part 4a, 5a of the corresponding ramp part 4, 5. This means that the sealing part 6b is stretched when the traffic calming device is being raised and when it is in its raised position, and that the sealing part 6b is compressed or is in its normal position when the traffic calming device is in its lowered position. In this embodiment, the coating 12 on the ramp parts 4 and 5 can extend all the way from the lower seal 16 to the upper seal 6.

Fig. 4 is a detailed view of the transition between the road surface and the lower part 5b of a ramp part 5. The ramp part 5 is in its lower part 5b pivotally mounted on a ramp bearing 15. A lower seal 16 ensures that no matter reaches the movable parts.

The advantages of arranging the upper parts 4a, 5a of the ramp parts 4, 5 to be freely movable are many. If the upper part 3 is used as a pedestrian crossing, the particles that are supplied by pedestrians etc to the traffic calming device will practically exclusively land on the upper part since people will walk on the horizontal part of the traffic calming device, and therefore there is no risk of the particles reaching the movable parts since the upper part moves merely vertically and the seal 6 prevents any matter from entering via the upper part 3. In particular, the seal 6 also implies that the risk of pedestrians, animals or devices getting stuck between the ramp parts and the upper part is minimised. Particles, gravel and the like emitted by the vehicles and also rain water, salt etc and other dirt landing on the ramp parts 4, 5 will, owing to the inclination of the latter, run off from the traffic calming device and, thus, further prevent any matter from penetrating the seals 6. When the traffic calming device is lowered and the ramp parts 4,5 are again pressed against the vertical

sealing part 6c, they will not entrain any large amounts of dirt etc, but the dirt will be stopped by the part 6b of the seals that overlaps the ramp parts 4, 5 and run off due to the inclination of the ramp parts. The traffic calming device according to the figures has ramps only on its front and rear side seen in the travelling direction, but it may also have ramps on all sides in order to minimise the risk of pedestrians etc. being squeezed.

An alternative embodiment of the invention is illustrated in Fig. 5. This embodiment substantially corresponds, except in the parts that will be indicated below, to the above described embodiment, for example regarding the nature of the system, coating, seals, technique for deactivating the traffic calming device, managing passing heavy vehicles etc. In this embodiment, the movement is also controlled by an actuator 7, which in this embodiment is pneumatic. A number of pneumatic pistons or bellows are mounted between the stationary lower frame 2 and the movable upper frame 1. These pistons or bellows can be filled with air to perform an upward movement, in which the movable frame 1, the upper part 3 which is mounted on the movable frame 1, and the two ramp parts 4, 5, the upper parts of which are articulated to the upper part 3, constitute the function of a normal traffic calming device. Like in the previous embodiment, this is the normal position of the system. The ramp parts 4, 5 are in this embodiment pivotally arranged in their lower parts 4b, 5b. When evacuating the actuators 7, that is the pneumatic pistons or bellows, all parts 3, 4, 5 are lowered and then constitute a flat road surface.

In this embodiment, a stationary lower frame 2 is provided, which is wholly or partially positioned inside the movable outer frame 1. Between the frames there is a bearing in the form of a number of rolls or wheels 22, of, for example, steel, rubber or plastic. These wheels or rolls 22 are mounted in bearings in the stationary inner frame 2.

The nature and function of the invention will be evident from that stated above and illustrated in the drawings, and of course the invention is not limited to that described above and shown in the accompanying drawings. Modifications are conceivable, especially regarding the nature of the various parts, or by using an equivalent technology, without departing from the scope of protection of the invention as defined in the claims.

CLAIMS

1. A controllable traffic calming device (20) consisting of an upper part (3), at least two ramp parts (4, 5) and seals (6) located between the upper part (3) and the ramp parts (4, 5), the traffic calming device in the lowered position being substantially flush with the surrounding road surface, and in the raised position the upper part (3) being located at a raised level and substantially parallel to the road surface, the ramp parts (4, 5) being positioned at an angle to the upper part (3) and the lower parts (4b, 5b) of the ramp parts (4, 5) being pivotally arranged flush with the road surface, c h a r a c t e r i s e d in that the upper parts (4a, 5a) of said ramp parts (4, 5) are movably arranged between adjacent seals (6) and support parts (14),
that said seals (6) overlap the upper parts (4a, 5a) of said adjacent ramp parts (4, 5) and the ends of the adjacent upper part (3),
that an actuator (7) is arranged to vertically move the upper part (3) and thus simultaneously affect the angular position of the ramp parts (4, 5),
that the traffic calming device comprises a controlling device adapted to control the actuator (7), and that the traffic calming device comprises a decision device which is adapted to instruct the controlling device to lower the traffic calming device when a number of criteria are satisfied.

2. A controllable traffic calming device (20) as claimed in claim 1, wherein the lower parts (4b, 5b) of the ramp parts (4, 5) are pivotally mounted (15) flush with the road surface.

3. A controllable traffic calming device (20) as claimed in claim 1 or 2, c h a r a c t e r i s e d in that the traffic calming device consists of a lower frame part

(1) and an upper frame part (2), the upper frame part (2) being arranged to be actuated in the vertical direction by an actuator (7).

4. A controllable traffic calming device (20) as claimed in claim 3, c h a r a c t e r i s e d in that a vertical oblong hole (17) is formed in the upper frame (1), the traffic calming device being capable of moving from a raised position to a lowered position without being actuated by the actuator (7).

5. A controllable traffic calming device (20) as claimed in any one of the preceding claims, c h a r a c t e r i s e d in that the upper side of the ramp parts (4, 5) and the upper part (3) of the traffic calming device are coated with a mix of a polyurethane mixture and a ceramic stone.

6. A controllable traffic calming device (20) as claimed in any one of the preceding claims, c h a r a c t e r i s e d in that a seal (6) consists of a substantially vertical part (6c) which is attached to one vertical end of the upper part (3), a substantially horizontal part (6a) which overlaps part of the upper side of the upper part (3) at said end, and a part (6b) which abuts against and overlaps the upper part (4a, 5a) of a ramp part (4, 5).

7. A controllable traffic calming device (20) as claimed in claim 6, c h a r a c t e r i s e d in that the sealing part (6b) which abuts against and overlaps the upper part (4a, 5a) of a ramp part (4, 5) consists of an elastic material and is attached to the upper part (4a, 5a) of the corresponding ramp part (4, 5).

8. A controllable traffic calming device (20) as claimed in any one of the preceding claims, c h a r a c -

t e r i s e d in that the upper surface of said support (14) has an inclination which substantially corresponds to the inclination of the ramp parts (4, 5) when the traffic calming device is raised.

9. A controllable traffic calming device (20) as claimed in claim 3, c h a r a c t e r i s e d in that the actuator (7) is of the double-acting type and is in the form of a hydraulic of pneumatic piston.

10. A controllable traffic calming device (20) as claimed in claim 1 or 2, c h a r a c t e r i s e d in that the criteria for lowering the traffic calming device are satisfied if the decision device detects signals which indicate that an authorised vehicle is located within a certain distance from the traffic calming device.

11. A controllable traffic calming device (20) as claimed in any one of the preceding claims, c h a r a c - t e r i s e d in that said decision device is adapted to detect RF signals transmitted from emergency vehicles, buses or other authorised vehicles which are located within a certain distance from the traffic calming device, and actuate the controlling device to lower the traffic calming device and then raise the traffic calming device when said vehicles have passed the traffic calming device.

12. A controllable traffic calming device (20) as claimed in any one of the preceding claims, c h a r a c - t e r i s e d in that said decision device is adapted to detect when a vehicle equipped with an authorised SIM card is located within a certain distance from the traffic calming device, and instruct the controlling device to lower the traffic calming device and then raise the traffic calming device when said vehicle has passed the traffic calming device.

13. A controllable traffic calming device (20) as claimed in any one of the preceding claims, c h a r a c t e r i s e d in that said decision device is adapted to be informed by GPS when certain authorised vehicles are located within a certain distance from the traffic calming device and instruct the controlling device to lower the traffic calming device and then raise the traffic calming device when said vehicles have passed the traffic calming device.

14. A controllable traffic calming device (20) as claimed in any one of the preceding claims, c h a r a c t e r i s e d in that said decision device is adapted to be connected to image and/or sound recording means to detect when certain authorised vehicles are located within a certain distance from the traffic calming device and instruct the controlling device to lower the traffic calming device and then raise the traffic calming device when said vehicles have passed the traffic calming device.

15. A controllable traffic calming device (20) as claimed in any one of the preceding claims, c h a r a c t e r i s e d in that the traffic calming device is provided with a timer function, the traffic calming device being adapted to be lowered or raised at certain points of time.

16. A controllable traffic calming device (20) as claimed in any one of the preceding claims, c h a r a c t e r i s e d in that sensors which detect the weight of a passing vehicle are arranged at a certain distance from the traffic calming device, the traffic calming device being adapted to be lowered and remain in the lowered state while the vehicle passes, if the weight exceeds a certain value.

17. A controllable traffic calming device (20) as claimed in any one of the preceding claims, c h a r a c t e r i s e d in that a signalling device is arranged in connection with the traffic calming device and adapted to visually indicate when the traffic calming device is out of operation.

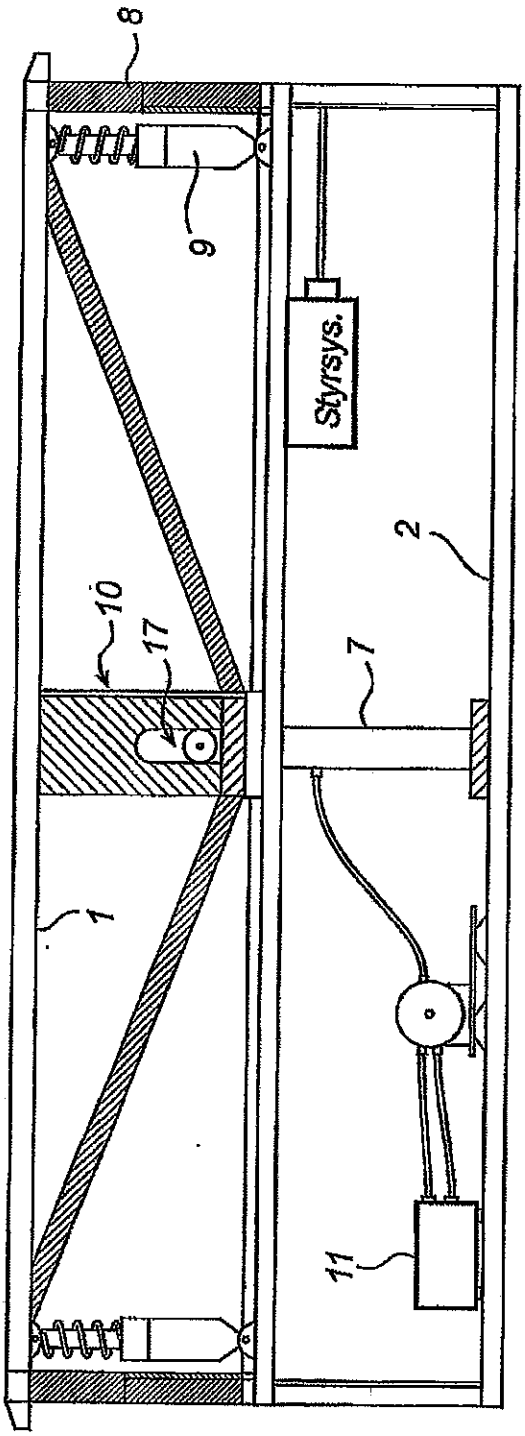


Fig. 1

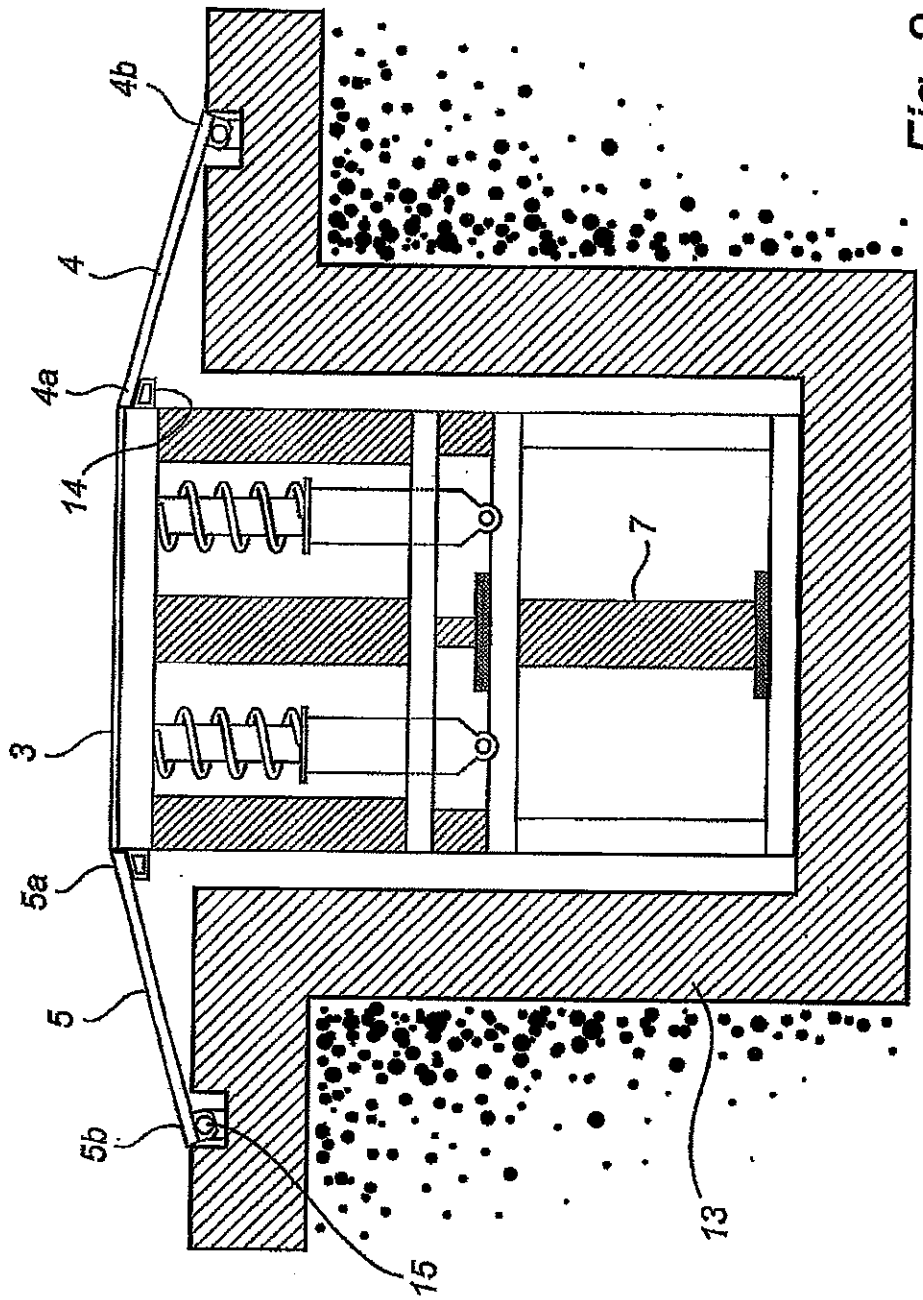


Fig. 2

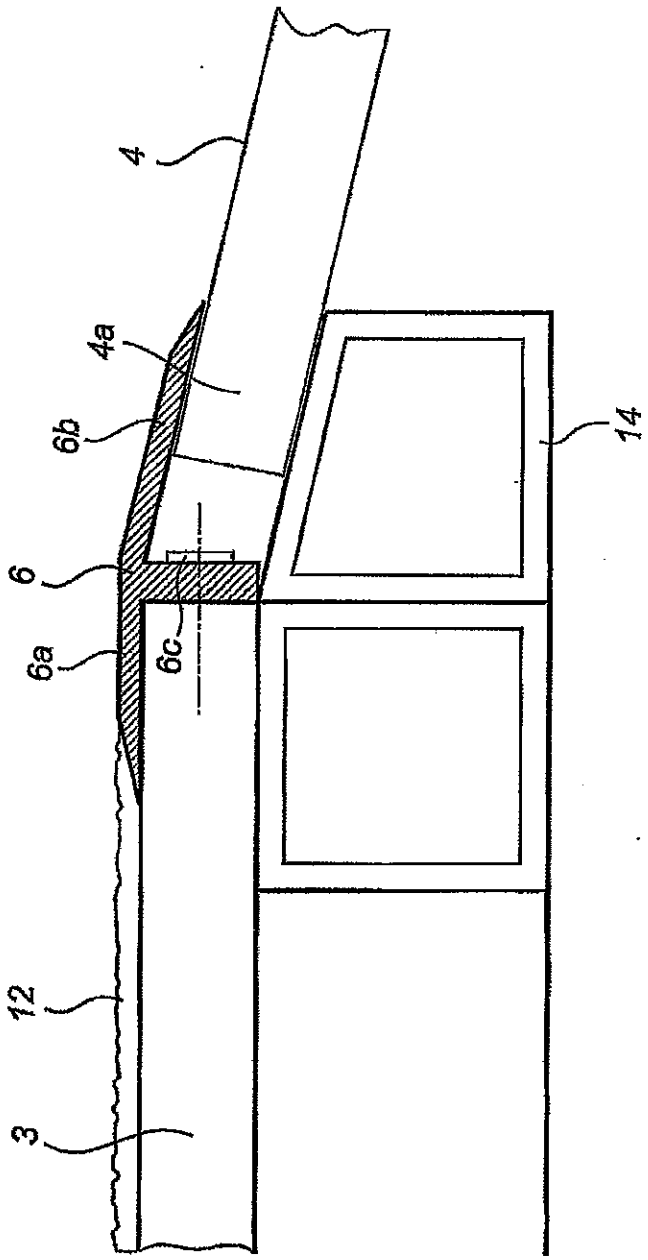


Fig. 3

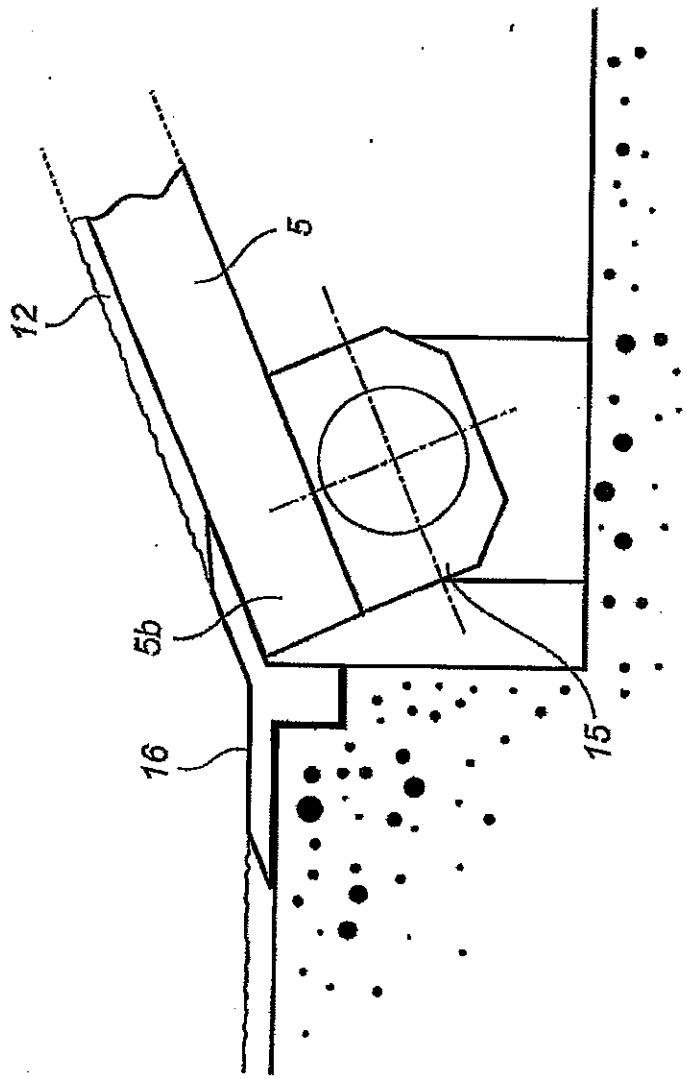


Fig. 4

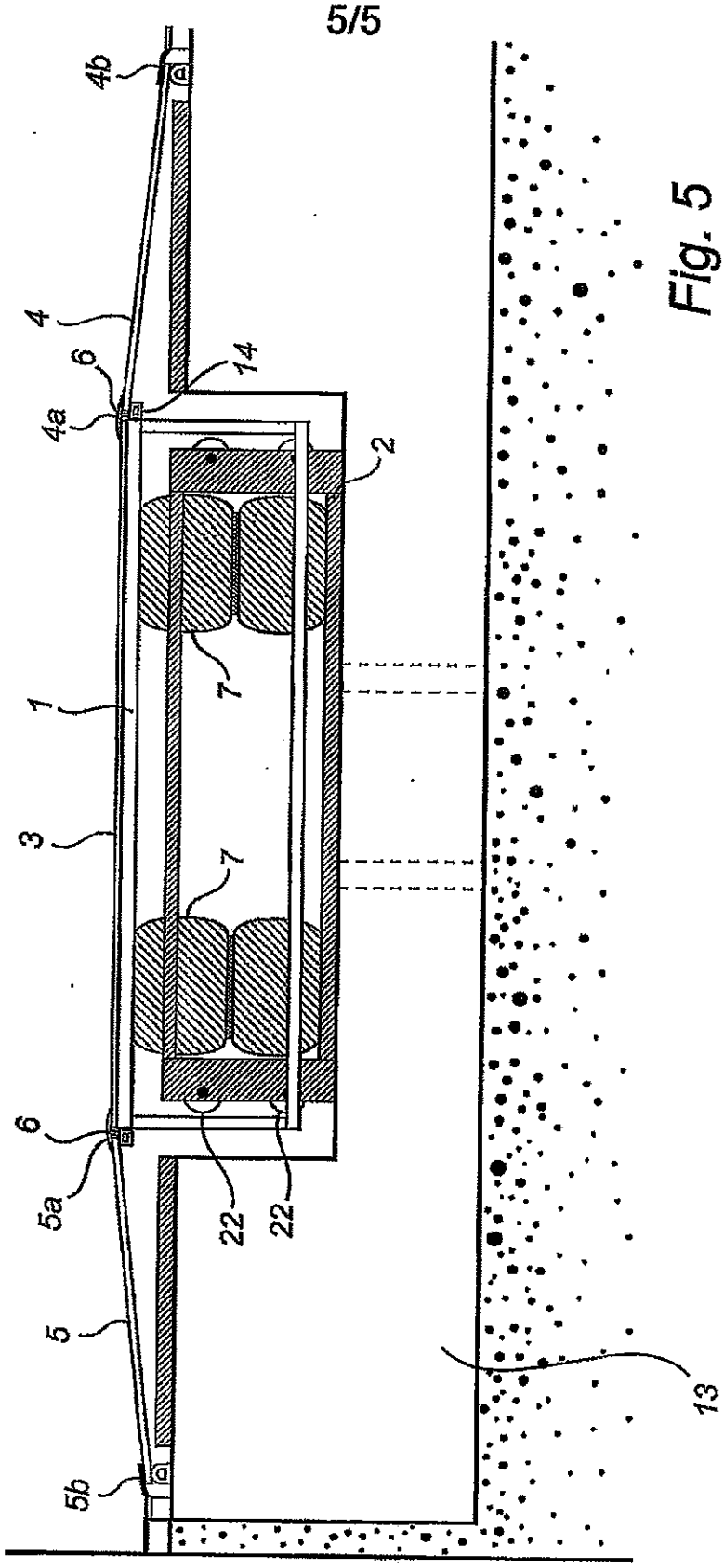


Fig. 5