



(11) **EP 1 709 250 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
02.06.2010 Bulletin 2010/22

(21) Application number: **04808850.4**

(22) Date of filing: **19.11.2004**

(51) Int Cl.:
E01F 9/011 ^(2006.01) **E04H 12/22** ^(2006.01)

(86) International application number:
PCT/NO2004/000356

(87) International publication number:
WO 2005/064084 (14.07.2005 Gazette 2005/28)

(54) **ROAD POLE**

STRASSENPFOSTEN

POTEAU ROUTIER

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LU MC NL PL PT RO SE SI SK TR**

(30) Priority: **29.12.2003 NO 20035826**
29.10.2004 NO 20044680

(43) Date of publication of application:
11.10.2006 Bulletin 2006/41

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Description

[0001] The invention relates to a road pole as stated in the introductory part of claim 1, particularly to be used as a light pole on roads and similar traffic routes, implying a risk of collision with cars and similar vehicles.

Background

[0002] There is a need for designing road poles, particularly light poles and similar poles for traffic routes, to provide retardation of the vehicle during a collision, with as little vehicle body damage and injury to persons as possible. This has resulted in the development of "collision-friendly" road poles with particular deformation zones, which will decelerate the colliding vehicle most gently.

[0003] Known are steel plate road poles, which are folded into an octagonal conical tube, with iron rods welded along the interior of the fold lines. The manufacture of such road poles are time consuming and costly. The current cushioning requirements have not been satisfied either.

[0004] Truss beam poles, designed and dimensioned for providing cushioning during collision are also known. But such poles have been costly. Additionally, they have esthetic drawbacks.

[0005] From German Patent Publication 1 811 147 (Saalmann 1968) it is known to weaken the foot of a road pole with a series of slots distributed circumferentially at ground level. This will solve the problem of stiff poles causing damage, but it will be sheared off at the foot, and the vehicle will continue with almost unreduced velocity, due to the low energy absorption.

[0006] From UK-patent specification 2.268.744 (Dowling 1993) known is a road pole with extended narrow slots provided in the vertical direction, in a pattern changing between slots and solid wall both lengthwise, and from row to row circumferentially. It is proposed by Dowling to provide 16 rows of slots.

[0007] This way of designing road poles has a number of disadvantages. The punching of a multitude of slots requires an expensive tool, and is time consuming. Such road poles will therefore be expensive, and have not been used to any extent.

[0008] From EP patent application 1 964 (Svensson 1979) a further road pole with slots is known, in which a road pole of a thin steel tube has axial rows of slots. In its preferred embodiment, there are 12 rows of slots circumferentially. This will weaken the tube wall so that there will be a risk of buckling. The exterior is thus covered by a layer of a plastic material or it is galvanized, which will fill the slots completely or partly. Covering the road pole with plastic will increase the cost. Galvanization, which closes the slots will give unanticipated breaking and bending strength.

[0009] Thus, slots have long been used as a tool in the manufacture of poles for traffic routes. But no solution

with optimal strength and providing a decelerating effect on the vehicle, over a sufficient length of pole, to reduce the risk of injury to persons in a secondary collision, has emerged. Also, it has not been possible, with the prior art manufacturing methods, to manufacture a tube with slots with sufficient strength at acceptable cost. This pole design has thus not gained acceptance.

Object

[0010] The main object of the invention is thus to provide a design, and a method of production, for road poles with beneficial properties, regarding carrying capacity and buckling properties, and which decelerates the vehicle over a sufficient distance to manage the requirements for retardation and energy absorption.

[0011] It is a particular object to provide a road pole which can absorb most of the kinetic energy of a vehicle hitting the road pole with a high velocity, to make the road pole safer to traffic. The costs should be kept low to make the novel technology exploitable.

The Invention

[0012] The invention is stated in claim 1. This design provides a favourable balance between the bending strength and static strength properties on one side, and the dynamic properties during a collision on the other. The proposed structure of the road pole will withstand wind load, while the energy needed for flattening the tubular design during a collision by a vehicle is approximate to the kinetic energy of a common private car. Then optimal occurrence is present when the road pole is dimensioned to be completely deformed, i.e. flattened, by a private car hitting it at a high velocity, and thus decelerating the vehicle as much as possible. Road poles according to the invention have been approved at a test carried out according to EU-norms.

[0013] It is known to provide an interior wire to inhibit the road pole tearing away from the base, but this is unsuitable in manufacturing, and expensive. Claims 2 - 10 state particular advantageous embodiments.

Example

[0014] The drawing shows an embodiment, wherein Figure 1 shows a side view of the lower part of a road pole according to the invention, with an inspection aperture shown without a lid,

Figures 2 and 3 are showing an enlarged part of the road pole of Figure 1, seen in directions being perpendicular, Figure 4 shows an axial section of the lower part of the road pole of Figures 1 - 3.

Figure 5 shows a side view of a reinforcement band used for the road pole of Figures 1 - 4,

Figure 6 shows an enlarged lower part of the reinforcement band of Figure 5,

Figure 7 shows a plan view from above of a base disc

for the road pole of Figures 1 - 4,

Figure 8 shows a collision case, wherein a private car hits a road pole according to the invention, while Figure 9 shows a picture of a part of a road pole according to the invention, which has been hit by a vehicle.

[0015] Figures 1 - 3 show a road pole 11 that is manufactured in the shape of a conical tube 12 with a base flange 13 provided for mounting on a base 14 (Figure 8). Through the base 14, electrical conductors and signal lines can enter the interior of the pole. For connection and maintenance, the road pole has an aperture 15 which can be covered by a lid (not shown).

[0016] Four axial rows of slots 16 -19 are arranged circumferentially, 90° apart (Figure 7). This selection of slots has proven to provide a favourable balance between the number of slots and the material of the wall, which provides particularly favourable dampening during collision, while the pole has high strength in its initial, static condition, partly due to the reinforcement band or bands. The number of rows of slots can be reduced to three or increased to six, but then less favourable ranges are approached.

[0017] It is known to provide slots in road poles by punching plates, which are then folded or pressed into tubular form, however, but this method is time consuming and thus expensive. It has proved advantageous to cut the slots with a plasma cutter. The current economic restriction of using a plasma cutter is connected to the wear at the start of each cut. The design of the slots, having a relatively low number of long slots 16 - 19, will reduce the nozzle costs to an acceptable level. Laser cutting may also be used.

[0018] In Figures 4 and 7, the arrangement of four reinforcement bands 20, 21, 22, 23, extending from the lower side of the base flange 13, and up to the top of the inspection aperture 15, are shown. Figures 5 and 6 show details of a reinforcement band 20, which at the lower end has a downwardly inclined leg 24, which is fastened under the base flange 13 by welding, and which is fastened at its upper end to the interior of the tube 12. A reinforcement band is arranged on each side of the aperture 15, and a further two are arranged inside of the aperture, being welded to the wall of the tube 12 through the aperture 15. The reinforcement band will thus, to a substantial degree, be integrated with the tube 12.

[0019] The reinforcement bands 20 - 23 are manufactured of strip steel, with a suitable surface treatment. An alternative to strip steel which may be used are materials with corresponding properties e.g. steel rod. It is important to the function, that the reinforcement bands 20 - 23 are integrated into the road pole structure by welding.

[0020] Figure 7 shows the base flange 13 as seen from above, showing the arrangement of the reinforcement bands 20-23.

[0021] The reinforcement bands 20 - 23 will thus inhibit the road pole tearing off during collision, and ensuring a successive flattening over a certain length of the road pole.

[0022] The number of reinforcement bands can differ from the example above. The length of the reinforcement bands can be accommodated to the area of use. For road poles for low velocity roads, an extension over a short distance from the base flange may be sufficient. The bands can be fastened by welding through holes in the wall of the road pole.

[0023] Figure 8 shows a collision as seen from the side, with a vehicle 25 bending and flattening a road pole 11, according to the invention. A flattening zone 26 is created at the front of the vehicle, where the developing zone ascends the road pole 11.

[0024] Figure 9 shows a picture illustrating an example of a deformation developed during a collision with a road pole, according to the invention, with a tube 12. The deformation is a flattening which absorbs kinetic energy, and decelerates the vehicle gently to avoid injury to persons. Due to the reinforcement bands 20-23, this can occur without risking the road pole tearing off, and the continued movement of the vehicle with high velocity.

[0025] The inventions provide a favourable combination of static strength which makes the road pole resistant to wind load and other non-traffic related loads. Simultaneously it provides the ability to yield without causing injury to persons, and also decelerates a colliding vehicle gently, to reduce the damage during collision with obstacles in the continued path of the vehicle. The road pole of the invention will thus take on the character of a shock absorber instead of being a damaging object. This will apply both to light and heavy private cars.

[0026] The base flange 13 is mounted slightly below ground level, so that a vehicle will always knock the road pole over. At the front end of the vehicle, the road pole is pressed to flatten the tubular structure. The upper parts of the road pole will simultaneously be bent in a U-shape around the front of the vehicle, where the flattening zone 26 is created at the transition between the flattened part, and the succeeding upper part of the road pole, which still has its full section. In the flattening zone, a decelerating energy absorption will occur on the forward movement of the vehicle 11. This energy absorption is a crucial part of the function of the road pole, according to the invention. The proposed slot design has proved to provide favourable energy absorption, combined with low cost and favourable static properties.

[0027] The slots can have a length of 250 - 350 mm, with 300 mm as an assumed optimal length. The width of the slots can be from 2 mm down to zero, with 1,5 mm as a value suitable for use, and for manufacturing with a plasma cutter. The distance between adjacent slots 16 - 19 can be 20 - 70 mm, e.g. 30 mm in the lower part, with an increasing distance ascending the road pole.

[0028] In one example, a 12 meter long road pole was provided with 300 mm long slots up to a level of 8 meters. Under the aperture 15 on a level of 0,8 meter, the distance was 30 mm, wherefrom to a level of 4 -5 meters, the distance was 40 mm, with a distance of 50 mm at the remainin row of slots.

Claims

1. Road pole (11), particularly for use as a light pole on roads and similar traffic routes, with a conical tube (12) which is narrowing continuously or stepwise, ascending from a base (14), particularly with a polygonal or circular cross section, wherein the wall of the tube has circumferential distributed rows of axial slots (16-19) and which at the lower end has an integrated base flange (13) for fastening to the base (14), **characterized in**

- **that** at least the lower part of the road pole has 3 to 6 rows of circumferentially distributed slots (16 - 19), and
- **that** at least one axial reinforcement band (20 - 23) being integrated on the inside of the road pole (11) in its lower part, said element is fastened at least at its lower end to the base flange (13) of the road pole, and at its upper end to the pole wall.

2. Road pole according to claim 1, **characterized in that** four steel reinforcements bands (20 - 23) are distributed circumferentially, extending along the walls of the conical tube (12).
3. Road pole according to claim 1 or 2, **characterized in that** four rows of slots (16-19) are arranged circumferentially.
4. Road pole according to anyone of claims 1-3, **characterized in that** the axial distance between adjoining slots is approximately 1/5 - approximately 1/15 of the length of the slots.
5. Road pole according to claim 4, **characterized in that** the distance between the slots (16 -19) axially is increasing continuously or stepwise from the base end.
6. Road pole according to anyone of the claims 1-5, **characterized in that** the slots have a length of 250 - 400 mm and a mutual distance of 25 - 70 mm, at a wall, thickness of approximately 3 mm.
7. Road pole according to claim 6, **characterized in that** the slots in the lower part have a length of approximately 300 mm and a mutual distance of approximately 30 mm.
8. Road pole according to anyone of the claims 1 -7, **characterized in that** the reinforcement band or bands (20 - 23) is/are fastened to the base flange (13) of the tube (12) at its/their lower end (24) and at its/their upper end at the level of an inspection aperture (15).

9. Road pole according to claim 8, **characterized in that** the reinforcement band or bands (20 - 23) is/are fastened to the base flange (13) by welding.

10. Road pole according to claim 9, **characterized in that** the reinforcement band or bands is/are at a strip steel with a J-shaped lower end (24).

Patentansprüche

1. Straßenpfosten (11), insbesondere zur Verwendung als Lichtpfosten an Straßen und ähnlichen Verkehrswegen, mit einem konischen Rohr (12), das von einer Basis (14) aufsteigend, kontinuierlich oder stufenweise enger wird, insbesondere mit einem polygonalen oder kreisförmigen Querschnitt, wobei die Wand des Rohres am Umfang verteilte Reihen axialer Schlitze (16 - 19) hat, und am unteren Ende einen einstückig ausgebildeten Basisflansch (13) zum Befestigen der Basis (14) aufweist, **kennzeichnet dadurch, dass** zumindest der untere Teil des Straßenpfosten 3 bis 6 Reihen umfangmäßig verteilter Schlitze (16 - 19) aufweist, und zumindest ein axial-verstärkendes Band (20 - 23) an der Innenseite des Straßenpfosten (11) in seinem unteren Teil integriert ist, wobei das Element an dem unteren Ende mit dem Basisflansch (13) des Straßenpfosten und an dem oberen Ende der Pfostenwand verbunden ist.
2. Straßenpfosten nach Anspruch 1, **dadurch gekennzeichnet, dass** vier Verstärkungsbänder aus Stahl (20 - 23) umfangmäßig verteilt sind und sich entlang der Wände des konischen Rohrs (12) erstrecken.
3. Straßenpfosten nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** vier Reihen von Schlitzen (16-19) umfangmäßig angeordnet sind.
4. Straßenpfosten nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** der axiale Abstand zwischen benachbarten Schlitzen in etwa 1/5 bis 1/15 der Länge der Schlitze ist.
5. Straßenpfosten nach Anspruch 4, **dadurch gekennzeichnet, dass** der Abstand zwischen den Schlitzen (16 - 19) axial kontinuierlich oder stufenweise von dem Basisende aus größer wird.
6. Straßenpfosten nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** die Schlitze eine Länge von 250 bis 400 mm und einem jeweiligen Abstand von 25 bis 70 mm bei einer

Wand mit einer Dicke von etwa 3 mm haben.

7. Straßenpfosten nach Anspruch 6, dadurch gekennzeichnet, dass

die Schlitzte in dem unterem Teil eine Länge von etwa 300 mm und einen jeweiligen Abstand von etwa 30 mm aufweisen.

8. Straßenpfosten nach einem der Ansprüche 1 bis 7, dadurch gekennzeichnet, dass

das/die verstärkende(n) Band oder Bänder (20 - 23) mit dem Basisflansch (13) des Rohres (12) an seinem unterem Ende (24) und an dem/den oberen Ende(n) auf der Höhe einer Inspektionsöffnung (15) befestigt ist/sind.

9. Straßenpfosten nach Anspruch 8, dadurch gekennzeichnet, dass

das/die verstärkende(n) Band oder Bänder (20 - 23) mit dem Basisflansch (13) durch Schweißen verbunden ist/sind.

10. Straßenpfosten nach Anspruch 9, dadurch gekennzeichnet, dass

das/die verstärkende(n) Band oder Bänder an einem Stahlstreifen mit einem Y-förmigen unterem Ende (24) ist/ sind.

Revendications

1. Poteau routier (11), en particulier pour une utilisation comme lampadaire sur des routes et voies de circulation similaires, avec un tube conique (12) qui se rétrécit en continu ou par paliers, vers le haut à partir d'une base (14), présentant en particulier une coupe polygonale ou circulaire, dans lequel la paroi du tube présente des rangées réparties circonférentiellement de fentes axiales (16 à 19) et qui, au niveau de l'extrémité inférieure, comporte un rebord de base intégré (13) pour une fixation à la base (14), caractérisé en ce que

- au moins la partie inférieure du poteau routier comporte 3 à 6 rangées de fentes réparties circonférentiellement (16 à 19), et
- au moins une bande de renfort axial (20 à 23) est intégrée sur l'intérieur du poteau routier (11) dans sa partie inférieure, ledit élément est fixé au moins au niveau de son extrémité inférieure au rebord de base (30) du poteau routier, et au moins au niveau de son extrémité supérieure à la paroi de poteau.

2. Poteau routier selon la revendication 1, caractérisé en ce que quatre bandes de renfort en acier (20 à 23) sont réparties circonférentiellement, s'étendant le long des parois du tube conique (12).

3. Poteau routier selon la revendication 1 ou 2, caractérisé en ce que quatre rangées de fente (16 à 19) sont agencées circonférentiellement.

4. Poteau routier selon l'une quelconque des revendications 1 à 3, caractérisé en ce que la distance axiale entre des fentes attenantes est d'approximativement 1/5 à approximativement 1/15 de la longueur des fentes.

5. Poteau routier selon la revendication 4, caractérisé en ce que la distance entre les fentes 16 à 19 augmente axialement en continu ou par palier à partir de l'extrémité de base.

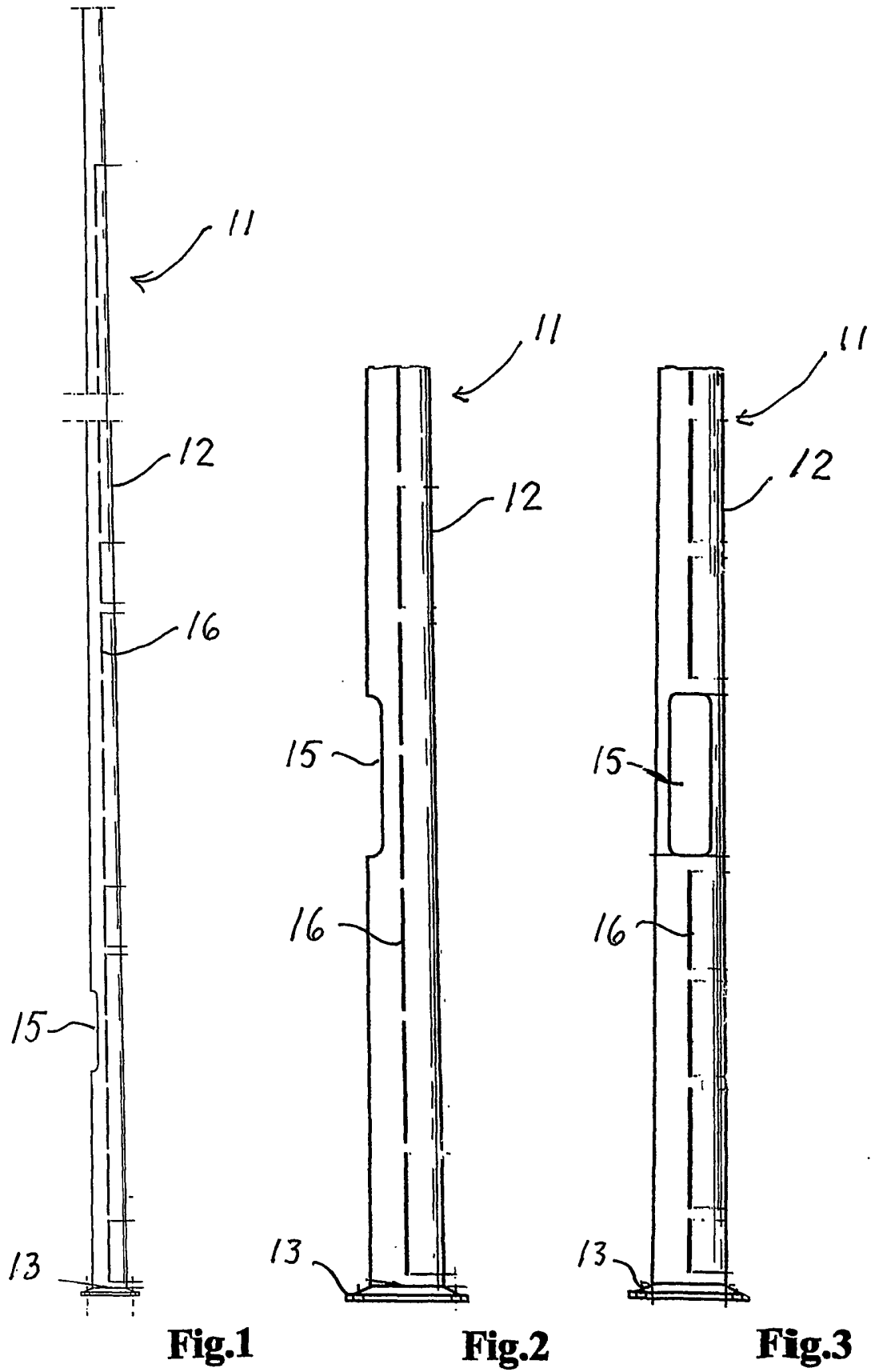
6. Poteau routier selon l'une quelconque des revendications 1 à 5, caractérisé en ce que les fentes ont une longueur de 250 à 400 mm et une distance mutuelle de 25 à 70 mm, à une épaisseur de paroi d'approximativement 3 mm.

7. Poteau routier selon la revendication 6, caractérisé en ce que les fentes dans la partie inférieure ont une longueur d'approximativement 300 mm et une distance mutuelle d'approximativement 30 mm.

8. Poteau routier selon l'une quelconque des revendications 1 à 7, caractérisé en ce que la bande ou les bandes de renfort (20 à 23) est/sont fixée(s) au rebord de base (13) du tube (12) à son/leur extrémité inférieure (24) et à son/leur extrémité supérieure au niveau d'une ouverture d'inspection (15).

9. Poteau routier selon la revendication 8, caractérisé en ce que la bande ou les bandes de renfort (20 à 23) est/sont fixée(s) au rebord de base (13) par soudage.

10. Poteau routier selon la revendication 9, caractérisé en ce que la bande ou les bandes de renfort est/sont au niveau d'un feuillard d'acier avec une extrémité inférieure en J (24).



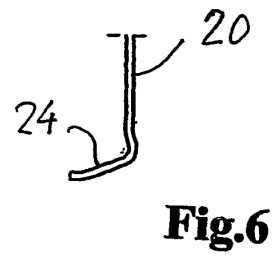
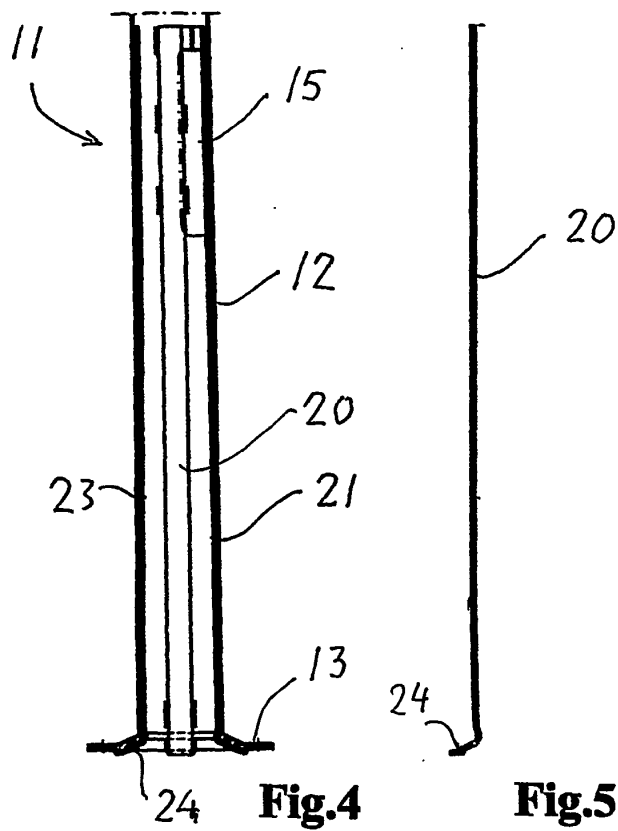


Fig.5

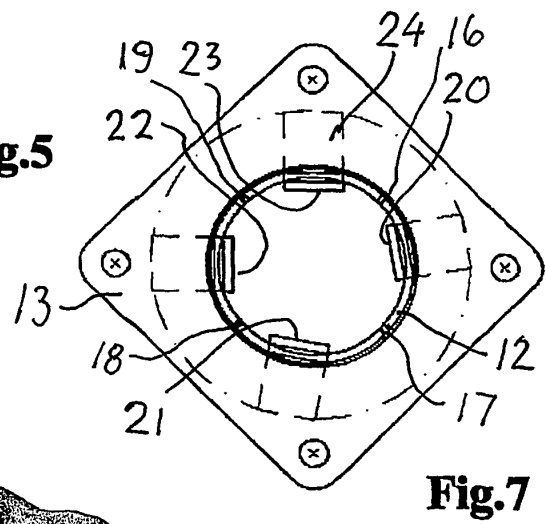


Fig.7

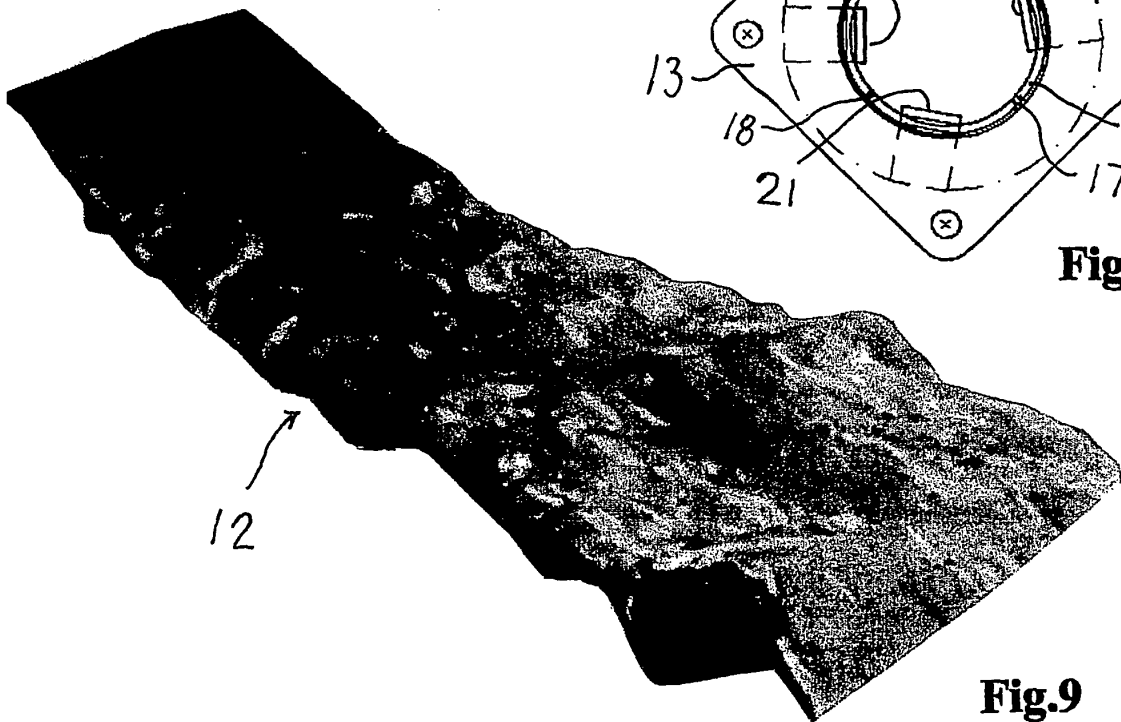


Fig.9

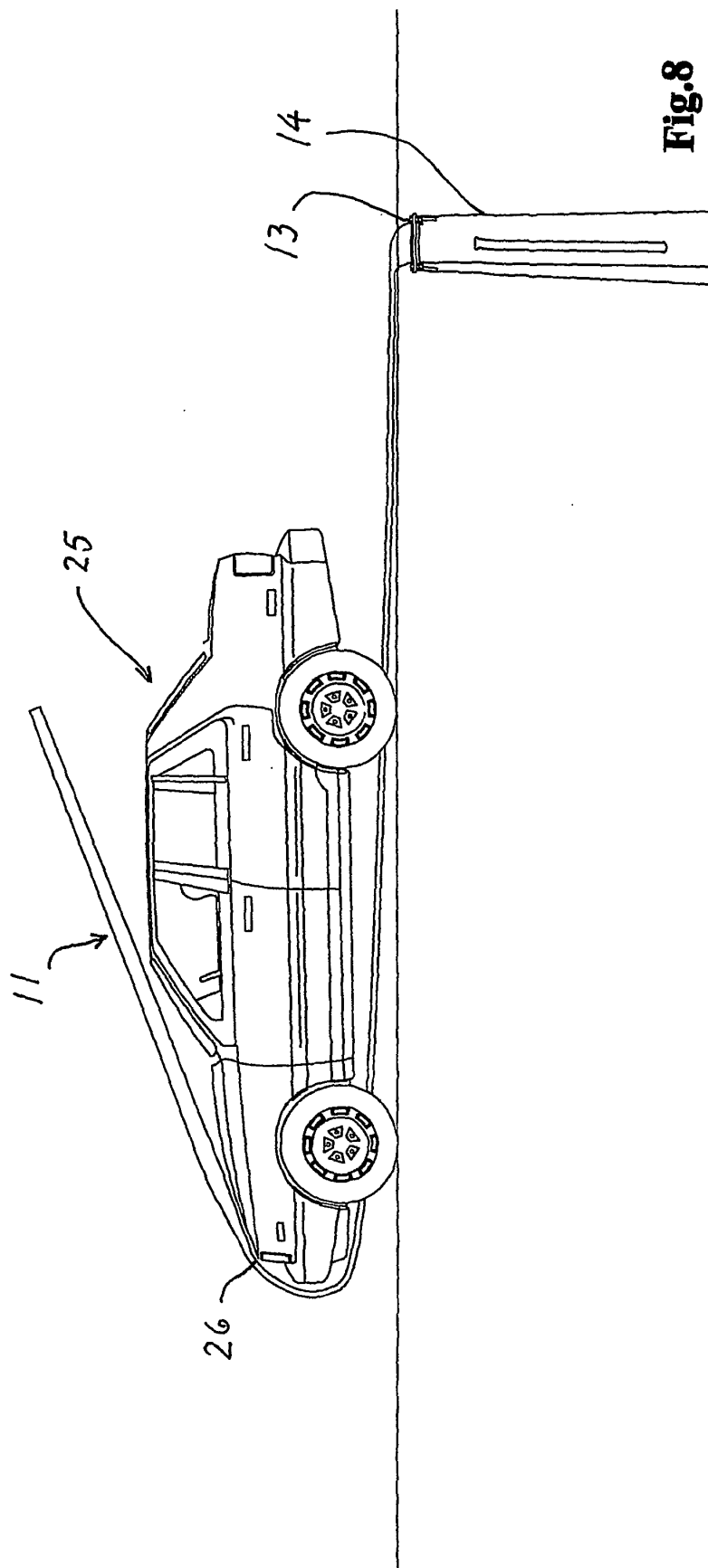


Fig. 8

REFERENCES CITED IN THE DESCRIPTION

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