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(54) **COLLISION-SAFE FRAME FOR LARGE TRAFFIC GANTRIES**

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Description

[0001] The present invention relates to a collision safe frame for large traffic gantries. The frame comprises a plurality of legs, each supported at their lower end by a foundation, while at their upper end, each leg supports one or more transverse transoms, girders or the like, intended to extend across a road, supporting traffic signs and/or traffic lights or the like.

[0002] From a safety point of view, traffic gantries of this type must be so as to cause as little injury and damage as possible to human bodies or to the vehicles in a crash.

[0003] Further, there is a need for robust structures which may be able to carry the loads and to resist the moments acting on the structure at any time, without causing the gantry to collapse when exposed to such forces. As an example it should be appreciated that the traffic signs and the traffic auxiliaries supported by the gantry may be very heavy. Further, said signs and/or auxiliaries may be eccentrically positioned and the maximum wind forces acting on the gantry may be formidable.

[0004] It has previously been proposed to employ gantries formed of masts and transoms formed by trusses. These elements are made rigid in order to resist the environmental loads and forces acting at any time on the gantry. It is a requirement for such gantries that they shall not collapse when subjected to a collision with a vehicle and further that the transom shall not fall down onto the vehicles beneath the gantry. Such known traffic gantries are formed of single vertical masts, or inclined, but rigidly fixed masts, arranged on each side of the road and with intermediate masts in case of separated, several traffic lane motorways.

[0005] Document EP 0 179 739 A2 discloses a collision safe traffic gantry, comprising a transverse transom (49), intended to support traffic signs or traffic lights or the like, said transom (49) being supported by a plurality of frames (11, 12), wherein each frame (11, 12) comprises a pair of legs (15, 16) and leg (39), which legs at their upper end support said transom (49), the legs (15, 16, 39) being configured with releasable joint elements (18, 42) arranged at the lower end of the legs, wherein said legs are pivotably configured on the transverse transom (49) by means of a hinged joint element (55), said legs at their lower end being supported on said releasable joint elements (18, 42), and allowed to pivot in a vertical plane around the hinged joint element (55).

[0006] An object of the present invention is to provide a traffic gantry which is collision safe and collision friendly when hit by vehicles, the gantry being of a yielding type, yielding at predetermined sections, thereby minimizing injury to people or damage to the H vehicle.

[0007] An other object of the invention is to provide a collision safe traffic gantry of a type wherein the transom or transverse girder does not fall down, even if one or two of the supporting masts or legs are completely destroyed in a collision with a vehicle.

[0008] A further object of the invention is to provide a collision safe traffic gantry which may resist impact from a vehicle hitting a supporting leg or mast from either sides with respect to the possible driving directions of the traffic lane, without causing severe damage to the transom or girder, or without causing the transom or girder to fall down, completely or partially.

[0009] A still further object of the invention is to provide a traffic gantry which may easily be assembled in a simple way, and which may quickly be erected across the road or motorway without causing any long stoppage in the traffic.

[0010] The objects are achieved by a collision safe gantry and a method as further defined in the independent claims.

[0011] According to the present invention the transom is supported by pairs of legs or masts, each pair forming a frame. Frames may be placed on both sides of a multi traffic lane motorway and between the traffic lane(s).

[0012] Each mast or leg is designed to resist the following collision conditions:

1. Straight in front or at an angle on the front leg,
2. Straight in front or at an angle on the rear leg
3. Straight from behind or at an angle on the front leg
4. Straight from behind or at an angle on the rear leg.

[0013] There exists a specific solution for each of the collision conditions 1-4. All solutions depend on a relatively high speed in order to function according to the intension.

[0014] A substantial difference between the solution according to the present invention and the solutions according to the prior art, having vertical or inclined, but rigidly fixed legs, is that the frame according to the invention only is required to withstand tension and compression, and a minimum of moments, while the conventional vertical or inclined, rigidly fixed frame legs in addition also have to withstand substantial bending moments. According to the invention this difference makes it possible to introduce "lever arms" at the breaking joint, improving breaking of the bolts in a predetermined correct manner at a predetermined point, and providing a free path for the leg to pivot.

[0015] According to the present invention the legs in each frame are not fixed at the top of the girder, but are pressed against a suitably arranged damping cushion.

[0016] With respect to the collision cases described above, the solution according to the present invention will function in the following way:

[0017] For collision of the most common character, i.e. collision condition 1, i.e. from front or at an angle on the front leg, the lower breaking point will break off, the pivotable foundation joint element will swing down into the space in the ground in front of and at the rear of the foundation, and the front leg will pivot freely under the gantry in the same direction as the direction of motion of the vehicle. The pendulum motion is stopped either be-

cause the rotational energy is damped out and the leg is freed from its rotational axis and fall down, or when the leg hits the transom, whereupon the leg will become free from the fixture at the pivot hinge on the transom, and then fall down.

[0018] When the collision occurs from the front or at an angle on the rear leg of the frame, i.e. collision condition 2, the vehicle will hit the leg beneath the gantry. Both the upper and the lower breaking joint elements will break off in such way that the lower breaking joint element will break off first, while the upper breaking joint element will temporarily be intact whereupon the upper breaking joint element will break off and the leg will fall down at a stage where the vehicle has passed under and away from the gantry. Also for this condition will the lower pivotably configured hinge pivot fall down into the space besides the foundation, but in this case in opposite direction.

[0019] When the vehicle hits the front leg from behind, i.e. the collision condition 3, the same will occur as for collision condition 1, but course of events will be in opposite direction.

[0020] When the rear leg is hit from behind, i.e. collision condition 4, the same will occur as for collision condition 2, but course of events will be in opposite direction.

[0021] With a solution according to the invention, it is possible to install the gantry across a motorway in a very short time, less than half an hour, whereby the installation will not to any significant degree stop or hinder the traffic.

[0022] A preferred embodiment of the invention will be described below in greater details, referring to the drawings, in which:

Figure 1 shows an alternative solution of a collision safe traffic gantry according to the invention, the gantry being positioned across a motorway comprising several traffic lanes, the gantry comprising two end frames and an intermediate frame placed in the mid shoulder between two traffic lanes;
Figure 2 shows a preferred embodiment of a collision safe gantry according to the invention;
Figure 3 shows a gantry frame, identifying the four different collision conditions;
Figure 4 shows in detail the lower end of a leg of a gantry frame;
Figure 5 shows, in an enlarged scale, details of a preferred support of the transom;
Figure 6 shows a preferred embodiment of the interposition of two legs in a frame; and
Figures 7a-7c show steps of a preferred method of assembling and erecting the legs and the transom.

[0023] Figure 1 shows an embodiment of a gantry 10 according to the invention. The gantry comprises three pairs of frames 11, each formed by two upwards and inwards extending legs 12,12'. At their upper ends the legs 12, 12' support a transversely arranged transom or beam 13. According to the embodiment shown in Figure 1, the two end frames 11 are arranged on the side shoulder of each traffic lane, while the third frame 11 is arranged in the mid shoulder.The legs 12,12' and the transom 13 are formed of suitable trusses. The transom supports traffic signs 14. According to the embodiment shown in Figure 1 pairs of legs 12,12' meet in a single plane at their upper ends.

[0024] Figure 2 shows a preferred embodiment of the invention, said embodiment corresponds in general with the embodiment shown in Figure 1, except that legs 12,12' in a pair are laterally displaced with respect to each other.

[0025] Figure 3 shows a frame 11, a vertical section through a transom 13, the upper end of the frame 11 and the lower end of a leg 12, while Figure 4 shows in an enlarged scale the lower end of a leg 12, the foundation 17 and breaking joint element 15.

[0026] As indicated in the Figures the leg is formed of a Lattix®-profile. At its lower end the leg 12 is connected to the upper end of the breaking joint element 15 by means of breaking bolt 16. The breaking bolts 16 may preferably be provided with a crack initiation (not shown). The breaking joint element 15 is at its lower end pivotably arranged on the foundation 17, the foundation being fixed to the supporting ground 20. The pivot suspension is obtained by means of an axis 18 extending in a direction parallel with the transom 13, across the motorway. The upper end of the foundation 17 is configured in such way that a room 19 is formed on each side of the foundation 17, whereby the breaking joint element, when the leg 12 is broken off, may pivot around the axis 18 and fall down into the hole 19 on either side of the foundation, dependent upon the direction of motion of the vehicle causing the break off. In order to prevent foreign bodies, such as dirt, snow, rubbish or water from coming down into said hole(s) 19, the breaking jointkand the upper end of the foundation 17 may be covered, for example by means of a tarpaulin bellow, a flexible jacket, or the like (not shown). As shown in more detail in Figure 4, showing the lower end of a leg 12 and the foundation 17 in an enlarged scale, the shaft 18 may preferably be arranged levelled with the adjacent ground 20.

[0027] At its upper ends, the legs 12,12' support the transom 13. Also, a breaking joint element 21 is arranged at the upper ends of the legs 12, 12' , said breaking joint element comprising one or more breaking bolts 16, preferably provided with a crack initiation. The legs 12,12' are not fixed to the transom, but are pressed against one or more impact cushions 22 arranged on each side of the transom 13.

[0028] The frame 11 according to the present invention needs only to resist tension and compression. This makes it possible to provide "level arms" contributing to breaking off the bolts 14 correctly for such solution. For this purpose the upper breaking bolts 14 may preferably be placed along the inner sides of the legs 12,12'.

[0029] As indicated in Figure 3 by means of arrows, four different directions of collision impacts are indicated. In the description below the front leg 12 and the rear leg

12' must be seen in the same direction as indicated by the arrow A. The arrow A shows the condition wherein the vehicle hits the frame 11 in front on the front leg 12, while the arrow B shows the condition wherein the vehicle hits the rear leg 12' of the frame 11 in its front. The arrow C shows the condition wherein the vehicle hits the front leg 12 of the frame 11 from the rear, while the arrow D shows the condition wherein the vehicle hits the rear leg 12' of the frame 11 from the rear.

[0030] Figures 3 and 4 indicates further the pendulum motion P, indicated by broken line, the leg 12 will follow when broken off at the breaking joint element 15.

[0031] Figure 5 shows in enlarged scale the upper end of the two legs 12,12' in a frame 11, and a section through the transom 13. The Figure shows the upper breaking joint element 21 and the breaking bolts 16. At its upper end each leg 12,12' is further provided with a support profile 23, which according to the embodiment shown has a triangular cross section. The upper corner of the supporting profile 23 is pressed against the press cushion 22. To clarify, the drawing is somewhat exaggerated in order to show the space between the press cushion 22 and the supporting profile 23.

[0032] At its lower end, each supporting profile 23 is hinged along the lower end facing inwards to the transom 13 by means of a hinged connection 24,25. The hinged connection 24,25 comprises a cylindrical groove or notch 24 with a laterally configured opening arranged along the lower, inner edge of the support profile 23. The groove or notch 24 has a shape adapted to receive and co-act with a shaft 25, arranged at both ends of the transom 13. On the surface facing inwards into the frame 11, the groove 24 is further configured with an opening which is somewhat larger than the diameter of the shaft 25. Hence, the support profile 23 and the leg 12,12' may thus be configured to be moved out of the hinged connection 24,25 when subjected to collision condition 1 or 4. If the collision impact is too large, also the upper breaking joint element 21 may break off.

[0033] At the outer and upper side of the hinged connection 24,25, a number of smaller filler bodies 26 may be arranged between the hinged connection 24,25 and the transom 13. Such filler bodies may for example be rods or bodies formed of other types of profiles.

[0034] The purpose of the hinged connection 24,25 is to allow the leg 12,12' to pivot around the hinged connection in case of collision between a vehicle and the leg 12,12', causing break off of the lower breaking joint element. The purpose of the filler bodies 26 is to secure that the leg 12,12' is kept in forced contact against the transom 13, and that the leg 12,12' and/or the transom 13 is not moved unintentionally if subjected to environmental loads or forces, such as wind, earthquake or the like.

[0035] Figure 6 shows parts of a preferred embodiment of the frame 11 according to the invention, wherein each leg 12,12' in a frame 11 is laterally displaced with respect to each other. Preferred distance between two legs 12,12' of a frame may be in the order of Om to about 3m.

[0036] The solution according to the present invention will with respect to the collision conditions identified above function in the following manner:

[0037] For collision of the most common type, i.e. collision condition 1 - impact from the front of or at an angle on the front leg 12 - the lower breaking joint will break off, the pivotable joint element 15 will rotate and fall down into the space 19 in the ground 20 in front or at the rear of the foundation 17, and said front leg 12 will pivot freely beneath the gantry 10, around the hinged connection 24,25 in the same direction as the direction of motion of the vehicle. The pivotable motion will stop when the upper end of the leg 12 hits the transom 13, the leg 12 may then be freed from the hinged connection 24,25 and fall down behind the vehicle. In case of a heavy impact, the breaking joint 21 may also break off.

[0038] When a frontal collision occurs on the rear leg 12' of the frame 11, i.e. collision condition 2, the vehicle will hit the rear leg 12' under the gantry 10. In such case both the upper and the lower breaking joint elements 15,21 will break off in that the lower breaking joint element 15 will break off firstly, while the upper joint element 21 temporarily will be intact whereupon the upper joint element 21 subsequently will break off, whereby the leg 12' will fall down at a point in time where the vehicle has passed under the frame. Also for this case will the lower pivotable joint element 15 pivot and fall down into the space 19 at the foundation 17, but in this case in opposite direction.

[0039] When the vehicle hits the front leg 12 from the rear, i.e. collision condition 3, the same will occur as for the collision condition 1, but opposite direction.

[0040] When the rear leg 12' is hit from the rear, i.e. collision condition 4, the same will occur as for collision condition 2, but opposite direction.

[0041] The figures 7a-7c show one method of assembling the legs 12,12' and the transom. As indicated in the figure 7 the rear leg 12' is placed in a position to the right in the Figure, while the front leg 12 is placed in a position to the left in the Figure. The two legs 12,12' are placed on the ground in lateral distance apart, and their upper ends are pulled in so that the groove 24 on the front leg 12 is placed into position with respect to the front shaft 25 and the bracket 30 to the right in the Figure, and the groove 24' on the rear leg 12' is placed in position with respect to the rear shaft 25' and the rear bracket 30' on the transom 13.

[0042] The transom 13 its then lifted into position above the two ends of the legs 12,12' whereupon the groove 24 is coupled to the shaft 25, and the groove 24' is coupled to the shaft 25'.

[0043] This procedure is repeated at the other end of the transom and possibly for the intermediate legs to be arranged in the mid shoulders. The transom is then lifted up and the front leg 12 is rotated in an anti-clockwise direction until a position where the leg is rotated so that the lower end of the leg 12 may be joined to the pivot on the foundation. Correspondingly, the rear leg 12' is ro-

tated in a clockwise direction till the leg 12' has been rotated so far to the left in the Figure that the lower end of the rear leg 12' correspondingly may be connected to the pivot on the foundation. The legs may be rotated up to 16° sideways from the vertical.

[0044] As shown in the Figures the grooves 24,24' are directed upwards.

[0045] Possible signs or the like may possibly be fixed to the transom prior to assembling the legs 12,12' to the transom and lifting of the assembled gantry.

[0046] Prior to these installation steps, the hinged joint elements 15 may be arranged in such manner and temporarily be stiffened so that they are in their required position, ready to be connected to the legs.

[0047] A preferred, detailed method for assembling the various components will be described below:

1. Install concrete foundations, draining away any moisture.
2. Lift the bases into position. All bases are identical.
3. Place a foundation cover box around each base, using the same bolts as steel basis.
4. Backfill with gravel to allow water to drain from the foundation cover boxes.
5. Assemble the transom, module by module, end to end, and connect the modules together using matching end plates.
6. Assemble and position support scaffolds for the VSM (Variable Message Signs) assembly.
7. Lift assembled transom with cranes up onto the support scaffolds.
8. Install signs on transom
9. Place gantry legs on ground, with hinges open upwards, align and space apart. All legs are identical.
10. Place temporary assembly wheels on lower end of each leg.
11. Position the bases so that the upper plate is at the correct angle. Use wooden spacers provided.
12. Tie a rope to the base of each leg.
13. Lift up the legs so that the pivot pins on the transom (two for each A-frame joint) engage onto the hinges on all six legs.
14. Install temporary lifting hooks and locking pins into position. The pins are then secured.
15. Position the cranes to lift the transom (complete with signs) at the lifting positions.
16. Raise gantry, allowing legs to rotate to a vertical position. Leg movement are secured with ropes. The legs will pivot on the upper A-frame joints. The temporary wheels at the end of each leg will allow the leg to rotate freely.
17. Lift until legs are clear of ground - the legs will then hang vertically down. Remove temporary wheels from legs.
18. Using the ropes, each pair of legs is pulled apart to form the correct A-frame angle. Gently lower the gantry so that the base plate on the end of each leg mates with the upper plate of the support. The wooden spacers holding the base plate in position will secure that mating plates are parallel.
19. Insert the two breaking bolts in each leg. Adjust the height of the transom to complete the operation.
20. When all legs are in position, tighten the bolts to the required torque. Lower the crane to transfer the weight of the gantry to the supports as appropriate.
21. Remove cranes.
22. Remove pins and temporary lifting hooks from all upper hinges (access to top of transom is required, either by ladder or access platform).
23. Install aluminium foundation covers and fix in place.

[0048] The present invention is described using legs and girders of the Lattix®-type. It should be appreciated, however, that the effects of the invention also may be achieved in connection with any types of legs and girders. It should further be appreciated that the positions of the breaking bolts may be varied without deviating from the inventive idea.

[0049] Further, the profile material 26 may be of any suitable type, suitable for the intended purpose.

[0050] The collision safe frame may be modified to the roads and lanes where the gantry is to be installed. A gantry may for example have a length of for example 50m. In such case the transom is made of several girder units, bolted, together. The horizontal distance between the lower end of the legs in a pair may for example be 4-5 m, while the free height under the gantry may for example be 6,5-7 m. The length of a leg may for example be 6-7 m.

[0051] When several girder units are tied together, intermediate plates (not shown), specifically designed for such joint, may be applied.

[0052] The signs may be hung on the transom in any suitable manner, suited for the intended purpose.

[0053] The frame may preferably be made of trusses of aluminium, whereby the total weight will be low.

Claims

1. Collision safe traffic gantry (10), comprising one or more transverse transoms (13), intended to support traffic signs (14) or traffic lights, said one or more transoms (13) being supported by a plurality of frames (11) resting on a foundations (17), wherein each frame (11) comprises pairs of legs (12,12') which legs, at their upper end support said transom (13) and at their lower end rest on the foundation (17), the legs (12,12') being configured with releasable joint elements (15) arranged at least at the lower end of the legs (12,12'), wherein the paired legs (12,12') are inclined, extending upwards and inwards towards each other; said legs (12,12') are pivotably configured on the transverse transom (13) by means of a hinged joint element element (24,25);

and said legs (12, 12') at their lower end are supported on said releasable joint elements (15) configured to be retractable into the ground, said legs (12,12') being configured so that, when a leg (12,12') is impacted by a vehicle and broken off, the corresponding releasable joint element (15) is released or broken of f and the impacted leg (12, 12') is allowed to pivot in a vertical plane around the hinged joint element (24,25).

2. Collision safe traffic gantry (10) according to claim 1, wherein the hinged joint element (24,25) comprises a cylindrical body (24) attached to the leg (12,12') and shaft (25) fixed to the transom (13).

3. Collision safe traffic gantry (10) according to claim 1 or 2, wherein the cylindrical body (24) is configured with an opening having a size which is slightly larger than the diameter of the shaft (25), whereby the cylindrical body (24) may be moved out of interaction with the shaft (25) in case of a certain pendulum movement of the leg (12,12') upon impact.

4. Collision safe traffic gantry (10) according to one of the claims 1-3, wherein the lower ends of said legs (12, 12') are supported by a joint element (15) pivotably hinged to the foundation (17), allowing rotation of the joint element (15) around an horizontal axis (18), the axis (18) being configured substantially to extend in same direction as the transverse transom (13) .

5. Collision safe traffic gantry (10) according to claim 4, wherein the breaking joint between the pivoted joint element (15) and the adjacent part of the lower end of a leg (12,12'.) comprises one or more breaking bolts (16), configured to break off when the leg is impacted by a vehicle.

6. Collision safe traffic gantry (10) according to claim 4 or.5, wherein the hinged joint element (15), when broken off from the adjoining leg (12,12'), is configured to pivot down into a cavity (19) in the ground (20) associated with the foundation (17), the cavity (19) being arranged in spaced relation to the foundation (17), so that the hinged joint element (15) minimizes the damage to the underside of the vehicle.

7. Collision safe traffic gantry (10) according to one of the claims 4-6, wherein a surrounding protection configured to prevent dust, gravel, soil, ice, water and the like from entering the cavity (1), is arranged between the hinged joint element (15) and the foundation (17).

8. Collision safe traffic gantry (10) according to one of the claims 1-7, wherein said leg (12,12') at its upper end is provided with a releasable joint element (21), comprising a breaking bolt (16), configured to form a one way acting releasable joint, securing that the leg breaks off when the leg (12,12') is impacted from the rear side by a vehicles.

9. Collision safe traffic gantry (10) according to one of the claims 1-8, wherein the upper end of said leg (12,12') is configured to be in forced contact with a impact cushion (22) arranged on the transom (13) without being fixed or restrained to the transom (13) in any other manner.

10. Collision safe traffic gantry (10) according to any one of the claims 1-9, wherein each supporting leg (12,12') in a pair of legs is laterally displaced with respect to each other.

11. Collision safe traffic gantry (10) according to claim 10, wherein the lateral distance between two laterally spaced legs. (12,12') in a pair is in the order of Om-3m.

12. Collision safe traffic gantry (10) according to on of the claims1-11, wherein each breaking bolt (16) is provided with a crack initiation, n order to secure a break off at predetermined location.

13. Collision safe traffic gantry (10) according to one of the claims 1-12" wherein the breaking bolt (16) may be sideways displaced towards one side in the cross sectional area of the leg (12,12') with respect to the direction of motion of the vehicle, so that when subjected to impact a lever arm is formed in the breaking joint element (21) contributing with additional force to break off the breaking joint.

14. Method for assembling a collision safe traffic gantry (10) according to claim 1 across one or more traffic lanes, comprising a plurality of pairs of legs (12,12') supported at their lower end by a foundation (17) and at their upper end supporting one or more transverse transoms (13) or the like, said transom (s) (13) carrying signs (14) for traffic information and/or traffic lights or the like,
characterized in that said pairs of legs (12,12') are placed parallel with respect to each other, the legs being placed with their top ends towards each other and in opposite direction with respect to their final position when erected, that said transom(s) (13) are lifted in position above the upper end of the legs (12,12'), perpendicularly with respect to the legs (12,12'), that the upper end of each leg (12, 12') is attached to suitable attachment means arranged at the lower side of the transom, that the assembled legs and the transom then are lifted up and that said legs (12,12') then are rotated from their initial position through at least 90° to a position where the lower end of the legs is inclined outwards with respect to

the upper end, whereupon the lower end of the legs (12,12') is attached to the foundation (17).

Patentansprüche

1. Kollisionssichere Verkehrssignalbrücke bzw. überkehrszeichenbrücke (10), die einen oder mehrere Querträger (13) aufweist, die dazu bestimmt sind, Verkehrszeichen (14) oder Lichtsignale zu halten, wobei der eine oder die mehreren Querträger (13) durch mehrere Gerüste (11) gehalten werden, die auf einem Fundamente (17) ruhen, wobei jedes Gerüst (11) Fußpaare (12,12') aufweist, wobei die Füße an ihrem oberen Ende den Querträger (13) halten und an ihrem unteren Ende auf dem Fundament (17) ruhen, wobei die Füße (12,12') mit lösbaren Verbindungselementen (15) konfiguriert sind, die mindestens am unteren Ende der Füße (12,12') angeordnet sind, wobei die gepaarten Füße (12,12') geneigt sind und sich nach oben und nach innen zueinander hin erstrecken; die Füße (12,12') mittels eines gelenkigen Verbindungselements (24,25) drehbar am Querträger (13) konfiguriert sind; und die Füße (12,12') an ihrem unteren Ende an den lösbaren Verbindungselementen (15) gehalten werden, die so konfiguriert sind, dass sie in den Boden einziehbar sind, wobei die Füße (12,12') so konfiguriert sind, dass wenn ein Fuß (12,12') durch ein Fahrzeug getroffen und abgebrochen wird, das entsprechende lösbare Verbindungselement (15) gelöst oder abgebrochen wird und es ermöglicht wird, dass der getroffene Fuß (12,12') sich in einer vertikalen Ebene um das gelenkige Verbindungselement (24,25) dreht.

2. Kollisionssichere Verkehrssignalbrücke (10) nach Anspruch 1, wobei das gelenkige Verbindungselement (24,25) einen zylindrischen Körper (24), der am Fuß (12,12') angebracht ist, und einen Schaft (25) aufweist, der am Querträger (13) befestigt ist.

3. Kollisionssichere Verkehrssignalbrücke (10) nach Anspruch 1 oder 2, wobei der zylindrische Körper (24) mit einer Öffnung konfiguriert ist, die eine Größe aufweist, die heringfügig größer als der Durchmesser des Schafts (25) ist, wodurch der zylindrische Körper (24) im Fall einer bestimmten Pendelbewegung des Fußes (12,12') bei einem Aufprall aus einer Wechselwirkung mit dem Schaft (25) heraus bewegt werden kann.

4. Kollisionssichere Verkehrssignalbrücke (10) nach einem der Ansprüche 1-3, wobei die unteren Enden der Füße (12,12') durch ein Verbindungselement (15) gehalten werden, das drehbar gelenkig am Fundament (17) angebracht ist, das eine Rotation des Verbindungselements (15) um eine horizontale Achse (18) ermöglicht, wobei die Achse (18) so konfiguriert ist, dass sie sich im wesentlichen in dieselbe Richtung wie der Querträger (13) erstreckt.

5. Kollisionssichere Verkehrssignalbrücke (10) nach Anspruch 4, wobei die Bruchverbindung zwischen dem drehbaren Verbindungselement (15) und dem beanachbarten Teil des unteren Endes eines Fußes (12,12') einen oder mehrere Bruchbolzen (16) aufweist, die so konfiguriert sind, dass sie abbrechen, wenn der Fuß durch ein Fahrzeug getroffen wird.

6. Kollisionssichere Verkehrssignalbrücke (10) nach Anspruch 4 oder 5, wobei das gelenkige Verbindungselement (15), wenn es vom angrenzenden Fuß (12,12') abgebrochen wird, konfiguriert ist, sich nach unten in einen Hohlraum (19) im Boden (20) zu drehen, der mit dem Fundament (17) verbunden ist, wobei der Hohlraum (19) in einer beabstandeten Beziehung zum Fundament (17) angeordnet ist, so dass das gelenkige Verbindungselement (15) eine Beschädigung der Unterseite des Fahrzeugs minimiert.

7. Kollisionssichere Verkehrssignalbrücke (10) nach einem der Ansprüche 4-6, wobei ein Umgebungsschutz zwischen dem gelenkigen Verbindungselement (15) und dem Fundament (17) angeordnet ist, der so konfiguriert ist, dass er verhindert, dass Staub, Kies, Erde, Eis, Wasser und dergleichen in den Hohlraum (1) eintreten.

8. Kollisionssichere Verkehrssignalbrücke (10) nach einem der Ansprüche 1-7, wobei der Fuß (12, 12') an seinem oberen Ende mit einem lösbaren Verbindungselement (21) versehen ist, das einen Bruchbolzen (16) aufweist, der so konfiguriert ist, dass er eine in eine Richtung wirkende lösbare Verbindung bildet, die sicherstellt, dass der Fuß abbricht, wenn der Fuß (12,12') von der Rückseite durch ein Fahrzeug getroffen wird.

9. Kollisionssichere Verkehrssignalbrücke (10) nach einem der Ansprüche 1-8, wobei das obere Ende des Fußes (12,12') so konfiguriert ist, dass es mit einem Aufprallpolster (22) in Zwangskontakt steht, das am Querträger (13) angeordnet ist, ohne am Querträger (13) in irgendeiner anderen Art befestigt oder festgehalten zu sein.

10. Kollisionssichere Verkehrssignalbrücke (10) nach einem der Ansprüche 1-9, wobei jeder haltende Fuß (12,12') in einem Fulßpaar in Bezug auf den anderen lateral versetzt ist.

11. Kollisionssichere Verkehrssignalbrücke (10) nach Anspruch 10, wobei der laterale Abstand zwischen zwei lateral beabstandeten Füßen (12,12') in einem

Paar in der Größeordnung von 0 m - 3 m liegt.

12. Kollisionssichere Verkehrssignalbrücke (10) nach einem der Ansprüche 1.-11, wobei jeder Bruchbolzen (16) mit einer Rissauslösung versehen ist, um ein Abbrechen an einer vorgegebenen Stelle sicherzustellen.

13. Kollisinnssichere Verkehrssignalbrücke (10) nach einem der Ansprüche 1-12, wobei der Bruchbolzen (16) bezüglich der Bewegungsrichtung des Fahrzeugs zu einer Seite in der Querschnittsfläche des Fußes (12,12') seitwärts versetzt sein kann, so dass, wenn er einem Aufprall ausgesetzt ist, ein Hebelarm im Bruchverbindungselement (21) gebildet wird, der mit einer zusätzlichen Kraft zum Abbrechen der Bruchverbindung beiträgt.

14. Verfahren zum Montieren einer kollisionssicheren Verkehrssignalbrücke bzw. Verkehrszeichenbrücke (10) nach Anspruch 1 über eine oder mehrere Fahrspuren, die mehrere Fußpaare (12,12') aufweist, die an ihrem unteren Ende durch ein Fundament (17) gehalten werden und an ihrem oberen Ende einen oder mehrere Querträger (13) oder dergleichen halten, wobei der bzw. die Querträger (13) Zeichen (14) zur Verkehrsinformation und/oder Lichtsignale oder dergleichen tragen, **dadurch gekennzeichnet, dass** die Fußpaare (12,12') in Bezug zueinander parallel angeordnet sind, wobei die Füße an ihren oberen Enden zueinander hin und bezüglich ihrer Endposition in die entgegen gesetzte Richtung angeordnet werden, wenn sie aufgestellt werden, dass der bzw. die Querträger (13) in eine Position über dem oberen Ende der Füße (12,12') senkrecht bezüglich der Füße (12,12') angehoben wird, dass das obere Ende jedes Fußes (12,12') an eine geeignete Befestigungseinrichtung angebracht wird, die an der Unterseite des Querträgers angeordnet ist, dass die montierten Füße und der Querträger dann angehoben werden und dass die Füße (12,12') dann von ihrer Anfangsposition um mindestens 90° zu einer Position gedreht werden, wo das untere Ende der Füße bezüglich dem oberen Ende nach außen geneigt ist, woraufhin das untere Ende der Füße (12,12') am Fundament (17) angebracht wird.

Revendications

1. Portique de trafic routier anticollision (10), comprenant une ou plusieurs traverses (13) destinées à supporter des signaux de trafic routier (14) ou des feux de trafic routier, lesdites une ou plusieurs traverses (13) étant supportées par une pluralité de châssis (11) reposant sur une fondation (17), dans lequel chaque châssis (11) comprend des paires de jambes (12, 12'), lesquelles jambes supportent à leur extrémité supérieure ladite traverse (13) et reposent à leur extrémité inférieure sur la fondation (17), les jambes (12, 12') étant configurées avec des éléments de jonction amovibles (15) aménagés au moins sur l'extrémité inférieure des jambes (12, 12'), dans lequel les jambes appariées (12, 12') sont inclinées, s'étendant vers le haut et vers le bas en direction l'une de l'autre ; lesdites jambes (12, 12') sont configurées à pivotement sur la traverse (13) au moyen d'un élément de jonction articulé (24, 25) ; et lesdites jambes (12, 12') sont supportées à leur extrémité inférieure sur lesdits éléments de jonction amovibles (15) configurés pour pouvoir être rétractés dans le sol, lesdites jambes (12, 12') étant configurées pour que, lorsqu'une jambe (12, 12') est heurtée par un véhicule et cassée, l'élément de jonction amovible correspondant (15) soit libéré ou cassé et que lajambe heurtée (12, 12') soit soumise à un pivotement dans un plan vertical autour de l'élément de jonction articulé (24, 25).

2. Portique de trafic routier anticollision (10) selon la revendication 1, dans lequel l'élément de jonction articulé (24, 25) comprend un corps cylindrique (24) fixé à la jambe (12, 12') et un arbre (25) fixé à la traverse (13).

3. Portique de trafic routier anticollision (10) selon la revendication 1 ou 2, dans lequel le corps cylindrique (24) est configuré avec une ouverture d'un calibre qui est légèrement supérieur au diamètre de l'arbre (25), si bien que le corps cylindrique (24) peut être déplacé hors de toute interaction avec l'arbre (25) dans le cas d'un certain mouvement pendulaire de la jambe (12, 12') lors d'un choc.

4. Portique de trafic routier anticollision (10) selon l'une quelconque des revendications 1 à 3, dans lequel les extrémités inférieures desdites jambes (12, 12') sont supportées par un élément de jonction (15) articulé à pivotement sur la fondation (17), permettant la rotation de l'élément de jonction (15) autour d'un axe horizontal (18), l'axe (18) étant configuré pour s'étendre sensiblement dans la même direction que la traverse (13).

5. Portique de trafic routier anticollision (10) selon la revendication 4, dans lequel le joint de rupture entre l'élément de jonction (15) ayant pivoté et la partie adjacente de l'extrémité inférieure d'une jambe (12, 12') comprend un ou plusieurs boulons de rupture (16) configurés pour se rompre lorsque la jambe est heurtée par un véhicule.

6. Portique de trafic routier anticollision (10) selon la revendication 4 ou 5, dans lequel l'élément de jonction articulé (15), lorsqu'il est rompu de la jambe voisine (12, 12'), est configuré pour pivoter vers le bas

dans une cavité (19) du sol (20) associé à la fondation (17), la cavité (19) étant ménagée espacée de la fondation (17) de sorte que l'élément de jonction articulé (15) minimise les dommages subis par le soubassement du véhicule.

7. Portique de trafic routier anticollision (10) selon l'une quelconque des revendications 4 à 6, dans lequel une protection enveloppante configurée pour empêcher la poussière, les graviers, la terre, la glace, l'eau etc. de pénétrer dans la cavité (19) est aménagée entre l'élément de jonction articulé (15) et la fondation (17).

8. Portique de trafic routier anticollision (10) selon l'une quelconque des revendications 1 à 7, dans lequel ladite jambe (12, 12') est pourvue à son extrémité supérieure d'un élément de jonction amovible (21) comprenant un boulon de rupture (16) et configuré pour former un joint amovible à effet unidirectionnel garantissant que la jambe se brise lorsque la jambe (12, 12') est heurtée par l'arrière par un véhicule.

9. Portique de trafic routier anticollision (10) selon l'une quelconque des revendications 1 à 8, dans lequel l'extrémité supérieure de ladite jambe (12, 12') est configurée pour être en contact forcé avec un amortisseur d'impact (2) aménagé sur la traverse (13) sans être fixé ou retenu sur la traverse (13) d'une autre manière quelconque.

10. Portique de trafic routier anticollision (10) selon l'une quelconque des revendications 1 à 9, dans lequel chaque jambe de support (12, 12') d'une paire de jambes est déplacée latéralement l'une par rapport à l'autre.

11. Portique de trafic routier anticollision (10) selon la revendication 10, dans lequel la distance latérale entre deux jambes (12, 12') d'une paire espacées latéralement est de l'ordre de 0 à 3 m.

12. Portique de trafic routier anticollision (10) selon l'une quelconque des revendications 1 à 11, dans lequel chaque boulon de rupture (16) présente un départ de rupture afin d'assurer une rupture à un emplacement prédétermine.

13. Portique de trafic routier anticollision (10) selon l'une quelconque des revendications 1 à 12, dans lequel le boulon de rupture (16) peut être déplacé latéralement vers un côté de la surface en coupe transversale de la jambe (12, 12') par rapport à la direction de déplacement du véhicule de sorte que, lorsque la jambe est soumise à un choc, un bras de levier soit formé dans l'élément de jonction de rupture, ce qui contribue avec une force supplémentaire à rompre le joint de rupture.

14. Procédé pour assembler un portique de trafic routier anticollision (10) selon la revendication 1 en travers d'une ou plusieurs voies de trafic, comprenant une pluralité de paires de jambes (12, 12') supportées à leur extrémité inférieure par une fondation (17) et supportant à leur extrémité supérieure une ou plusieurs traverses (13) ou analogues, lesdites traverses (13) portant des signaux (14) pour des informations de trafic routier et/ou des feux de trafic routier ou analogues, **caractérisé en ce que** lesdites paires de jambes (12, 12') sont placées parallèlement l'une à l'autre, les jambes étant placées avec leurs extrémités supérieures tournées l'une vers l'autre et dans le sens opposé par rapport à leur position finale lorsqu'elles sont dressés, la ou les traverses (13) est ou sont soulevées en position au-dessus de l'extrémité supérieure des jambes (12, 12'), perpendiculairement par rapport aux jambes(12, 12'), de façon que l'extrémité supérieure de chaque jambe (12, 12') soit fixée à des moyens de fixation appropriés aménagés du côté inférieur de la traverse, les jambes assemblées et la traverse sont ensuite soulevées et lesdites jambes (12, 12') sont soumises à une rotation de leur position finale, sur au moins 90 °, à une position où l'extrémité inférieure des jambes est inclinée vers l'extérieur par rapport à l'extrémité supérieure, moyennant quoi l'extrémité inférieure des jambes (12, 12') est fixée à la fondation (17).

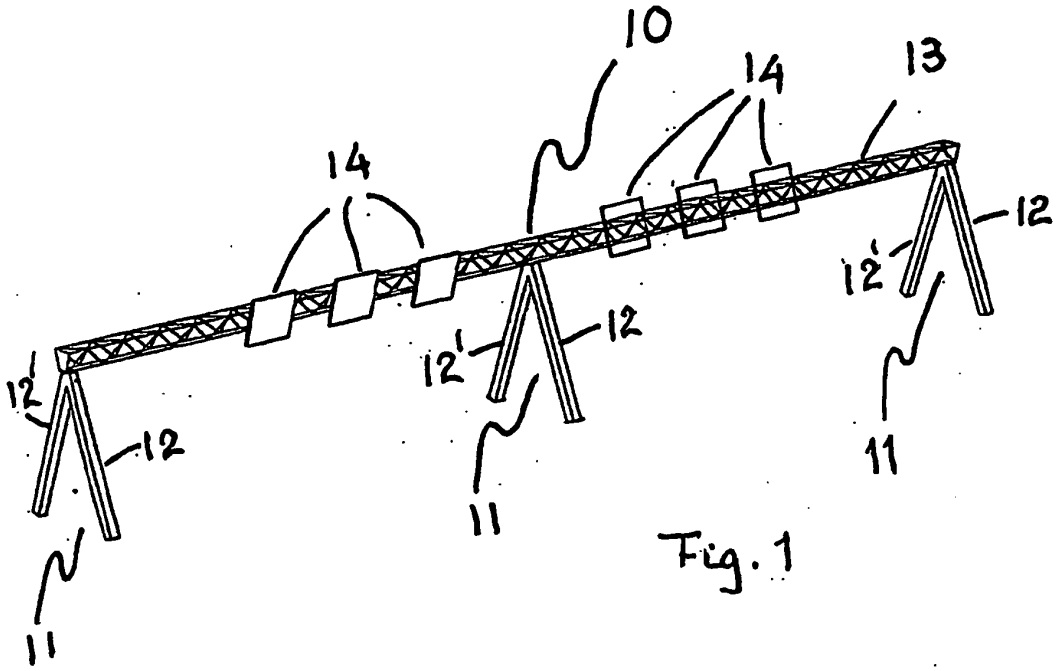

Fig. 1

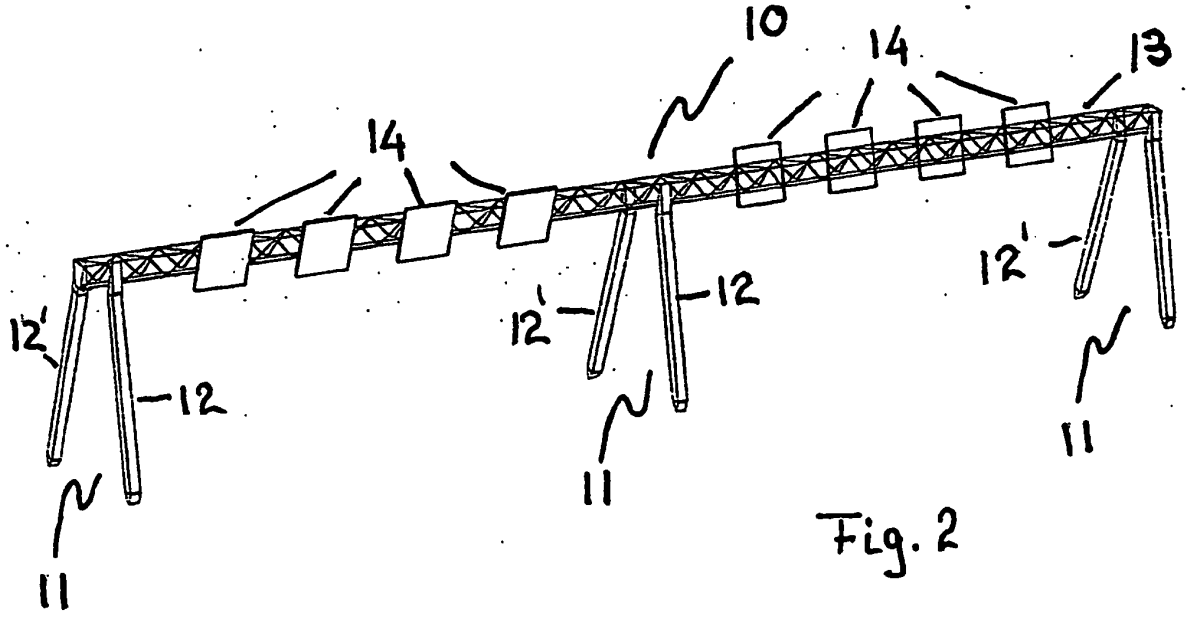

Fig. 2

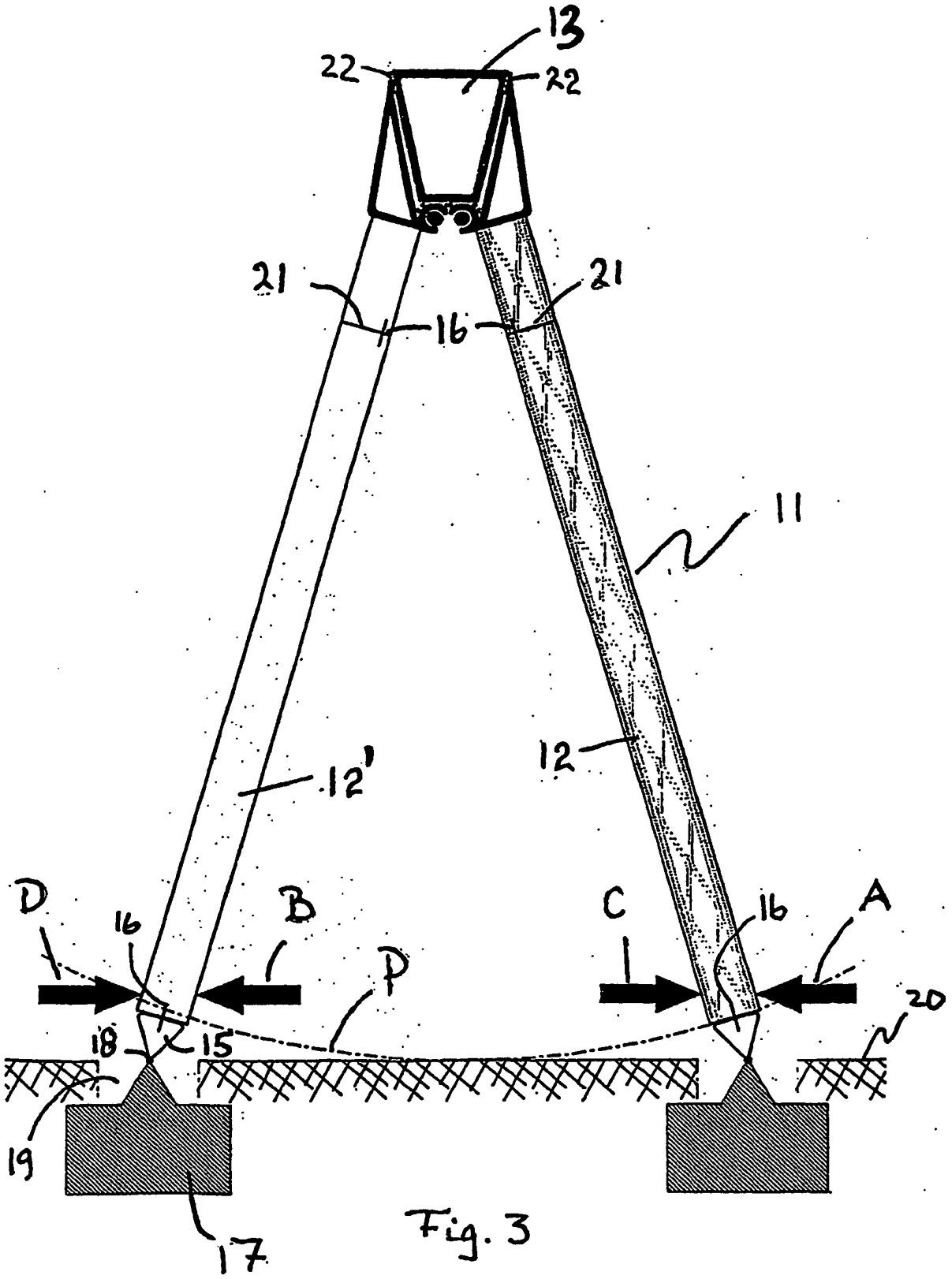

Fig. 3

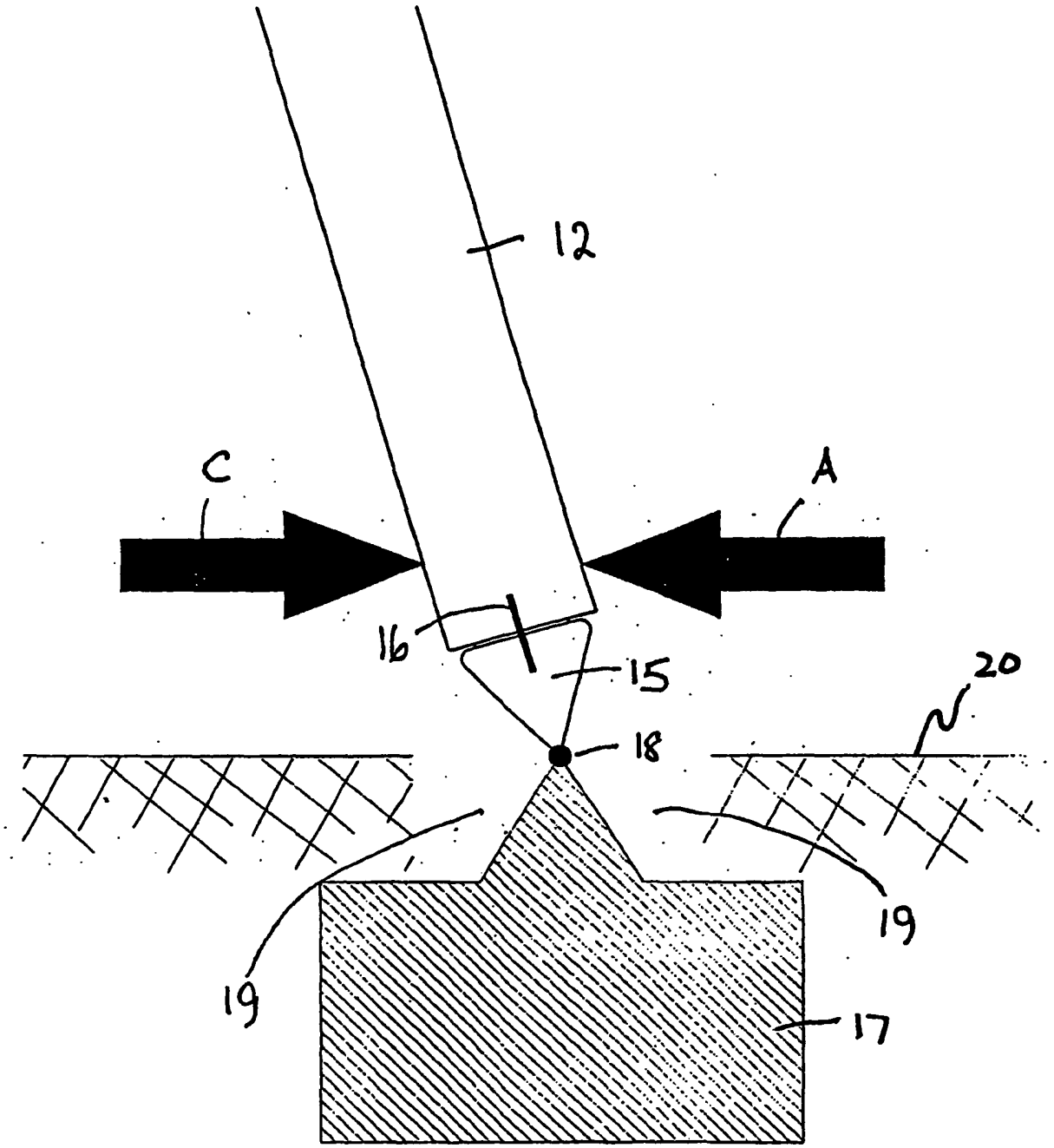

Fig. 4

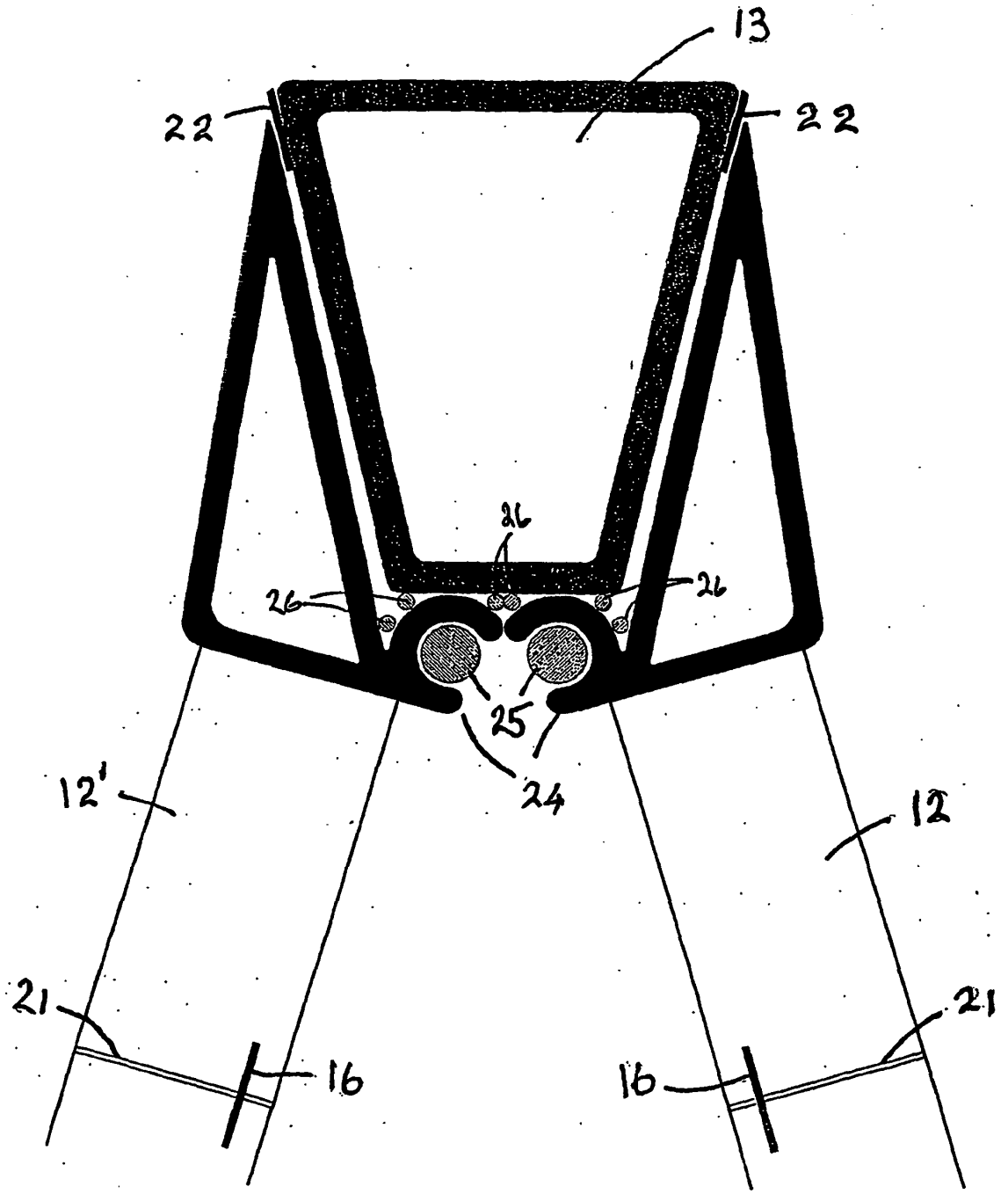

Fig. 5

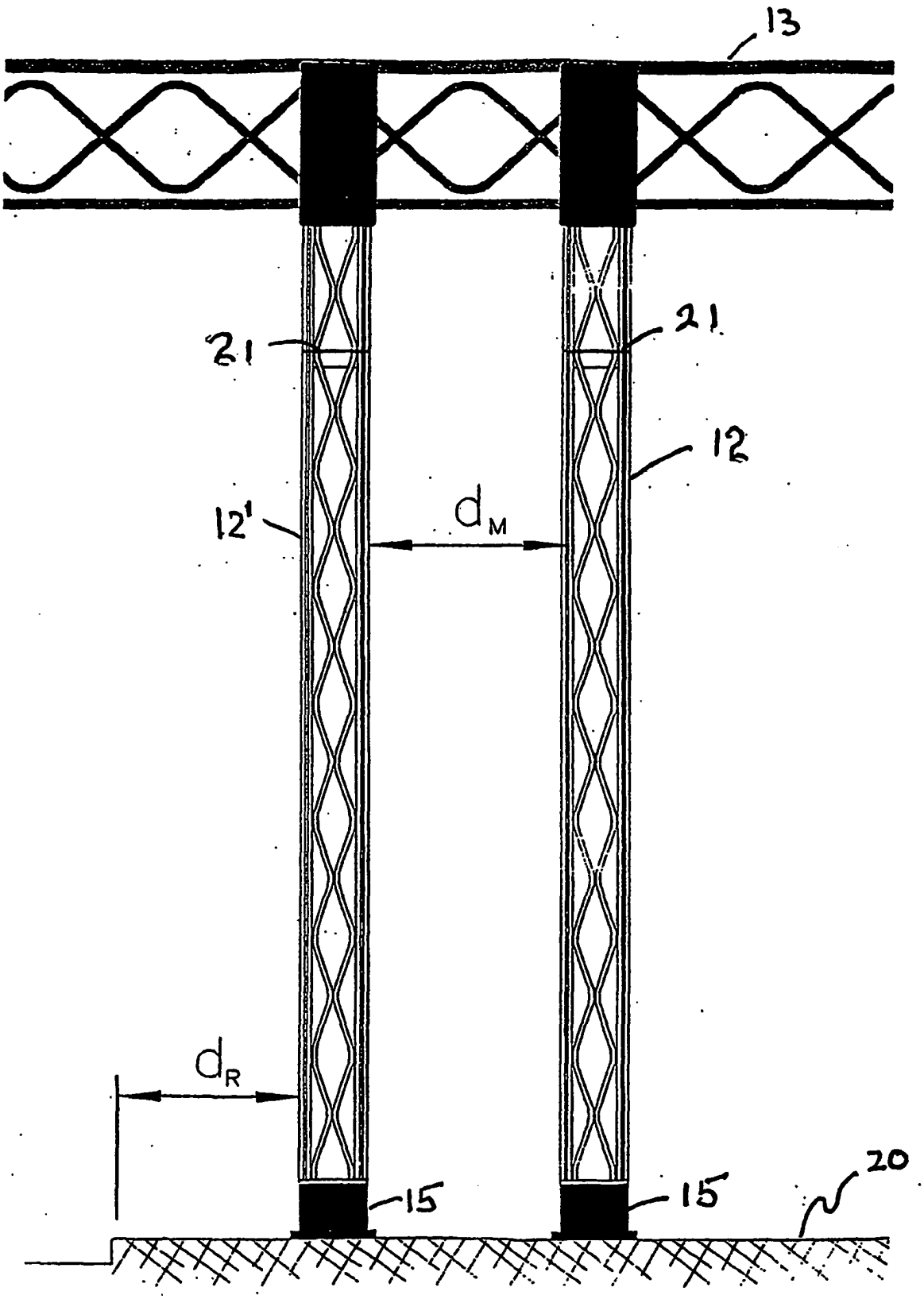

Fig. 6

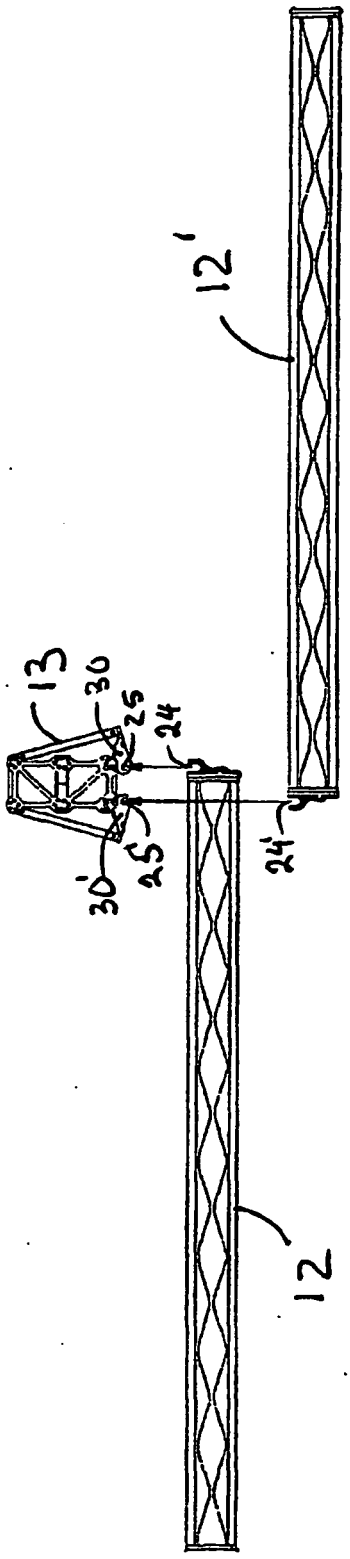

Figure 7a

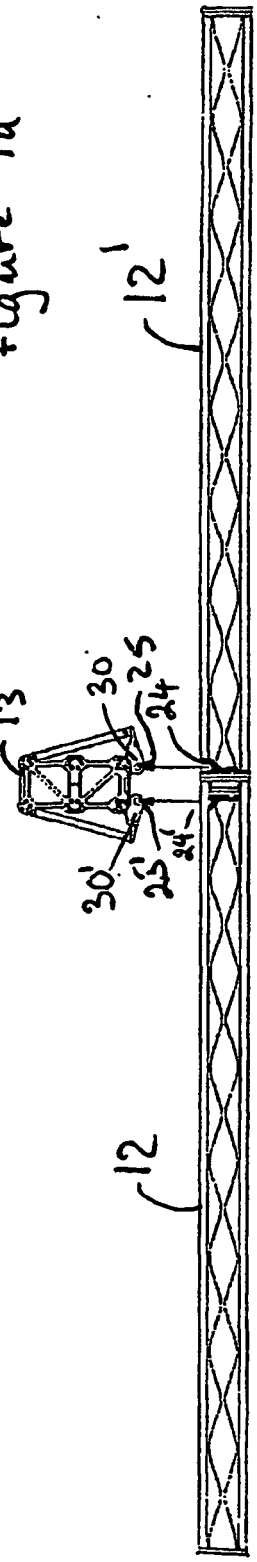

Figure 7b

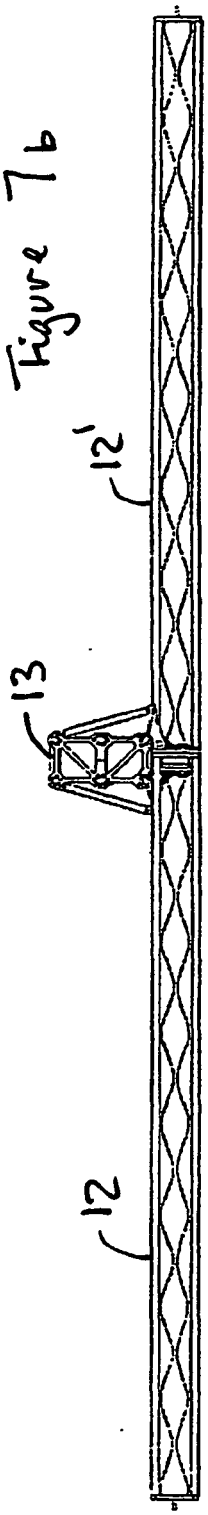

Figure 7c

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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