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(54) **Improvements in a self-supporting lattice to provide steel-concrete composite beams for housing and industrial building**

(57) An improved self-supporting lattice to provide steelconcrete composite beams characterized in that it is fully embodied in the concrete casting and provided with a base or bottom of concrete reinforced with plastic and/or steel fibres able to avoid the need for provisional

moulds during the installation.

The fibres reinforcing the concrete of the bottom have also the function of giving the latter an even limited tensile strength, thus preventing damages and cracks in the bottom which would cause problems in the mechanical resistance and/or fire resistance.

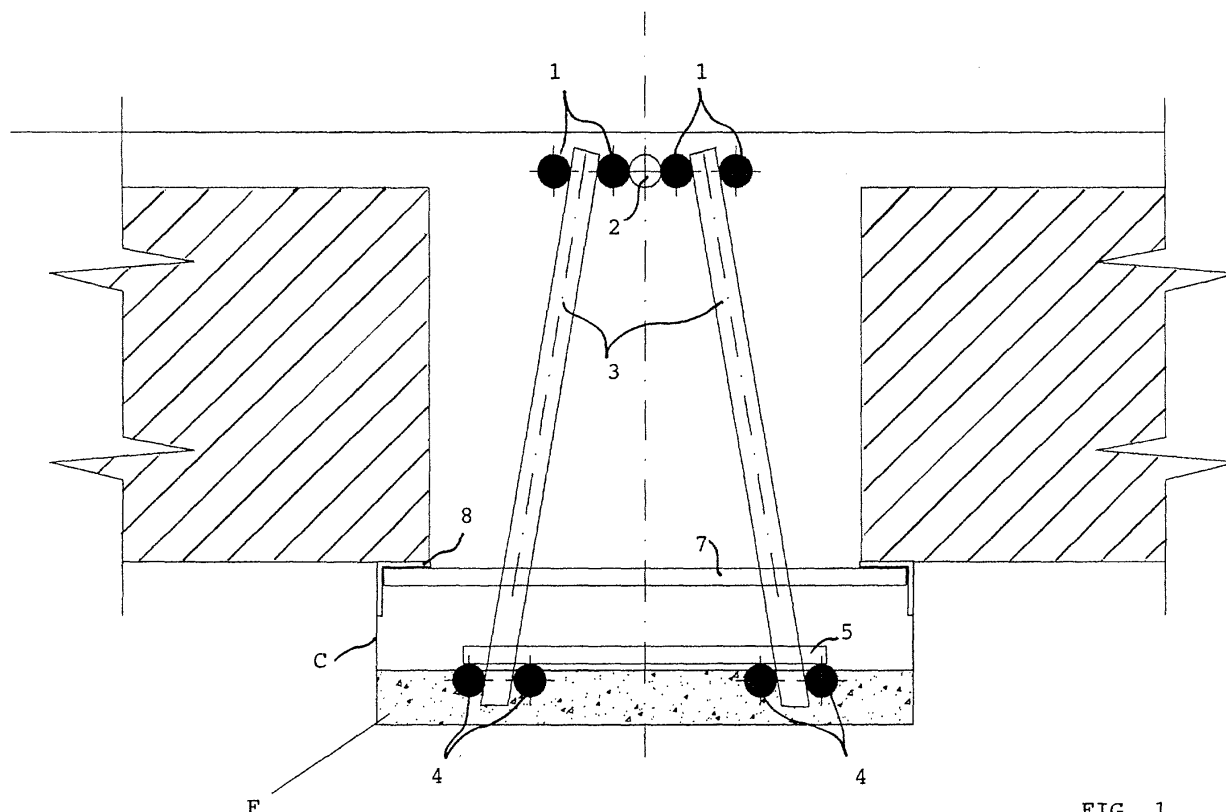


FIG. 1

Description

[0001] The present invention relates to the field of pre-fabricated construction elements generally for building and more particularly an improved self-supporting lattice to provide steel-concrete composite beams for housing and industrial building.

[0002] Beams for building with a composite steel-concrete construction have typically the shape of a reversed T and consist of a large lower plate or sole, several posts perpendicular thereto, and one or more stringers along the top of such posts. Such constructions are embodied upon installation into the concrete casting except for the intrados of the base plate which is subjected to weather and fire.

[0003] The main object of the invention is to provide a composite beam of the type mentioned above with a lattice fully embodied in the concrete casting and characterized by a base of concrete reinforced with plastic and/or steel fibres able to avoid the need for provisional moulds during the installation.

[0004] The invention will now be described with reference to the accompanying drawings that show a preferred embodiment and some variations thereof only by way of an illustrative, not limiting example.

[0005] In the drawings:

Figure 1 shows a section view of a beam with a lattice embodied in the bottom;

Figure 2 shows another embodiment of the invention in which the lattice is applied directly into the bottom in factory; and

Figure 3 similar to the preceding one shows a further embodiment in which the lattice is applied to the bottom during the installation.

[0006] With reference to the Figures, the upper girder of the lattice consists of three or more stringers 1 with a circular or square cross section laying on a plane parallel to the horizontal plane of the base. Such stringers are assembled in pairs each of them engages the upper end of a post 3. Spacers 2 are interposed between each pair of stringers at such upper end of the posts and have the same shape and size as the connected stringers.

[0007] The lower girder consists of four or more stringers 4 with a circular or square cross section laying on the horizontal plane of the base. They are made integral with posts 3 too in the same way as in the upper girder. The stringers 4 of the lower girder are also assembled in pairs each of them engages the lower end of the posts 3.

[0008] According to a peculiar feature of the invention, the reinforcing fibres mixed to the concrete of the bottom give the latter an even limited tensile strength in order to prevent damages or cracks in the bottom which would cause problems in the mechanical strength and/or fire

resistance.

[0009] In the first embodiment shown in Figure 1, the bottom is provided with a little upper mould consisting of side holding walls C to which longitudinal L-shaped section bars 8 supported by cross bars 7 connected to posts 3 are secured.

[0010] Moreover the invention provides several cross irons 5 welded to the lower stringers 4.

[0011] In this first embodiment, posts 3 have their lower ends together with the lower stringers 4 embodied in the bottom or base F of concrete reinforced with plastic fibres. It should be appreciated that the particular shape of the mould according to the present invention makes the use of any through bolt which would impair the fire resistance unnecessary.

[0012] Figure 2 shows a simplified embodiment of the invention in which the lattice is not embodied in the bottom of concrete reinforced with fibres but it is applied directly to the bottom in factory.

[0013] As can be seen in the above Figure, bottom F is provided with longitudinal supporting bars 6 which are integral with the above-mentioned cross irons 5 welded to the lower stringers 4 and are able to make bottom F integral with the lattice.

[0014] According to the latter embodiment, U-shaped cross brackets 9 are also provided which help to make the bottom integral with the casting of the beam and the relative floor.

[0015] Turning now to Figure 3 showing a second embodiment of the invention, it should be noted that in order to allow bottom F to be secured to the lattice of the beam, the upper side of bottom F is provided with a plurality of nuts D "embodied" in the bottom in suitable positions and engaging corresponding bolts B which tighten cross irons 5, thus connecting the bottom to the lower stringers of the lattice.

[0016] According to a further peculiar feature of the present invention, such bolts are not through bolts but are embodied in the bottom so that the fire protection is ensured.

[0017] The advantages of the construction according to the invention are self-evident from the foregoing:

- a) full compatibility with any type of floor with pre-fabricated beams of vibrated reinforced concrete and prestressed reinforced concrete as well as stringers and plates, as it needs no props upon assembling and casting the moulds;
- b) the particular shape of the lower girder, i.e. its permeability to the casting of concrete, gives the lattice the capability of being fully embodied and protected into the mix;
- c) exclusive use of steel stringers with circular or square cross section assembled in factory by welding;
- d) loading capacity such as to allow the following loads without props:

- dead load of the lattice,
- load of the moulds anchored and braced to lattice,
- dead load of the dry laid floor,
- accidental overload from the trampling of the staff for the floor reinforcement,
- load of the finishing casting (lattice and floor).

[0018] Still a further advantage of the present invention consists in that the use of a base reinforced with plastic fibres allows a provisional mould of the lower portion of the beam to be avoided. Moreover, fire protection can be either applied in factory or during the installation.

[0019] The lattice is preferably provided with a rise in factory which is annulled during the installation under the action of the above-mentioned loads.

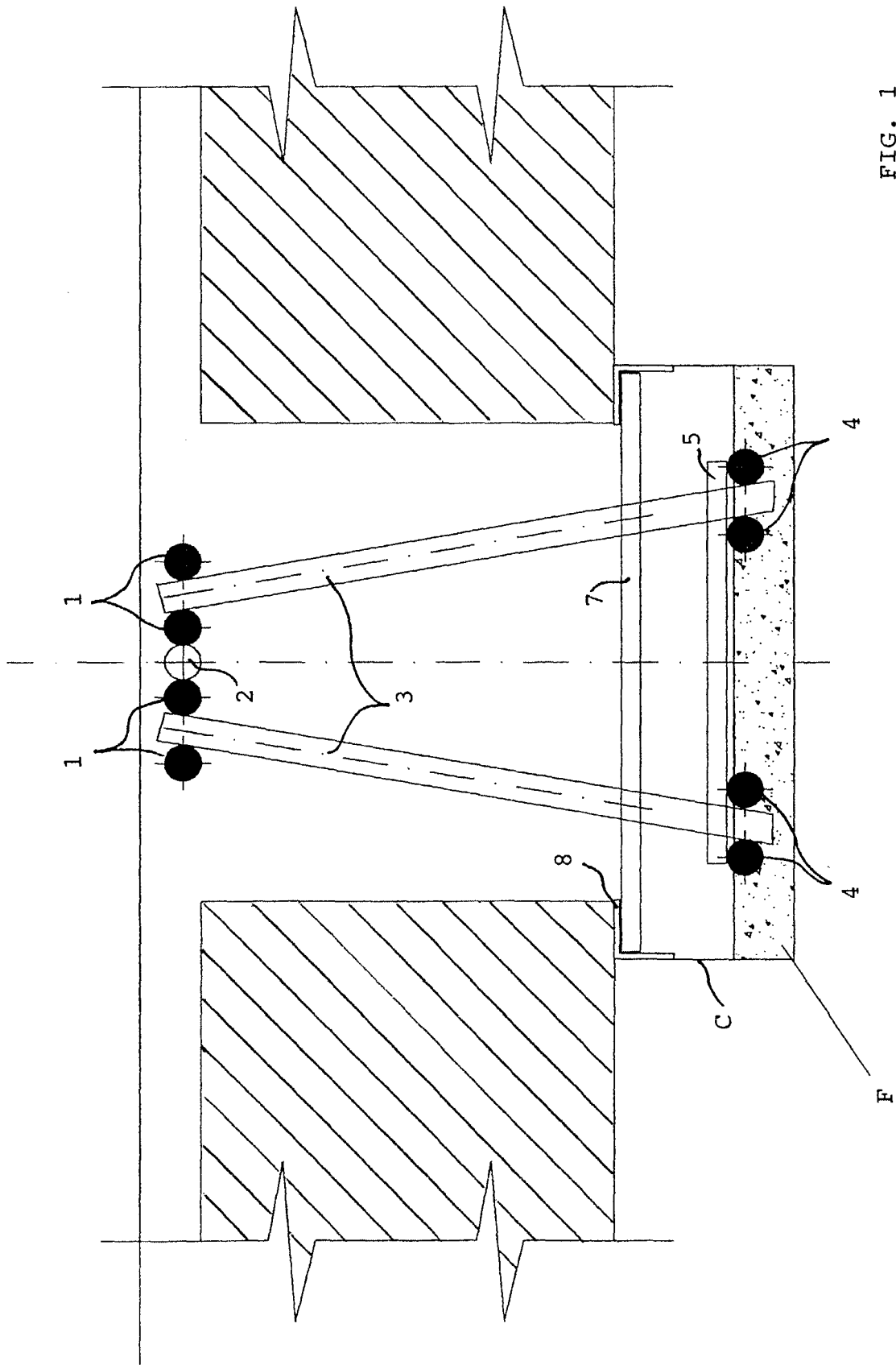
[0020] The present invention has been described and illustrated according to preferred embodiments thereof, however, it should be understood that those skilled in the art can make modifications without departing from the scope of the present industrial invention.

Claims

1. An improved self-supporting lattice to provide steel-concrete composite beams **characterized in that** it is fully embodied in the concrete casting and provided with a base or bottom (F) of concrete reinforced with plastic and/or steel fibres able to avoid the need for provisional moulds during the installation, said fibres reinforcing the concrete of the bottom (F) having also the function of giving the latter an even limited tensile strength, thus preventing damages and cracks in the bottom which would cause problems in the mechanical resistance and/or fire resistance.
2. The lattice according to claim 1, **characterized in that** it includes an upper girder consisting of three or more stringers (1) with a circular or square cross section laying on a plane parallel to the horizontal plane of the base, said stringers being secured to the upper ends of posts (3).
3. The lattice according to claim 1, **characterized in that** it includes a lower girder consisting of four or more stringers (4) with a circular or square cross section laying on the horizontal plane of the base of the lattice which are made integral with posts (3), said stringers (4) of the lower girder being assembled in pairs, each of them engaging the lower end of the posts (3).
4. The lattice according to claim 2 or 3, **characterized in that** the bottom (F) is provided with a little upper mould consisting of side holding walls (C) to which longitudinal L-shaped section bars (8) supported by

cross bars (7) connected to posts (3) are secured.

5. The lattice according to any claim from 2 on, **characterized in that** several cross irons (5) welded to the lower stringers (4) are provided.
6. The lattice according to any claim from 2 on, **characterized in that** posts (3) have their lower ends together with the lower stringers (4) embodied in the bottom or base (F) of concrete reinforced with plastic fibres.
7. The lattice according to any claim from 2 on, **characterized in that** it is applied directly in factory to the bottom (F) of concrete reinforced with fibres.
8. The lattice according to the preceding claim, **characterized in that** bottom (F) is provided with longitudinal supporting bars (6) which are integral with cross irons (5) welded to the lower stringers (4) and are able to make bottom (F) integral with the lattice.
9. The lattice according to any claim 2 to 5, **characterized in that** in order to allow bottom (F) to be secured to the lattice of the beam, the upper side of bottom (F) is provided with a plurality of nuts (D) "embodied" in the bottom in suitable positions and engaging corresponding bolts (B) which tighten cross irons (5), thus connecting the bottom to the lower stringers of the lattice.
10. The lattice according to the preceding claim, **characterized in that** said bolts are not through bolts but are embodied in the bottom so that the fire protection is ensured.
11. The lattice according to any claim from 6 on, **characterized in that** U-shaped cross brackets (9) are further provided which help to make the bottom integral with the casting of the beam and the relative floor.



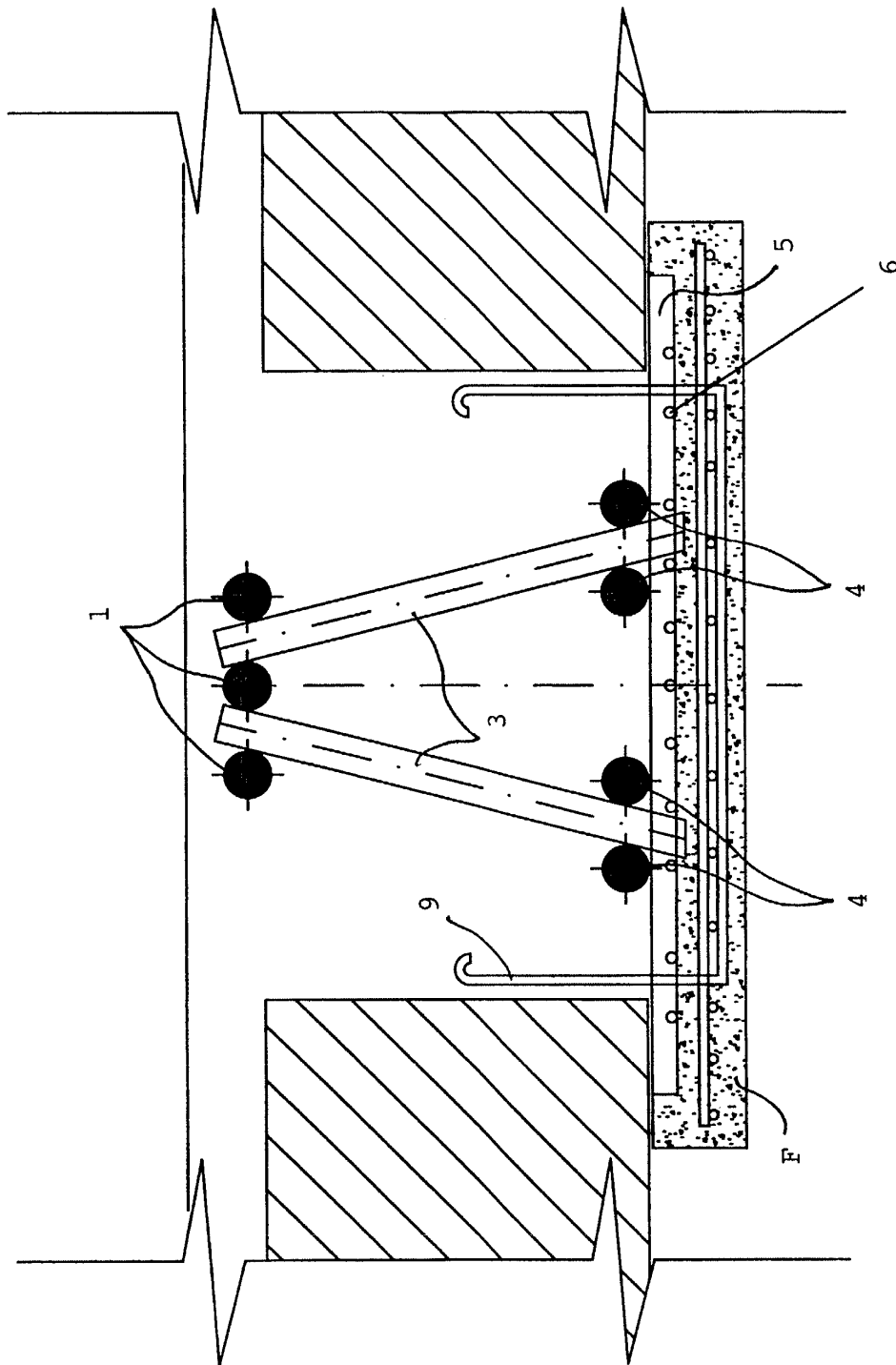


FIG. 2

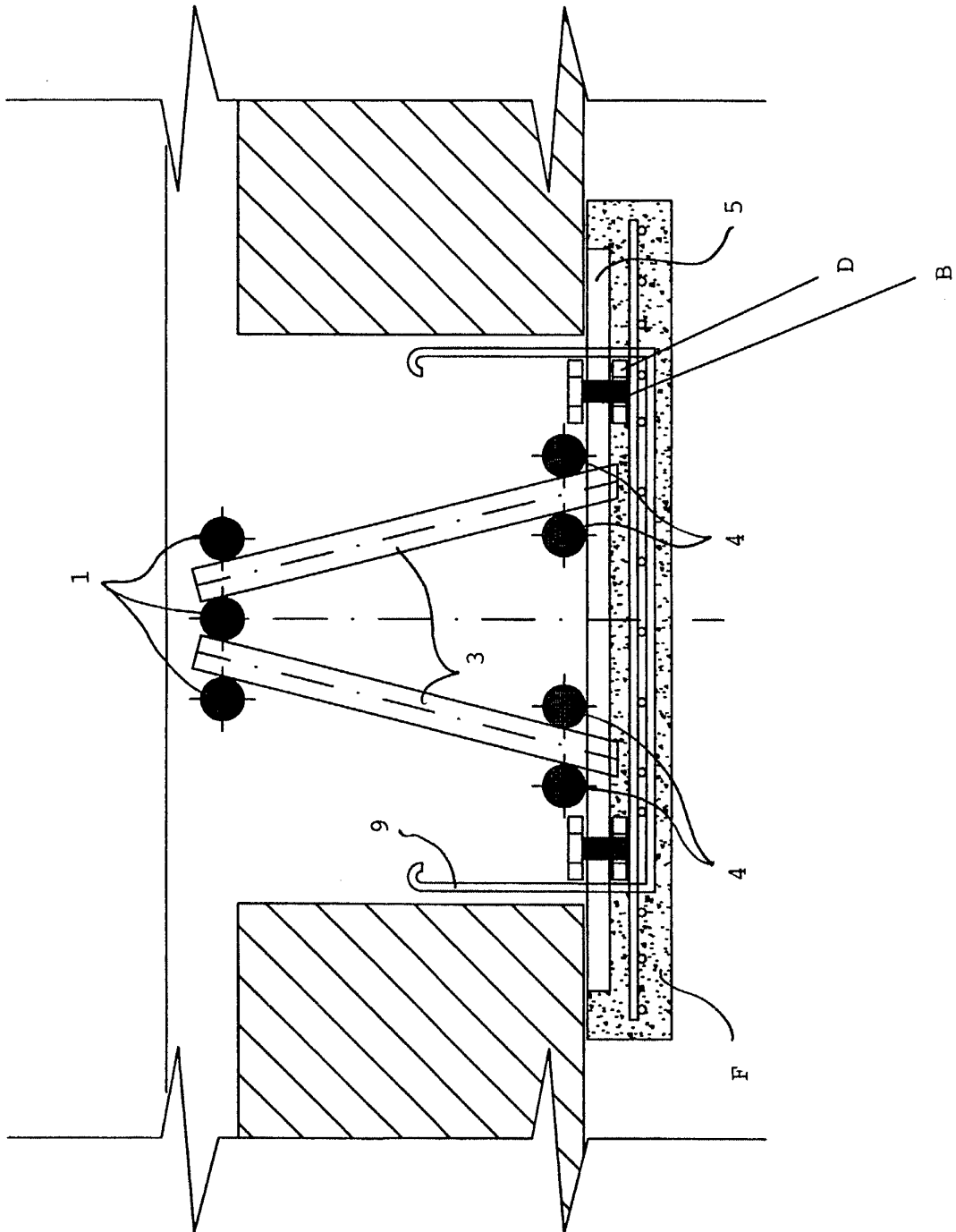


FIG. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 03 42 5377

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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 21 October 2003	Examiner Righetti, R
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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