2nd Istanbul International Inventions Fair
ISIF'17
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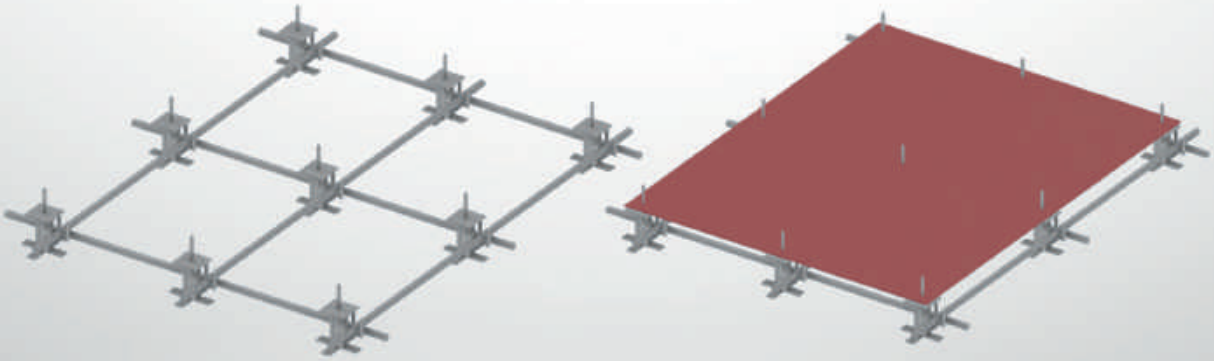
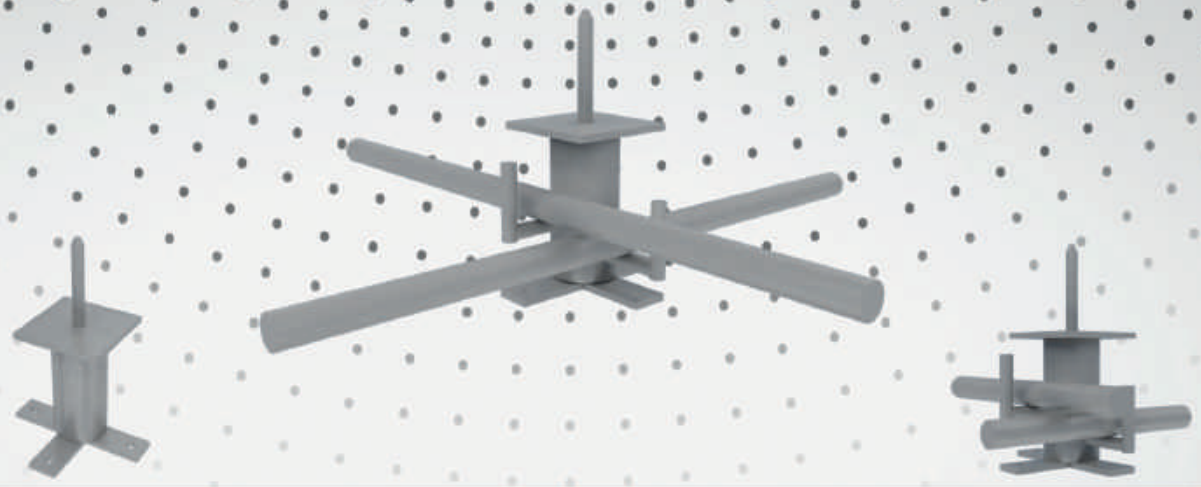
ALT DONATILI EPS ASMOLEN DÖŞEME SİSTEMİ

EPS HOLLOW - TILE FLOOR SLAB SYSTEM WITH BOTTOM REINFORCEMENT



Depreme Dirençli EPS Asmolen Döşeme Sistemi

Earthquake Resistant EPS Hollow - Tile Floor Slab System



ALT DONATILI EPS ASMOLEN DÖŞEME SİSTEMİ

EPS HOLLOW - TILE FLOOR SLAB SYSTEM WITH BOTTOM REINFORCEMENT

SUMMARY

EPS HOLLOW-TILE FLOOR SLAB SYSTEM WITH BOTTOM REINFORCEMENT

This invention is about, using EPS hollow-tiles(E), lifting them up with metal stands(A) and creating a reinforced cocrete slab below EPS hollow-tiles(83) by placing Ø8 bottom distribution reinforcements(2) in the occuring space and providing some technical benefits including earthquake resistance, fire protection for EPS hollow-tiles(E), heat&sound insulation to the whole structure, in one of the floor slab systems used in construction industry, which is known as hollow-tile floor slab system.

DESCRIPTION

EPS HOLLOW-TILE FLOOR SLAB SYSTEM WITH BOTTOM REINFORCEMENT

Technical Field of The Invention

This invention is about, using EPS hollow-tiles, lifting them up with metal stands and creating a reinforced cocrete slab by placing Ø8 bottom distribution reinforcements in the occuring space and providing some technical benefits to the whole structure, in one of the floor slab systems used in construction industry which is known as hollow-tile floor slab system.

The Present Status of the Technique

If we examine the present applications of hollow-tile floor slabs at Turkey or internationally we can see the classical brick hollow-tiles(clay or pumice), EPS-XPS hollow tiles and autoclaved aerated concrete hollow-tiles.

Hollow-tile floor slab is a one or two direction joist floor system consists of a light material between joists known as hollow tiles. It has large but thin beams, between 32-37 cm thickness(the same as concrete slab ceiling) and generally 40-60 cm width(depends on the project). At the top 5-7 cm thickness, there is reinforced concrete slab. The joists with 10-12 cm width that are placed one or two direction, has the same thickness of thin and large beams(and also the concrete slab ceiling). At the end, after concreting and removal of molds, the concrete slab(ceiling) seems flat with no beams visible, has low concrete molding cost and also has various applicaton easinesses.

There are also many disadvantages of Hollow-tile floor slabs which includes risks and dangers against the advantages that’s written above. These are;

Earthquake responses are not good.

Just because it is a frame system which has thin - large beams, its flexural & lateral rigidity are low and not adequate. There will be lateral displacements so the earthquake resistance is poor.

During the earthquake, slab behaves rigid through the joist direction, the loads will be transferred through axles, but the loads that come vertically to joists will not be transferred, just the 5-7 cm thickness slab will do the job which will not be adequate.

Brick(Clay or Pumice) and autoclaved aerated concrete hollow-tiles, has some earthquake behavioural problems just because of the weight and tendency to break and fall to pieces, which could cause severe damages to the ones beneath.

EPS hollow-tiles are not resistant to fire and has a tendency to form droppping flames if B1 Class non-flammable product not selected, and unfortunately most of the contractors choose the cheaper, low quality so-called non-flammable products which could cause dangerous consequences

In order to grab the EPS hollow-tiles and not to fall down, before applying the stucco-work to concrete slab there must be pre-installed rubber nets on the ceiling's below surface, which will cause extra cost and also some applying difficulties that can cause stucco-work to fall down.

At EPS hollow-tiles floor slab application, there will be extra need for special purpose plasters for the fire protection, which will also cause extra cost and the risk of plaster to fall down remains the same as we mentioned above.

At EPS hollow-tiles floor slab application, in order to avoid the suspended decorative instruments like chandeliers to fall down, there will be a need for special application like special purpose plastic anchors, which also will cause extra cost and extra work.

In order to keep the Stucco-work attached to the concrete slab and also for fire protection there is an ongoing application method of placing 4-5 cm blocks(clay or pumice) under EPS hollow-tiles through the last few years. This method doesn't solve the problem because they also have a poblem of breaking off from reinforced concrete floor slab and falling down after removing molds from below, and the same problem occures also during an earthquake which is a danger for the people below.

The Technical Problems that The Invention Aims to Solve

A total and complete fire protection of EPS hollow-tiles can be achieved.

Risk of forming dropping flames can be completely eliminated even if low quality EPS hollow-tiles are used for application.

There won't be a need for special purpose plasters in order to achieve fire protection for EPS hollow-tiles, which will save the extra cost.

Just because it will be a complete sandwich slab, the heat and voice transfer between floors will be highly limited and a highly effective insulation of heat&sound will be achieved.

The low flexural & lateral rigidity problem of frame systems, which consists of thin-large beams that we mentioned above previously, will be highly eliminated just because the total reinforced concrete slab thickness will be increased.

The risk of broken off pieces to fall down from heavy hollow-tiles such as clay from above concrete slab under effects of an earthquake, will be eliminated and injuries which could cause serious consequences will be prevented.

The below 6 cm reinforced concrete slab which is created to help the above 5-7 cm slab to compensate the effects of earthquake loads and transfer the earthquake loads, will provide a serious earthquake resistance to all floor slabs and to the whole structure.

The problem of plasters and stucco-work not to strongly grab the EPS hollow-tile floor slab and to fall down, will be completely eliminated by the below created reinforced concrete slab.

Just because the nearly 25mm below part of the 3 cm nails, which are used in order to attach the metal stands to molds, will hang down from above and will be visible when the molds are removed after concreting, it will supply an extra adhesion to the stucco-work applied to the concrete slab. The above mentioned parts of the nails can be leaned to sides by the stucco-work labors by hammering, after that, the stucco-work can be applied. With this application of the nails, they will act like some kind of a reinforcement within stucco-work which will give an extra grabbing and adhesion to the stucco-work applied onto the concrete slab, and the tips of the nails will stay inside the stucco-work also, causing no rust to the plaster layer applied after the stucco-work.

The mounting problem of suspended decorative instruments like chandeliers to EPS hollow-tiles, will be eliminated by the below created reinforced concrete slab, and there won't be a need for a special application like special purpose plastic anchors which could cause extra cost and work.

When suspendend ceiling application needed, the metal stands which will be seen under the concrete slab after the molds are removed, will be a ready&built anchorage for welding and attaching the parts and instruments of suspended ceiling to the concrete slab and this will provide easiness and lower the cost of the suspended ceiling work.

The weight of the classical brick hollow-tiles(clay or pumice) to one square meters is approximately 120 to 125 Kg, and the weight of the new system will be approximately 132 Kg(Taking all parts and instruments of system and also rebars into account), which means that it won't add a considerable weight to the whole structure, when compared to classical system.

Definitions of Drawings

Drawing -1 Perspective View of Metal Stand

Drawing -2 Front View of Metal Stand

Drawing -3 Front View of Swivel Bracelet

Drawing -4 Side View of Swivel Bracelet

Drawing -5 Perspective View of Three Legged Metal Stand

Drawing -6 Perspective View of Three Legged Metal Stand Without Moving Parts

Drawing -7 System Section View Before Concreting

Drawing -8 System Section View After Concreting

Drawing -9 Bottom View of PE(HDPE) Plate

Drawing -10 Perspective View of EPS Hollow-Tiles & Metal Stands Together

Drawing -11 System Applied Sample View of Formwork Plan

Explanations of References and Numbers on Drawings

A- Metal Stand

B- Three Legged Metal Stand

C- Three Legged Metal Stand Without Moving Parts

D- PE(HDPE) Plate

E- EPS Hollow-Tile

1- ø10 Rebar Body

2- ø8 Bottom Distribution Reinforcement

3- Metal Sheet Leg

4- Metal Stand Sheet Cap

5- Swivel Bracelet

6- Metal Hook for Rebars

7- Metal Top Pin

8- Nail Hole for Metal Sheet Leg

81- Above Distribution Reinforcement

82- Reinforced Concrete Slab Above EPS Hollow-Tiles

83- Reinforced Concrete Slab Below EPS Hollow-Tiles

91- Hole for Metal Top Pin

111- Thin-Large Beams

112- Joist

Dimensions over Drawings

a- 30 mm
b- 10 mm
c- 5 mm
d- 5 mm
e- 40 mm
f- 20 mm
g- 20 mm
h- 50 mm
i- 40 mm
j- 30 mm
k- 19 mm
l- 11 mm
m- 19 mm
n- 13 mm
o- 70 mm
p- 190 mm
r- 60 mm
s- 235 mm
t- 185 mm
u- 500 mm
v- 400 mm
y- 16 mm

Definition of the Invention

If we want to describe the details of the system;

We are making the definitions over the classical, most used 32 cm Hollow-Tile floor slab. Technically, the application can be made the same way with different thicknesses of slabs. All dimensions&measurements are given in milimeters on drawings. The dimensions, in definition and on drawings are recommended values and can be given different values in accordance with the rules and principles of the invention and the types&sizes of materials' that are used.

Above, 7 cm Reinforced Concrete Slab Above EPS Hollow-Tiles(82) and below, EPS Hollow-Tiles(E), at the bottom 6 cm part, there can be found the Reinforced Concrete Slab Below EPS Hollow-Tiles(83) with metal stands(A) and metal hooks for rebars(6) with Ø8 bottom distribution reinforcement(2) placed in two directions on horizontal plane. With joists(112) and thin-large beams(111) applied, floor slab will be ready for concreting.

However this system is defined for EPS hollow-tile(E), it can be applied with XPS hollow-tile the same way also. Only the material changes and it would cause no difficulties or different application techniques.

In order to place the metal top pin(7) to the PE(HDPE) plate(D), there are 4 mm diameter holes made on PE(HDPE) plates(D) according to dimensions&details shown in Figure-9 by proper punch or drill tools. After that, hole for metal top pin(91) is created.

EPS holow-tiles(E) are attached to 4 mm thickness, high density polyethylene(HDPE) plates(D) with the same sizes as EPS hollow-tiles(E) by silicone adhesive according to dimensions shown in Figure-9, in order to get them ready to be placed over metal stands(A).

Metal stand(A) production is made by welding of various metal parts together according to Figure-1 and Figure-2. The steps of this production are detailed below;

Ø10 rebar body(1) is made by cutting Ø10 rebar to 6 cm.

Swivel bracelet(5) is made by cutting 19 mm diameter and 3mm wall thickness steel pipe to 4 cm in order to get the ø8 bottom distribution reinforcement(2) placed to desired directions, with the ability to turn around its axle in both clockwise&counter clockwise. After that, swiwel bracelet(5) is placed over ø10 rebar body(1), having the ø10 rebar body(1) inside itself.

Metal hook for rebars(6) is made by bending a 4 mm diameter 40 mm length nail into “L” shape, and its head side is welded onto swivel bracelet(5) according to dimensions&details shown in Figure-3 & 4.

Metal sheet leg(3) is made by cutting 2 mm thickness sheet according to dimensions&details shown in Figure-1 & 2 and welding ø10 rebar body(1) onto it. After that, nail holes for metal sheet leg(8) are made onto metal sheet legs(3) for 3 cm nails according to dimensions&details shown in Figure-1 & 2 with proper punch or drill tools.

Metal stand sheet cap(4) is made by cutting 2 mm thickness sheet according to dimensions&details shown in Figure-1 & 2 and welding it onto ø10 rebar body(1).

Metal top pin(7) is made by welding 4 mm diameter 40 mm length nail onto metal stand sheet cap(4) by the head side of the nail.

<u>The principles of application are detailed below;</u>

First of all, placing of metal stands(A) on their places according to directions of EPS hollow-tiles(E) that are drawn by chalk or a proper pen over molds are done.

As a template, first an EPS hollow-tile(E) with its metal stands(A) is nailed from its nail holes for metal sheet leg(8) over molds by 3 cm length nails.

Then, EPS hollow-tile(E) is seperated from its metal stands(A) and the same procedure above repeats for alongside EPS hollow-tiles(E).

After all EPS hollow-tiles(E) are lined respectively, placing of metal stands(A) over molds are successfully made, without misplaced nail holes for metal sheet leg(8).

Metal stands(A) which are placed in the middle of EPS hollow-tiles(E) doesn’t need to be nailed to molds.

Metal stands(A), which are at the joining edges of alongside lined EPS hollow-tiles(E) are placed with a three legged metal stand(B) and a three legged metal stand without moving parts(C) put back to back according to details shown in Figure-5 & 6.

One of these legs are placed with swivel bracelet(5) and metal hook for rebars(6), the other is placed with only metal stand sheet cap(4) in order to place the ø8 bottom distribution reinforcement(2) properly.

Metal stands(A) which are below EPS hollow-tiles(E) are placed one with metal hook for rebars(6) and one without, respectively in both two directions on horizontal plane , so ø8 bottom distribution reinforcements(2) will touch the metal hooks for rebars(6) between 40-45 cm distance, without a problem of bending downwards. By this, an economy of manpower for placing ø8 bottom distribution reinforcement(2) would be made.

After placing of metal stands(A), ø8 bottom distribution reinforcements(2) are put onto metal hooks for rebars(6) in both directions on horizontal plane.

The placing distance between Ø8 bottom distribution reinforcements(2) on metal stands(A), are made between approximately 18-25 cm in both vertically and horizantally according to details&dimensions of PE(HDPE) plate(D) shown in Figure-9. It will also match the requirement of hollow-tile floor slab's distribution reinforcements' placing distances, which is minimum ø8/250 mm.

After placing of rebars, EPS hollow-tiles(E), which are attached onto 4 mm thicknes PE(HDPE) plates(D) with same dimensions by silicone adhesive, are placed over metal stands(A) by holes for metal top pins(91) in wanted directions.

EPS hollow-tiles(E) that are designed as 40 cm x 50 cm can be produced as 40 cm x 100 cm for large areas if wanted, it will provide an easiness for application, so there will be an economy of manpower and total cost.

After all these applications are done, joists(112) and thin-large beams(111) of hollow-tile floor slab are fabricated, then, above distribution reinforcements(81) are placed in order to make the application ready for concreting.

While concreting, the concrete can easily pass through the joists(112) and thin-large beams(111), so there will be reinforced concrete slab below EPS hollow-tiles(83) created at the bottom 6 cm of hollow-tile floor slab.

<u>The Application of the Invention to Industry</u>

The parts and fragments of EPS hollow-tile floor slab system with bottom reinforcement, which aims to get solutions for above mentioned problems and also provides technical benefits, can be easily produced and are applicable to industry, and also the system itself can be easily applicated to the construction industry which it belongs to.

FIGURE 1

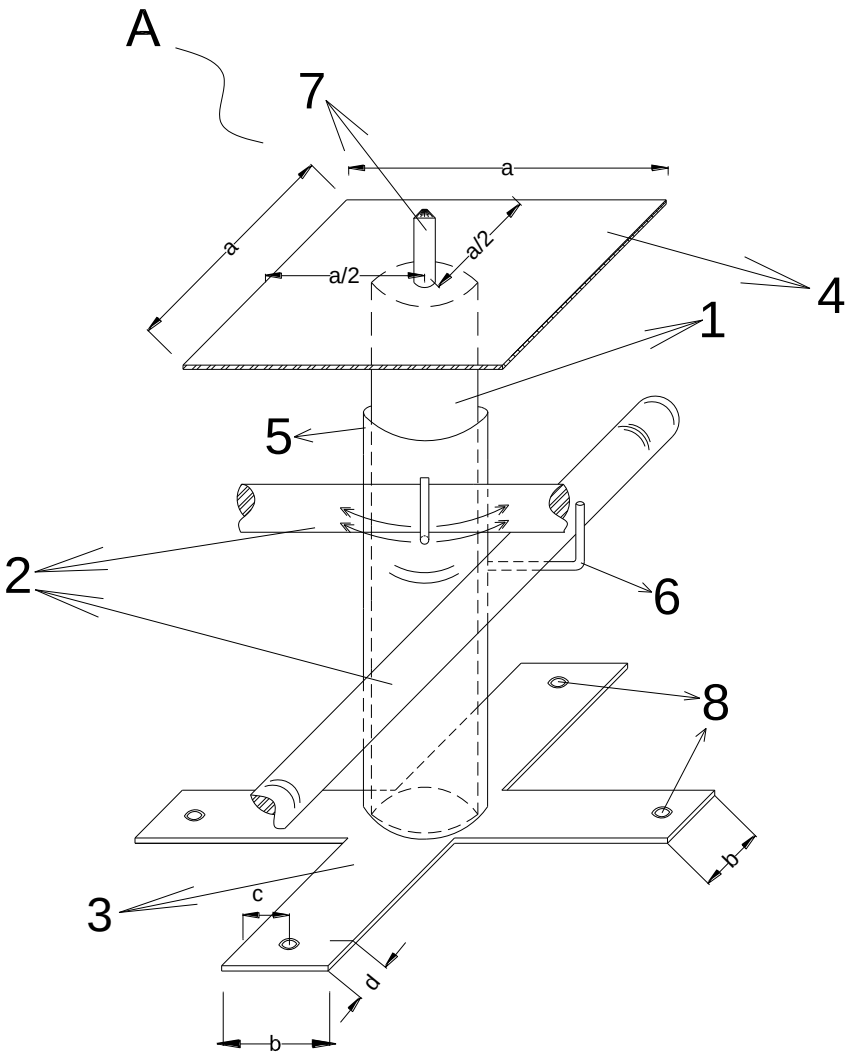


FIGURE 2

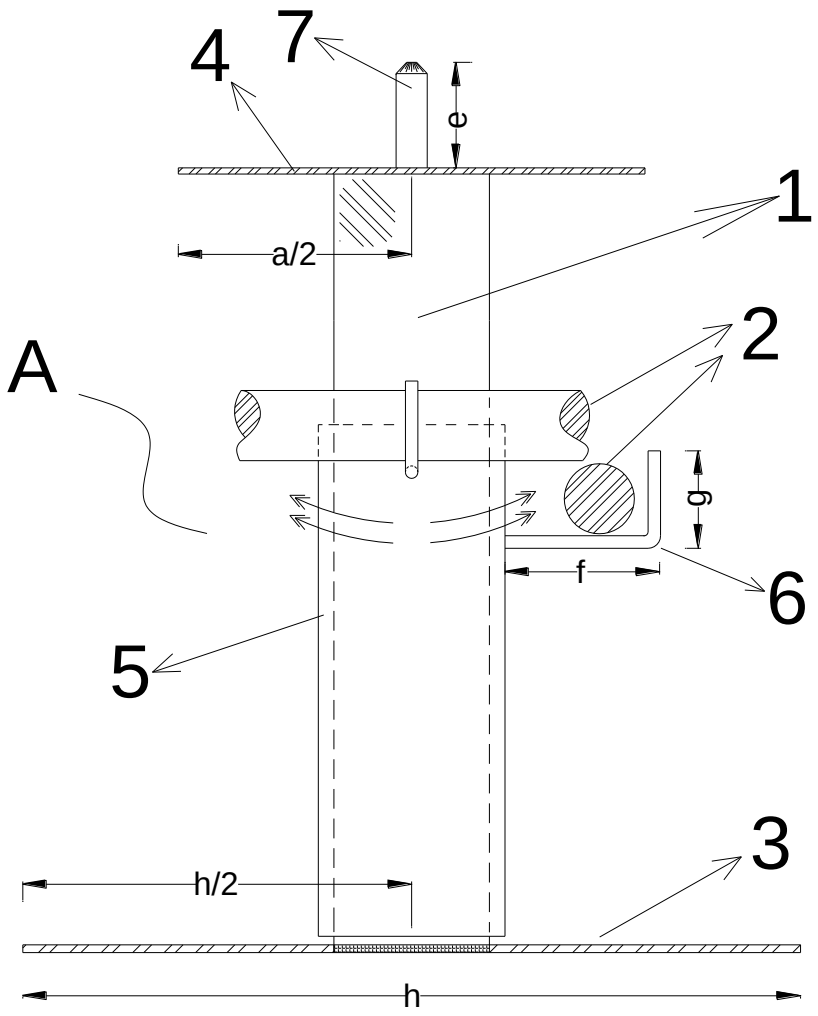


FIGURE 3

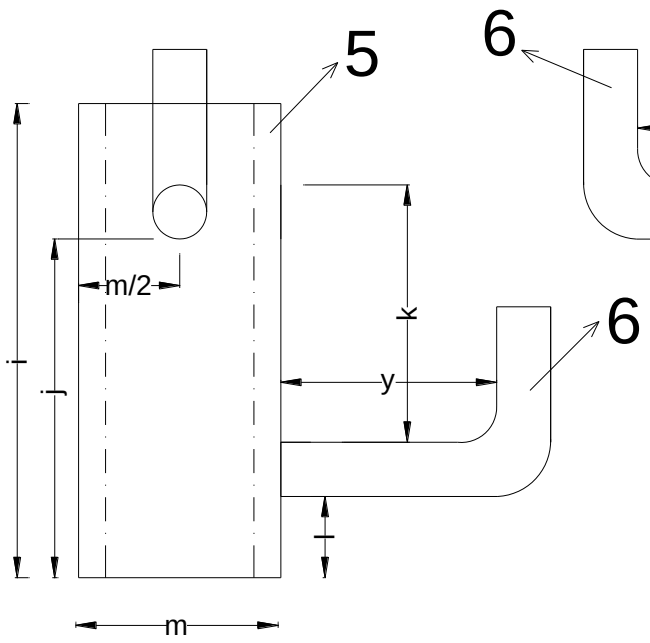


FIGURE 4

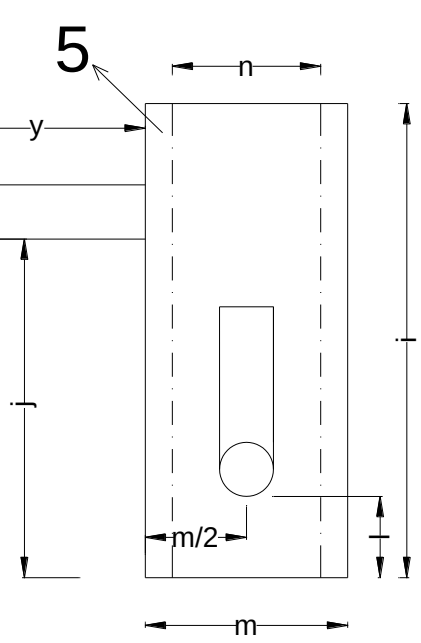


FIGURE 5

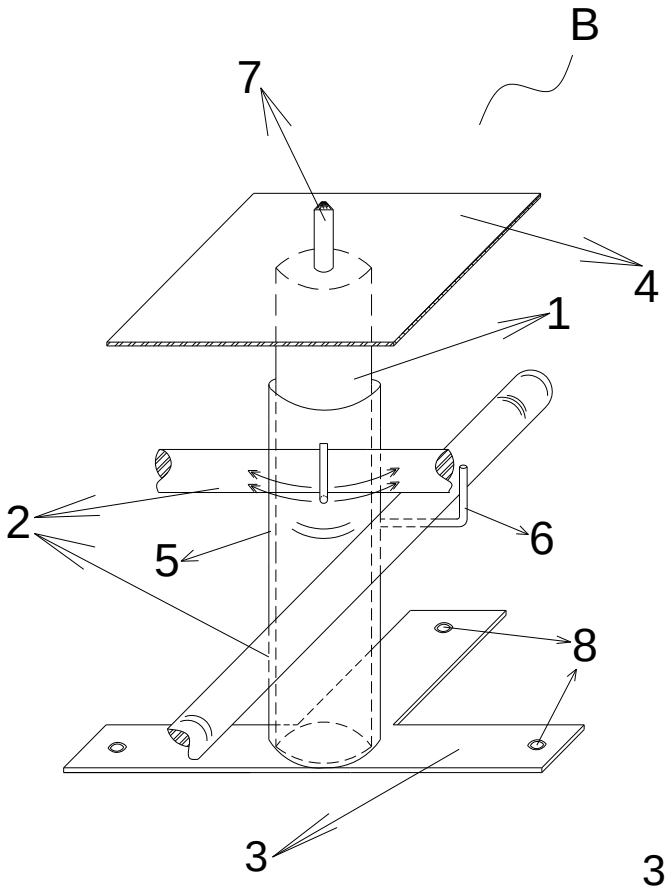


FIGURE 6

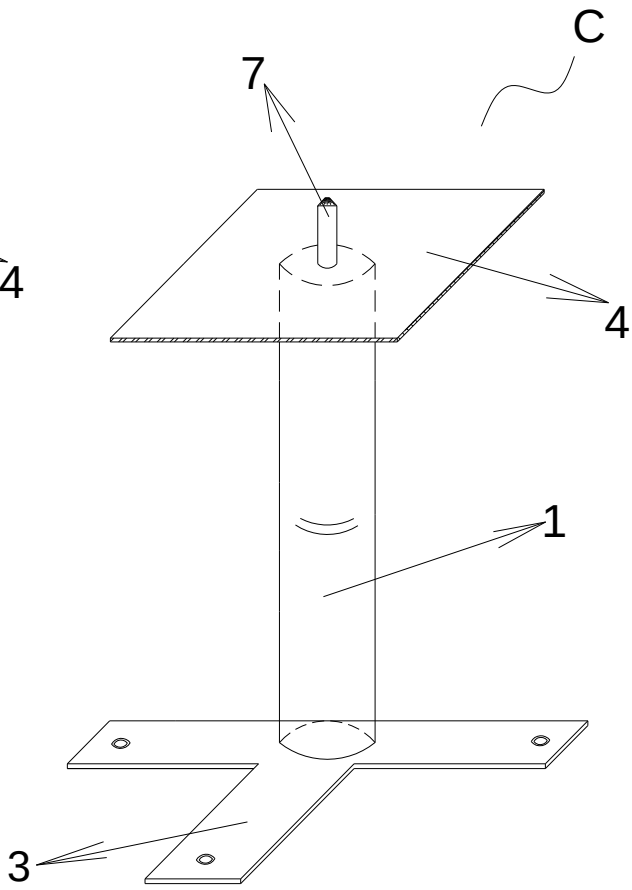


FIGURE 7

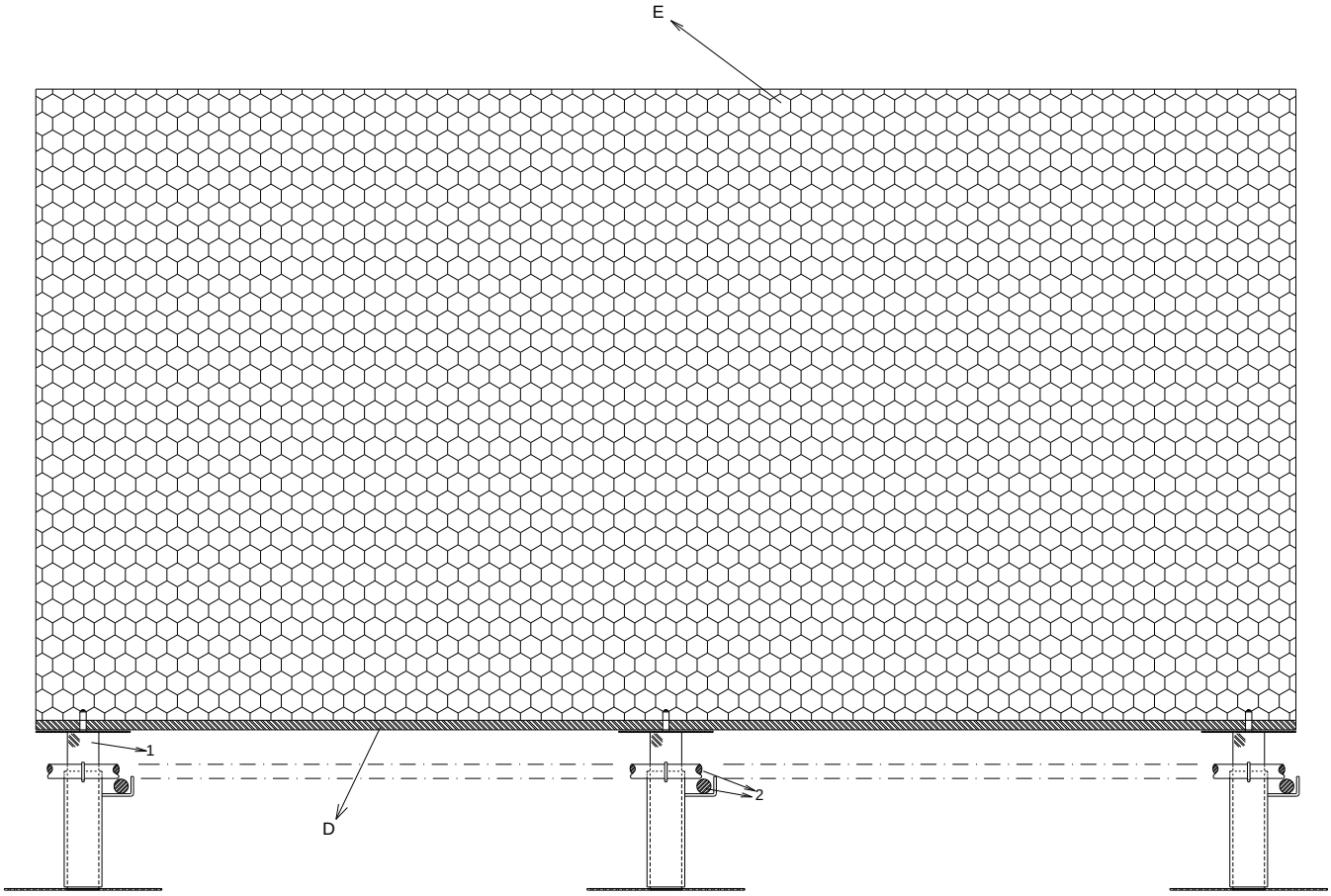


FIGURE 8

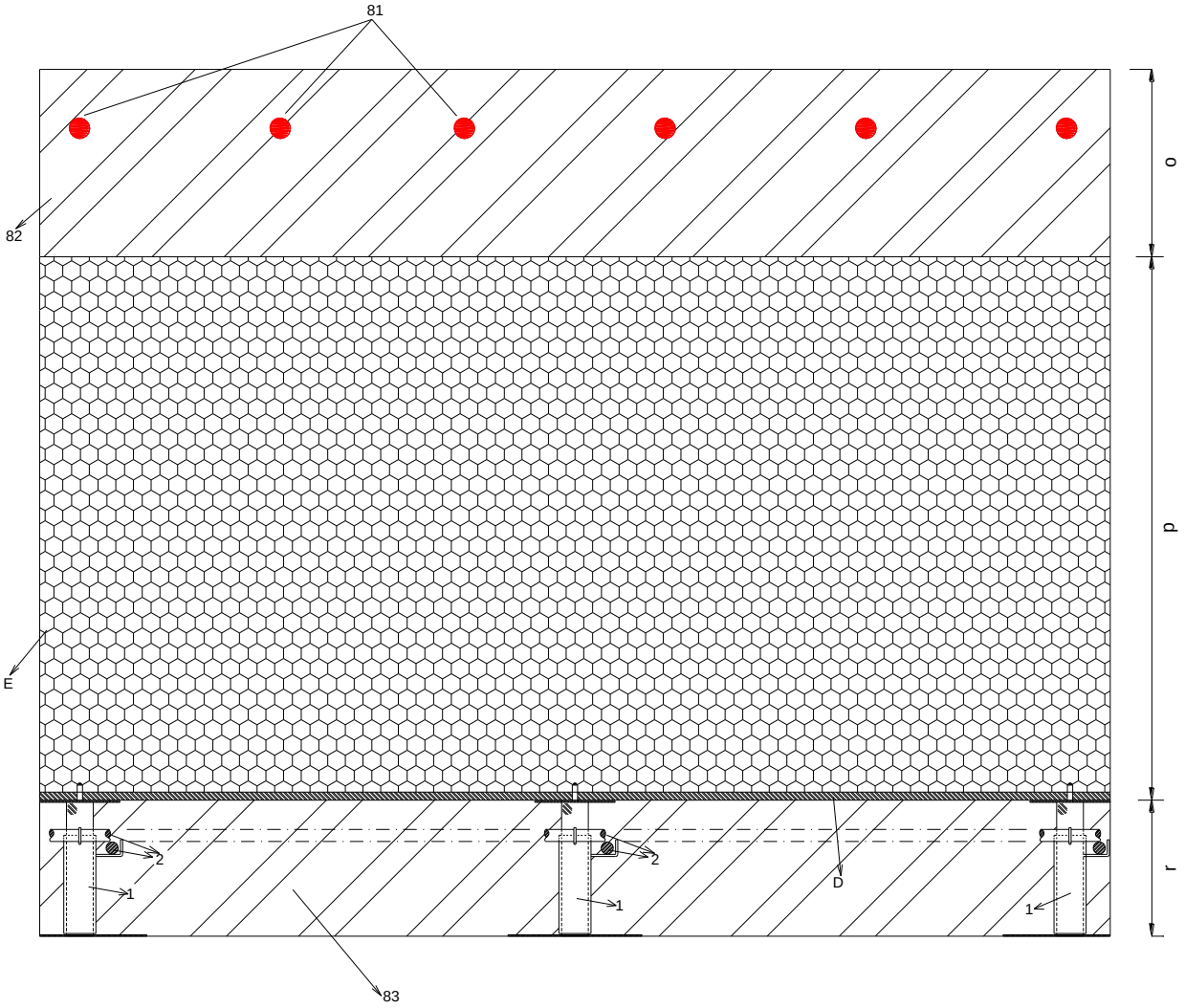


FIGURE 9

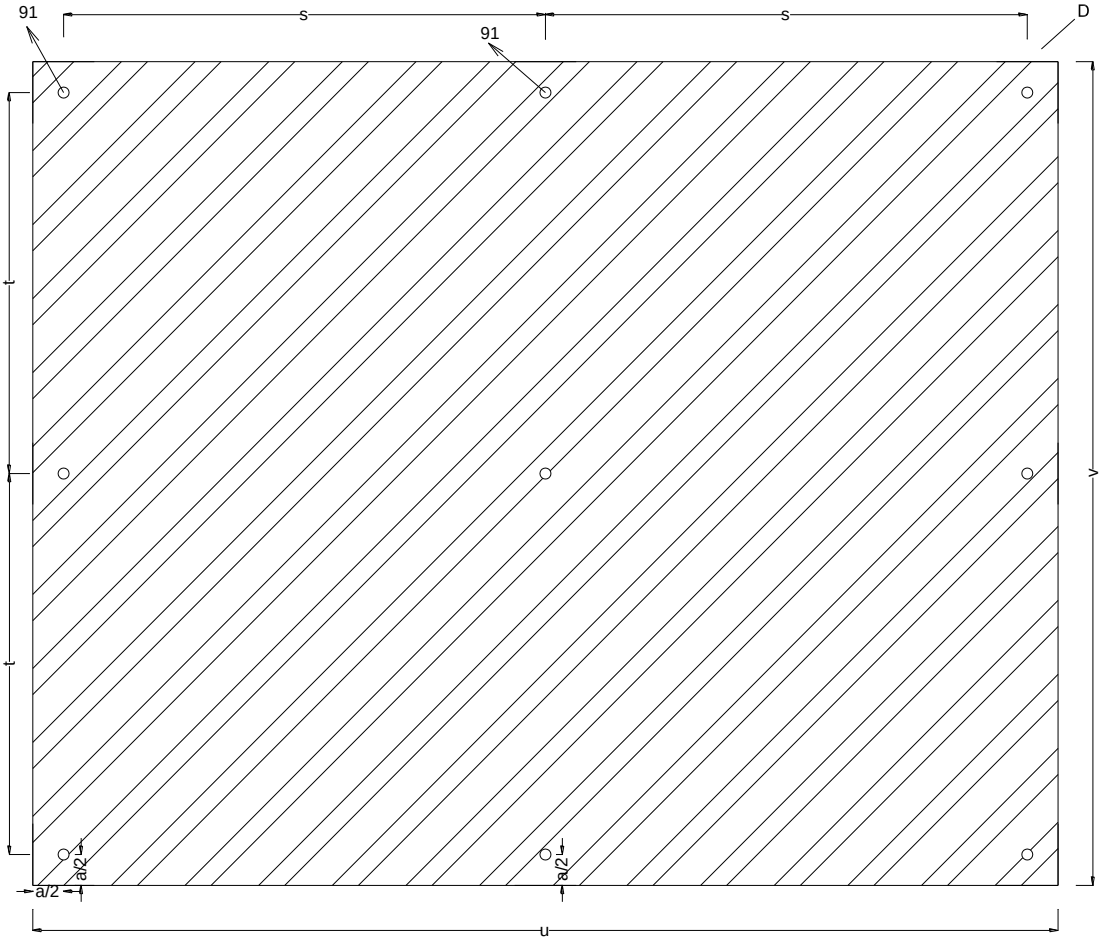


FIGURE 10

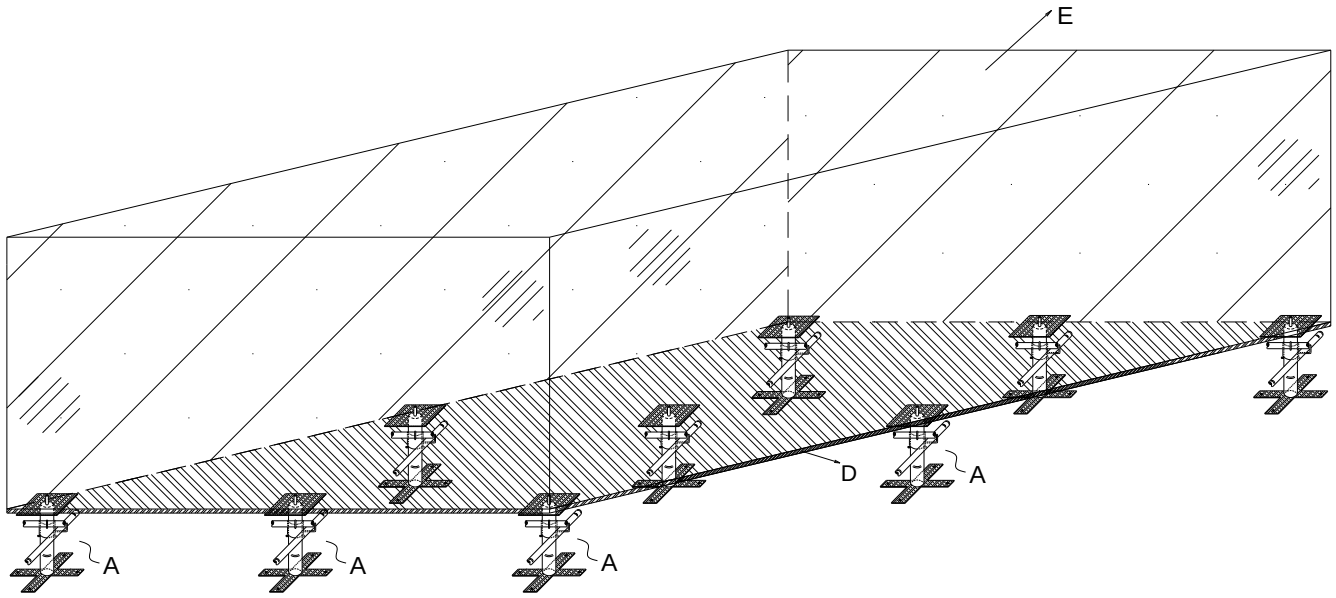


FIGURE 11