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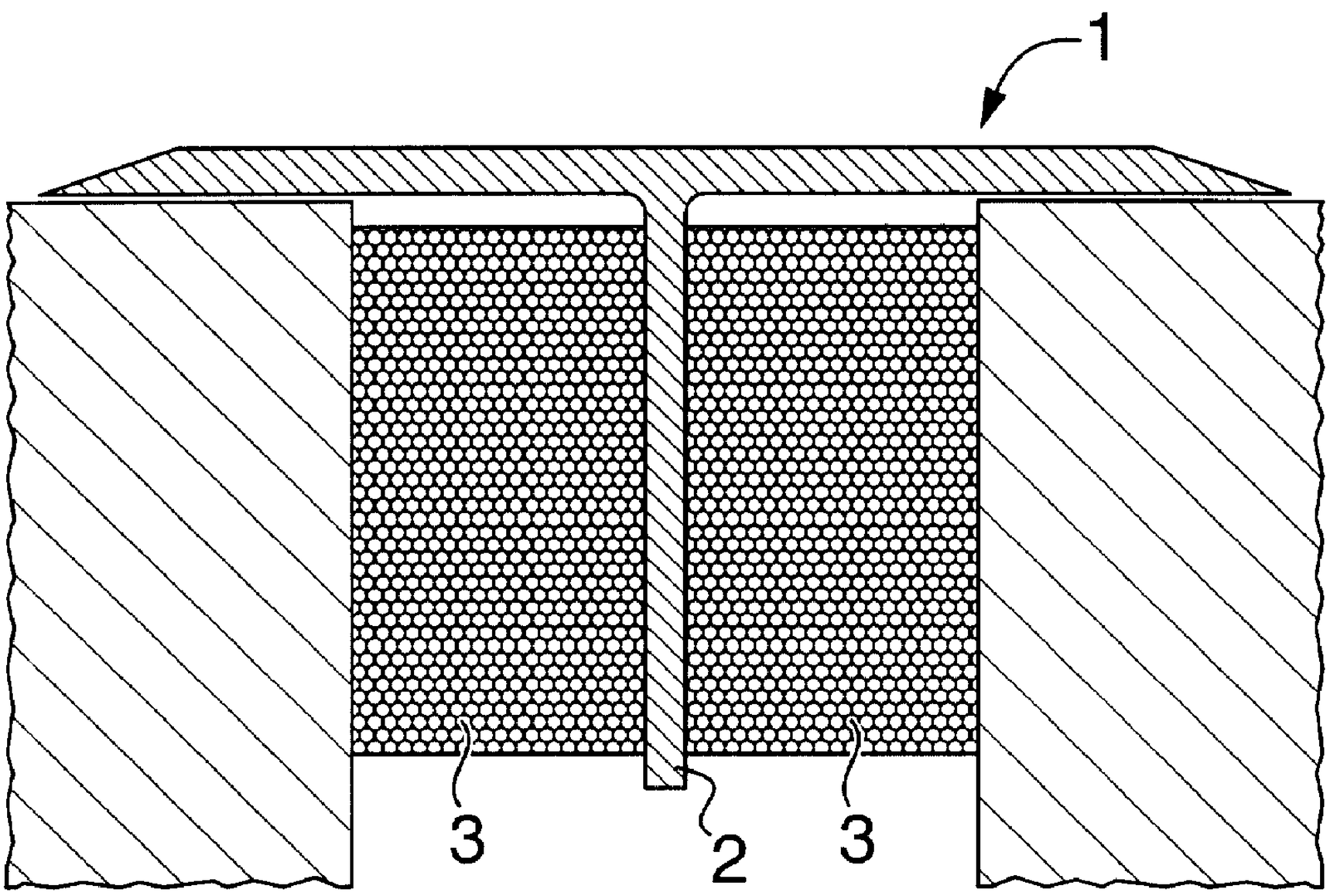


(57) Abrégé/Abstract:
A seismic/expansion joint seal and cover comprises a cover plate, and a central spine extending downwardly from said cover plate. At least one layer of a resilient compressible foam sealant is provided on each side of the spine.

ABSTRACT

A seismic/expansion joint seal and cover comprises a cover plate, and a central spine extending downwardly from said cover plate. At least one layer of a resilient compressible foam sealant is provided on each side of the spine.

EXPANSION AND SEISMIC JOINT COVERS

Background of the Invention

The present invention relates to the field of seismic and expansion joint covers.

Field of the Invention

Expansion and seismic joint covers are, essentially, covers or mechanism devices to cover expansion and seismic joints to provide pedestrian or vehicular passage over a joint, and provide a smooth transition from one slab to another, while not inhibiting joint movement or restricting this movement as a result of the mechanism employed. Generally, the mechanisms employed to position the expansion /seismic joint cover over the joint are either of a mechanical nature or make use of an elastic and recoverable element to provide the impetus (spring-memory or return-force) to maintain the joint cover in a median position relative to the joint movements occurring. These movements may be experienced in all three planes, such as expansion and contraction, deflection and shear of the joint.

Various mechanisms are thus employed to deal with this three directional movement and the mechanism to stabilize the expansion joint cover and restore it into a "neutral position" relative to the movement that has taken place.

Figure 1 is a typical prior art expansion/seismic joint cover manufactured by Migua Fugensysteme GmbH & CO. KG, in Germany particularly for Seismic Joints. As can be seen, this has a cover plate extending across the width of the joint to allow for both vehicular and pedestrian traffic. As a self-centring mechanism, it utilizes the recovery ability of elastomeric extrusions. These extrusions exert the return force required to reposition the cover plate as a result of movements occurring in the joint. The dotted line, seen midway through the joint, is a horizontal bar set across the width of the joint to act as a stabilizing element for the elastomeric extrusions in the centre. It is there to add stability to the joint and

allow the central (metallic) part of the joint to be fastened to the cover plate, prior to its (the horizontal bar) removal. This expansion/seismic joint cover is intended to be watertight. The waterproofing is confined substantially to the upper surfaces of the joint immediately below the cover plate. However, once the horizontal (stabilizing) bar is removed, remedial work on the joint is difficult as removal of the cover plate will allow the central portion of the joint to collapse as it is no longer supported (by the horizontal bar).

Figures 2 and 3 show an expansion/seismic joint made by Watson Bowman Acme Corp., in the U.S.A. In this design, the cover plate is attached to a scissors-type mechanical device immediately below it. The scissors-type mechanism is similar to a "pantograph" or expanding scissors type hot-plate mat. In other words, a scissors-type movement contained between nylon bearings and running the length of the joint. In this type of mechanism, an increase or decreases in the joint width will result in the repositioning of the cover plate along the centre line. However, this expansion/seismic joint cover is not watertight immediately below the cover plate - as is the case with the expansion/seismic joint cover in Figure 1. Thus, an elaborate system of gutters attempts to provide a solution to the watertight issue. The joint, in effect, suffers from three major problems. Firstly, an inability to inspect and clean out the joint other than by removal of the whole joint assembly (the scissors mechanism prevents direct access into the joint below the cover or slide plate). Secondly, the ingress of waterborne salts into the joint will seriously affect the long term performance of the self-centring mechanism. Thirdly, the joint design lacks "watertight properties".

The above prior art illustrates two objects of the present invention. The first is that the cover plate should be removable to permit inspection of the joint below. The second object is that the joint should be watertight at, or immediately below, the line of waterproofing that is applied to the deck. This will ensure a waterproofing line of integrity across both decks, on either side of the joint, and through the actual joint itself.

It can be seen from Figures 1 and 2 that the emphasis, until this point in time, has been to utilize either a mechanical mechanism or elastomeric extruded profile as the correcting or centring element required to maintain the cover plate in its correct position relative to joint movement occurring beneath it. In other words, the cover plate cannot be allowed to merely sit on the surface of the joint but must be guided to maintain a central position or neutral position relative to the joint movement occurring.

In the present invention, the use of an impregnated foam sealant as an elastic recovery or return force mechanism has the dual advantage that the system can remain watertight immediately below the level of the cover plate while at the same time the impregnated foam sealant acts as the return force or stabilizing element for the cover plate.

In the present invention, then, the present invention relates to a seismic/expansion joint seal and cover comprising a cover plate, a central spine extending downwardly from said cover plate, and at least one layer of a resilient compressible foam sealant on each side of said spine.

Brief Description of the Drawings

In drawings that illustrate the present invention by way of example:

Figure 1 is a cross-sectional view of a prior art seismic/expansion joint cover made by MIGUA;

Figure 2 is a cross-sectional view of a prior art seismic/expansion joint cover made by Watson Bowman;

Figure 3 is a cross-sectional view of a first embodiment of the present invention;

Figure 4 is a cross-sectional view of a second embodiment of the present invention;

Figure 5 is a cross-sectional view of a third embodiment of the present invention;

Figure 6 is a cross-sectional view of a fourth embodiment of the present invention;

Figure 7 is a cross-sectional view of a modified form of the embodiment shown in Figure 5;

Figure 8 is a cross-sectional view of another modified form of the embodiment shown in Figure 5;

Figure 9 is a cross-sectional view of a further modified form of the embodiment shown in Figure 5; and

Figure 10 is a cross-sectional view of a modified form of the embodiment shown in Figure 6.

Detailed Description

Figure 3 illustrates the simplest form of the present invention. This essentially consists of a T-piece that acts as both the cover/slide plate and mechanism for the self-centring of the cover plate. The leg of the T extends into the joint. Its length is dependent on joint dimensions and the size of pre-compressed expanding foam sealant placed on either side of the leg. As can be seen from Figure 3, impregnated expanding foam sealant such as 20H™ System or GREYFLEX™ from Emseal Corporation is placed on either side of the leg of the T. Thus, the system is in equilibrium if the expansion force of the impregnated expanding foam sealant to the left of the T is equal or equivalent to that being exerted by the impregnated expanding foam sealant to the right of the T. The system, such as, can be considered "at rest". Should the joint experience an extension due to a decrease in temperature or as a result of other movements, the impregnated expanding foam sealant will have to fill a greater void or distance between the faces of the joint. Due to its expanding nature, it will do so in relation to the movement experienced and thus come to a new "rest" position. In this new rest position, forces to the left of the T will balance those to the right of the T thus enabling the cover plate/slide plate to remain centred over the joint.

However, the Figure 3 configuration does not allow for an inspection of the joint beneath the slide plate as the T section is one solid piece. Therefore, provision must be made,

as in Figure 4 onwards, for the ability to remove the top cover plate/slide assembly from that portion contained within the throat of the joint. This is achieved as shown in Figure 4. In addition, the section contained in the joint may be provided with upper and lower base flanges (as shown) to position the impregnated expanding foam sealant more accurately and, in addition, enable the vertical element to be secured to the cover plate/slide plate.

Figure 5 is an alternate embodiment that allows for the removal of the cover plate/slide plate. This design allows for the fact that irregularities in joint construction may exist in regard to both the horizontal and vertical joint sizing parameters. In other words, joint sides may not be perfectly parallel to one another or equidistant from one another. The joint design criteria may not be met during actual field construction of the joint. In this case, the expansion of the impregnated expanding foam sealant on the left of the T piece may not be perfectly matched with the expansion characteristics of the impregnated expanding foam sealant on the right hand side of the T piece. This will be due to joint irregularity, in width, vertical, and horizontal alignment, occurring during the construction process. This situation should be corrected to allow the cover plate/slide plate to remain (slide) in contact with both opposing slabs that form the upper surface of the joint. The configuration of figure 5 will allow, by tightening of the respective screws, the ability to pull down the slide/cover plate to the degree that is necessary and so enable it to rest on one or other side of the joint in the correct manner.

The embodiment of figure 6 is an adaptation of that shown in Figure 5. However, in this case, the means to adjust the final position of the cover plate/slide plate is moved to immediately below the cover/slide plate.

It will be observed that the upper base flange in the embodiment of Figure 6 is incorporated in an angulated portion that is adjustable relative to the central spine by means of vertically extending slots in the spine and/or the angulated portion, through which bolts

extend, which can be tightened after the angulated portion is at the correct height. It will be appreciated that in selecting the material from which the angulated portion is to be fabricated, consideration should be given to flexibility, since a joint may be somewhat uneven along its length.

Referring now to Figure 7, modifications to enhance the water resistance of the joint directly beneath the cover plate are illustrated. The watertight properties of an impregnated expanding foam sealant both to the left and right of the T piece may be enhanced by the creation of a double seal at the upper surface level of the impregnated expanding foam sealant closest to the cover/slide plate. This may be achieved through the use of a low modulus or ultra low modulus sealant being applied to this surface layer. The use of an ultra low modulus sealant (such as Dow Corning 890 RTV Silicone Sealant) will provide the surface of the impregnated expanding foam sealant with a closed cell finish and additional sealant layer which will reduce the depth requirement of the impregnated expanding foam sealant beneath the low modulus sealant. In addition, the use of the correctly chosen wet sealant adhered to both the central spline and joint substrate will enhance the elastic properties of the double seal configuration. In the Figure 7 configuration, the impregnated expanding foam sealant will act as the primary return force or memory, while the ultra low modulus sealant will act as the primary watertight barrier, while also enhancing the return force or memory of the composite seal. It can be seen from this configuration that if this ultra low modulus sealant is applied in a self-levelling format, after the impregnated expanding foam sealant has been placed in the joint and allowed to recover to joint size, that a watertight element is obtained in terms of adhesion to the substrates.

The Figure 7 installation is effected firstly by the installation of the T piece with impregnated expanding foam sealant applied to both sides of the T piece or central spline. This assembly is adhered to the joint faces by means of a suitable adhesive and allowed to recover from its pre-compressed delivery and installation format. After recovery of the pre-

compressed impregnated expanding foam sealant, the ultra low modulus self-levelling sealant (or other suitable sealant) is applied to the top exposed surface of the impregnated expanding foam sealant on either side of the central spline. Once the sealant has been applied, a level may be applied across the top surface of the joint to correctly align the brackets and cover plate/slide plate. The cover/slide plate is then screwed into position.

Figure 8 shows a further modification and makes use of a prepackaged product consisting of layers of compressible and non-compressible foam, with a sealant applied to the top surface thereof, sold under the trade mark COLORSEAL, by Emseal Corporation. In the case of the use of the Colorseal product, a finishing of the detail will require that a corner or "heel" bead be applied between the substrate and the Colorseal to effect the proper chemical termination and adhesion of the top sealant to the substrate.

It can be seen from Figures 7 and 8 that the system can be extended to utilize interleaving layers of impregnated expanding foam sealant and closed cell foam or other resilient material to assist in the recovery and stability of the composite structure that is placed on either side of the central spline. In other words, a composite matrix may be utilized as the return or recovery force on either side of the central spline. The prime requirement is that the material to be inserted into the joint is capable of being pre-compressed and holding this pre-compression during the time taken to install the material correctly into the joint. So, a series of both differing densities of impregnated expanding foam sealant and closed cell foam may be used to provide the recovery force. This recovery force and the composition of the structure will, to a large extent, depend on the size (width) of joint to be formed together with the performance characteristics required from the joint (such as seismic or thermal movement characteristics, etc.)

It will be observed from Figures 9 and 10 that further combinations are possible. Figure 9 illustrates a form of the present invention utilizing a split central T-piece similar to

that shown in Figures 5 and 7, with a layered compressible and non-compressible foam layers, available from Emseal Corporation under the trade mark BACKERSEAL applied on each side of the T-piece, and a low modulus wet sealant applied in the field on the top surface of same, after it has expanded on each side to centre the T-piece.

Figure 10 illustrates a modification of the Figure 6 form of the invention, described in full above, but utilizing the COLORSEAL product as a centring means on each side of the T.

The cover/slide plate construction may be chosen from the metallic group of materials including stainless steel, bronze, brass, aluminum, galvanized or plated steel, etc. The main criterion for the choice of material is the allowable degree of flexing that is undergone during the passage of vehicular or pedestrian traffic while the material still retains its ability to bridge the joint in the manner required by the design engineer. In addition, the material should display corrosion-resistant properties if used in an external environment. Thus, the larger the joint that must be spanned by the cover/slide plate, the more rigid the material. Conversely, as the gap to be spanned becomes narrower, the distance between the joint faces is less and alternate materials may be used, such as thermo-plastics or thermo-plastic alloys (elastomers). The main criteria for the use of such alloys are impact resistance, rigidity in load transfer, and temperature resistance if exposed to an external environment. It can thus also be seen that the cover/slide plate may also be constructed from composite materials such as fiber resins.

Thus, the final choice of material will depend on joint width, load transfer, and structural integrity of the joint assembly.

The sub-assembly beneath cover/slide plate may be chosen from the group of metals including steel, aluminum, brass and bronze, which may be extruded or rolled to form the necessary sections. The material should display corrosive-resistance properties in accordance

with the environment in which it will operate (interior/exterior). However, the choice of material may also include rigid plastics, thermo-plastic alloys, and co-extrusions that are able to be fastened to the cover/slide plate and provide the cover/slide plate with sufficient retention and movement capability in relation to the movements being experienced by the joint.

The preferable choice of material would be aluminum extrusions.

It is to be understood that the examples described above are not meant to limit the scope of the present invention, it is expected that the numerous variants will be obvious to one skilled in the field of joint seal design without any departure from the spirit of the invention. The intended claims, properly construed, form the only limitation on the scope of the invention.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A seismic/expansion joint seal and cover comprising a cover plate, a central spine extending downwardly from said cover plate, and at least one layer of a resilient compressible foam sealant on each side of said spine.

2. A joint seal and cover as claimed in claim 1, wherein said cover is detachable from said spine.

3. A joint seal and cover as claimed in claim 2, wherein said cover is screwed to said spine.

4. A joint seal and cover as claimed in claim 3, wherein said spine is composed of two mirror-image generally C-shaped members, each of which has a lower base flange, an upper base flange into which said cover is screwed, and a flat web extending between the flanges, against which the said foam sealant is positioned.

5. A joint seal and cover as claimed in claim 4, wherein said upper flange of each said C-shaped member is the laterally extending portion of a right angle member that is affixable to said web at selected heights.

6. A joint seal and cover as claimed in claim 4 or 5, wherein said C-shaped members are separated by a strip of incompressible foam.

7. A joint seal and cover as claimed in any one of claims 1 to 6, wherein said compressible foam layer has a low modulus blastomeric sealant applied to the top surface thereof.

8. A joint seal and cover as claimed in any one of claims 2 to 7, wherein a bead of sealant is applied between said spine and said cover.

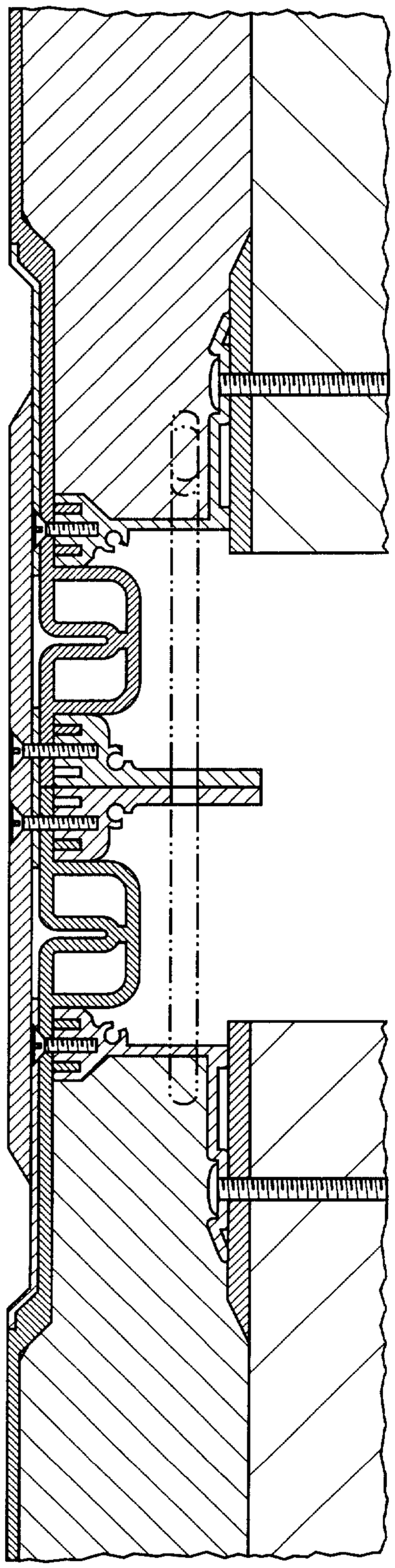


FIG. 1
PRIOR ART

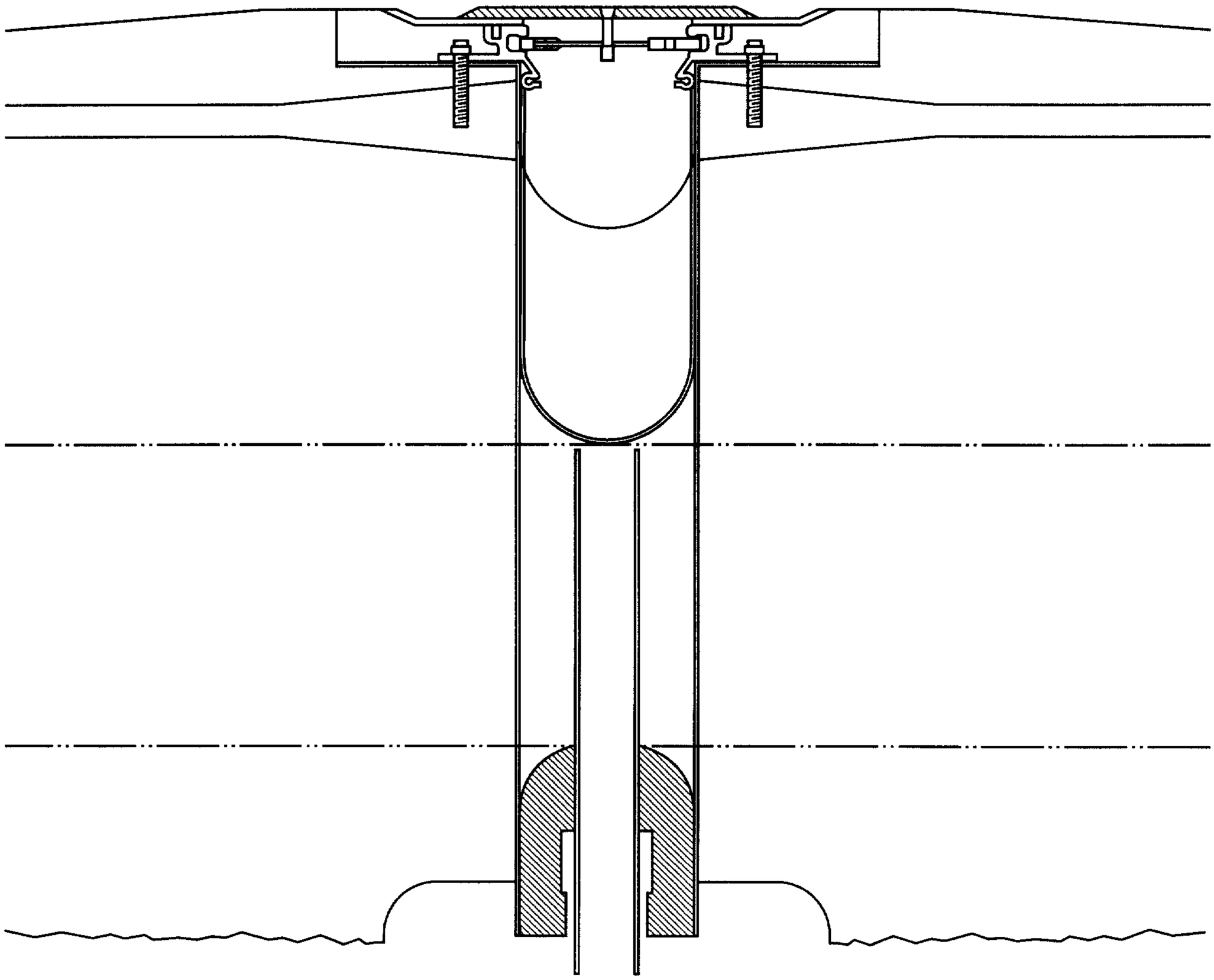


FIG. 2
PRIOR ART

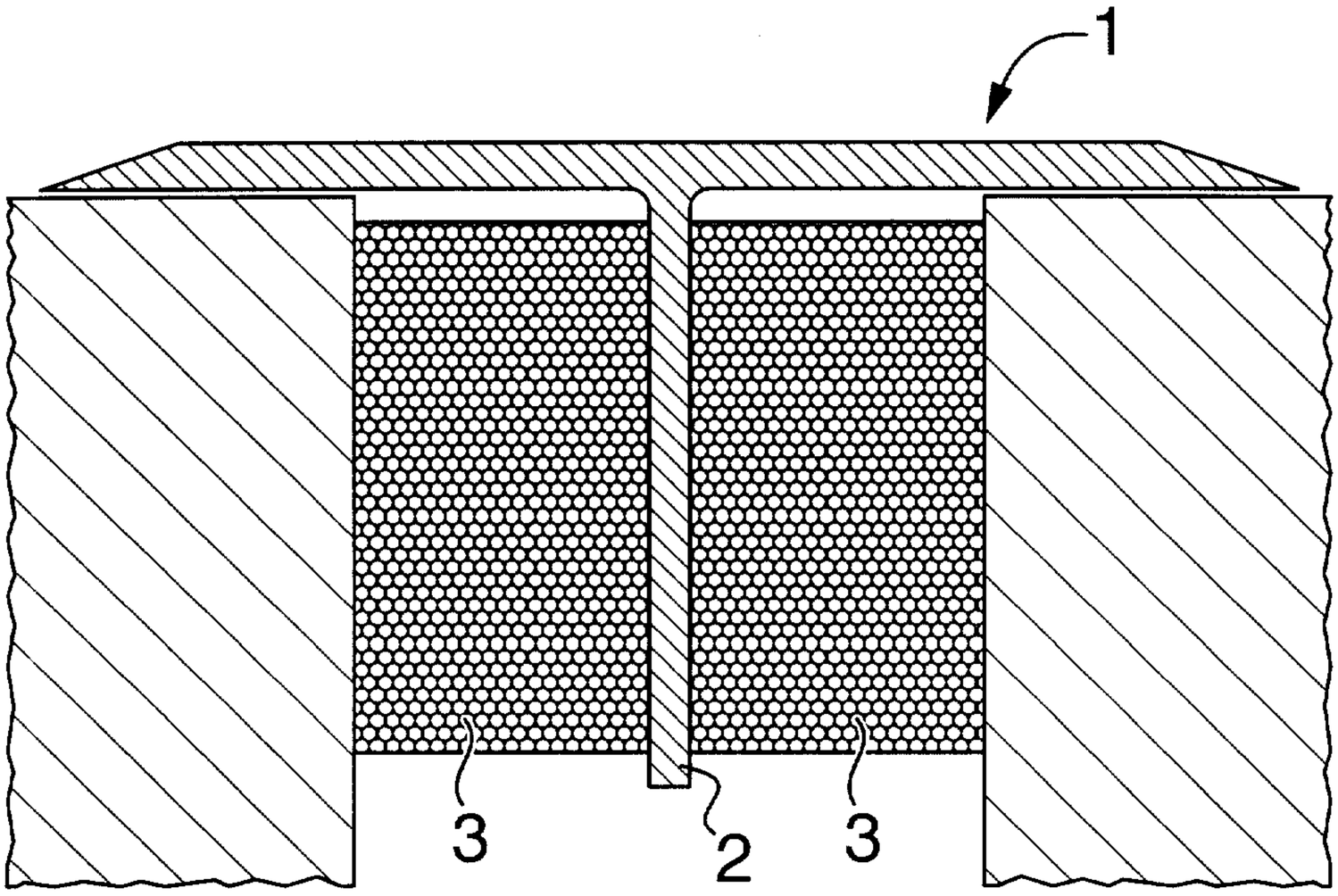


FIG. 3

FIG. 4

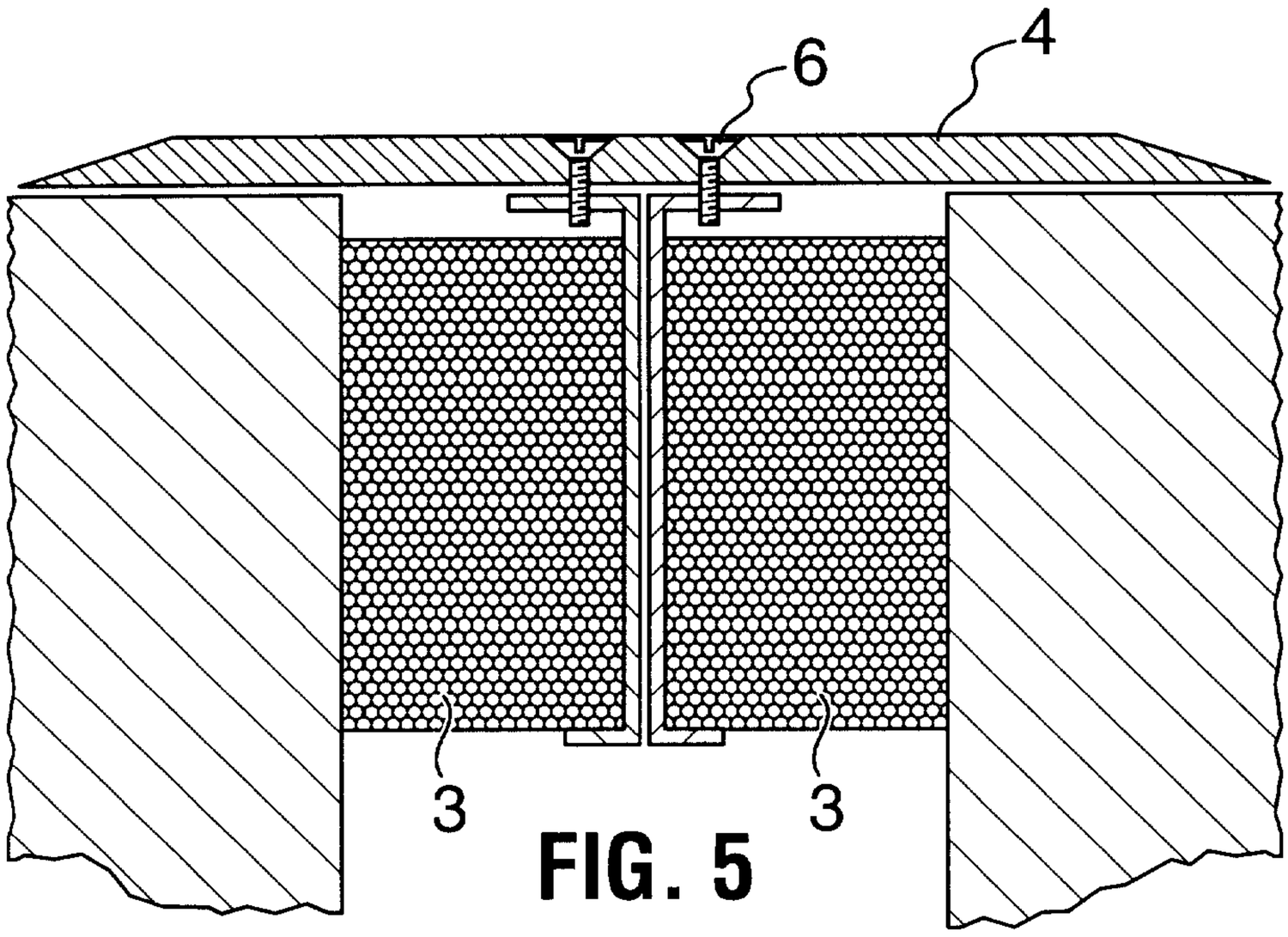


FIG. 5

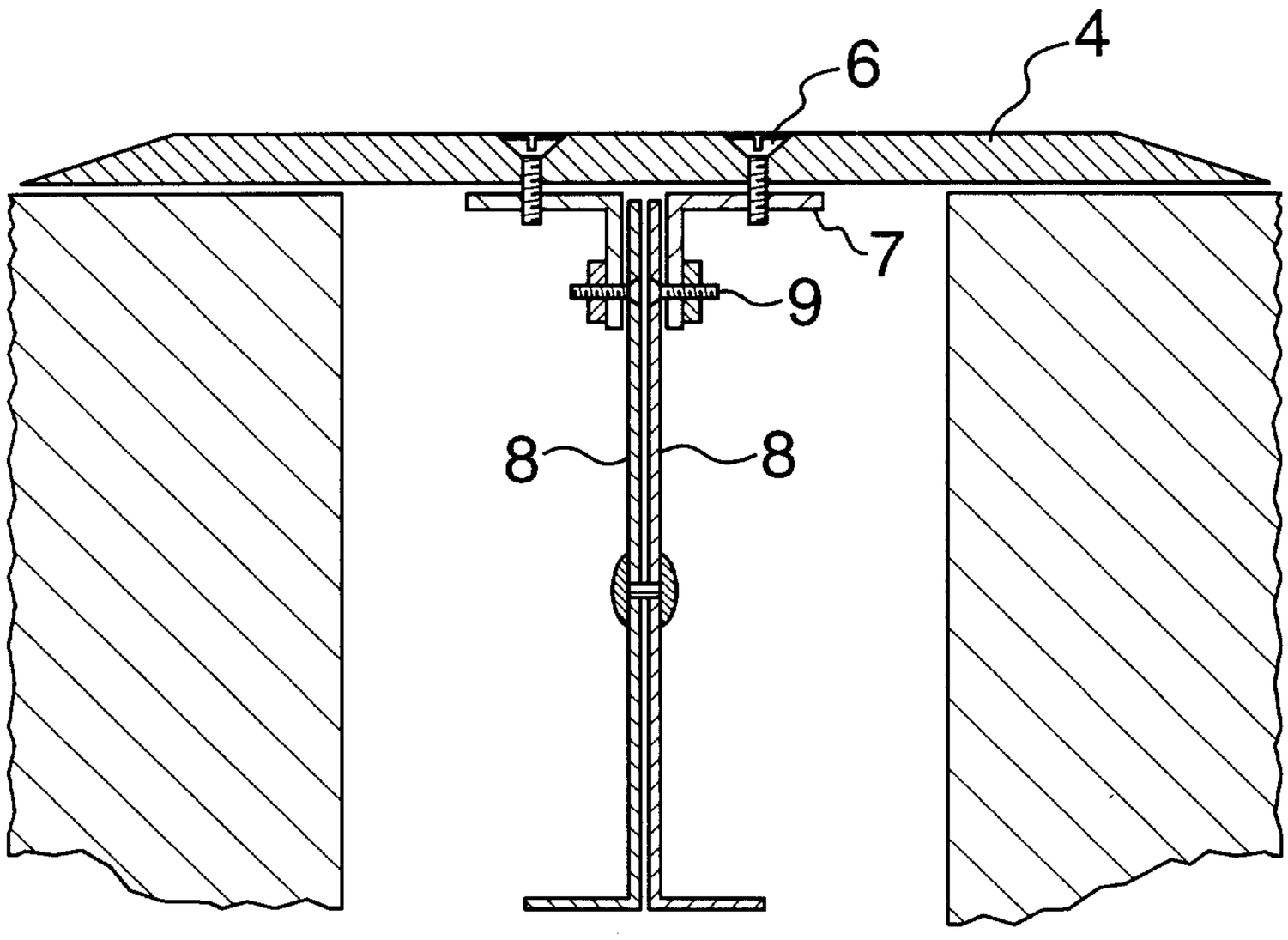


FIG. 6

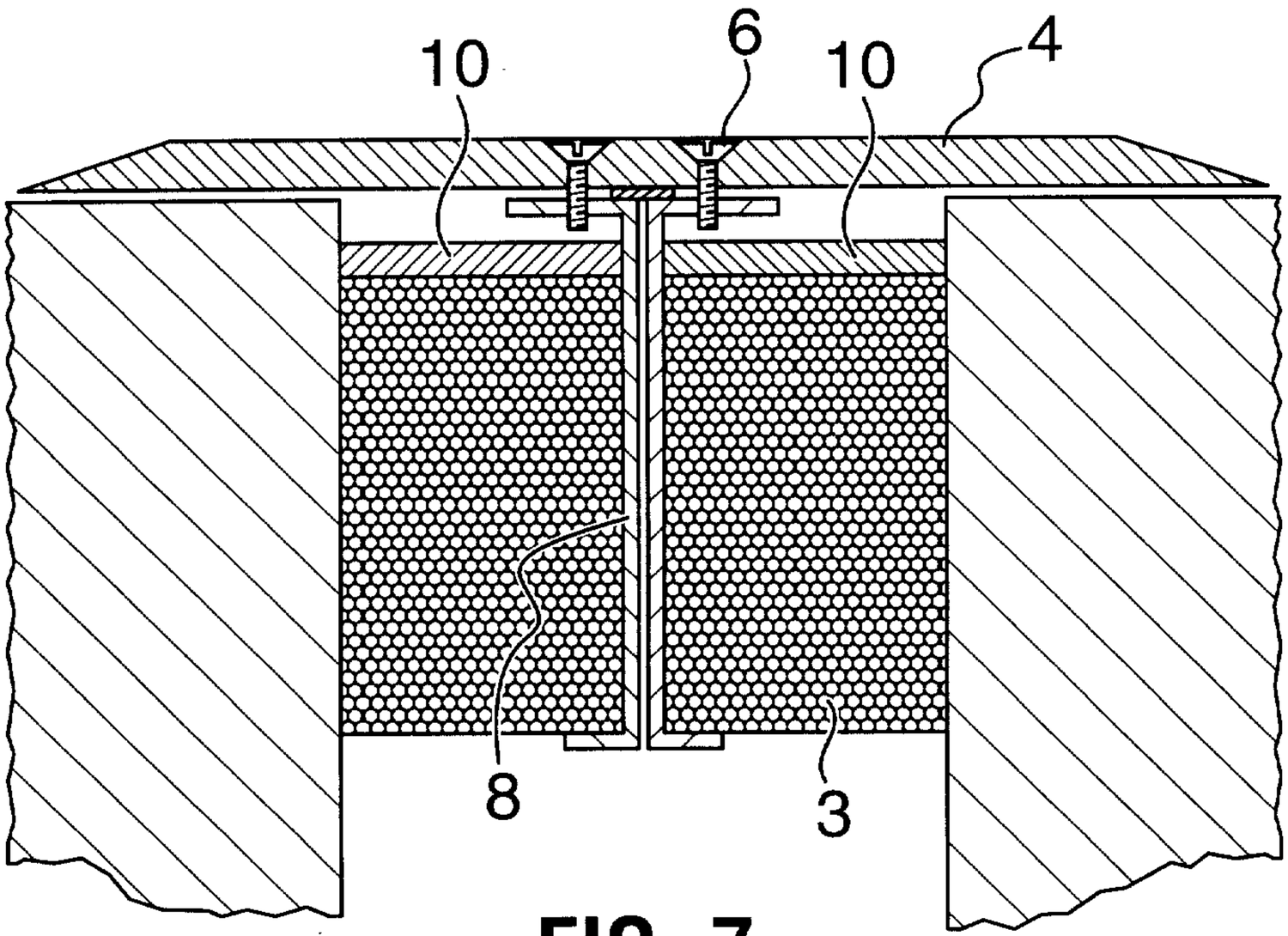


FIG. 7

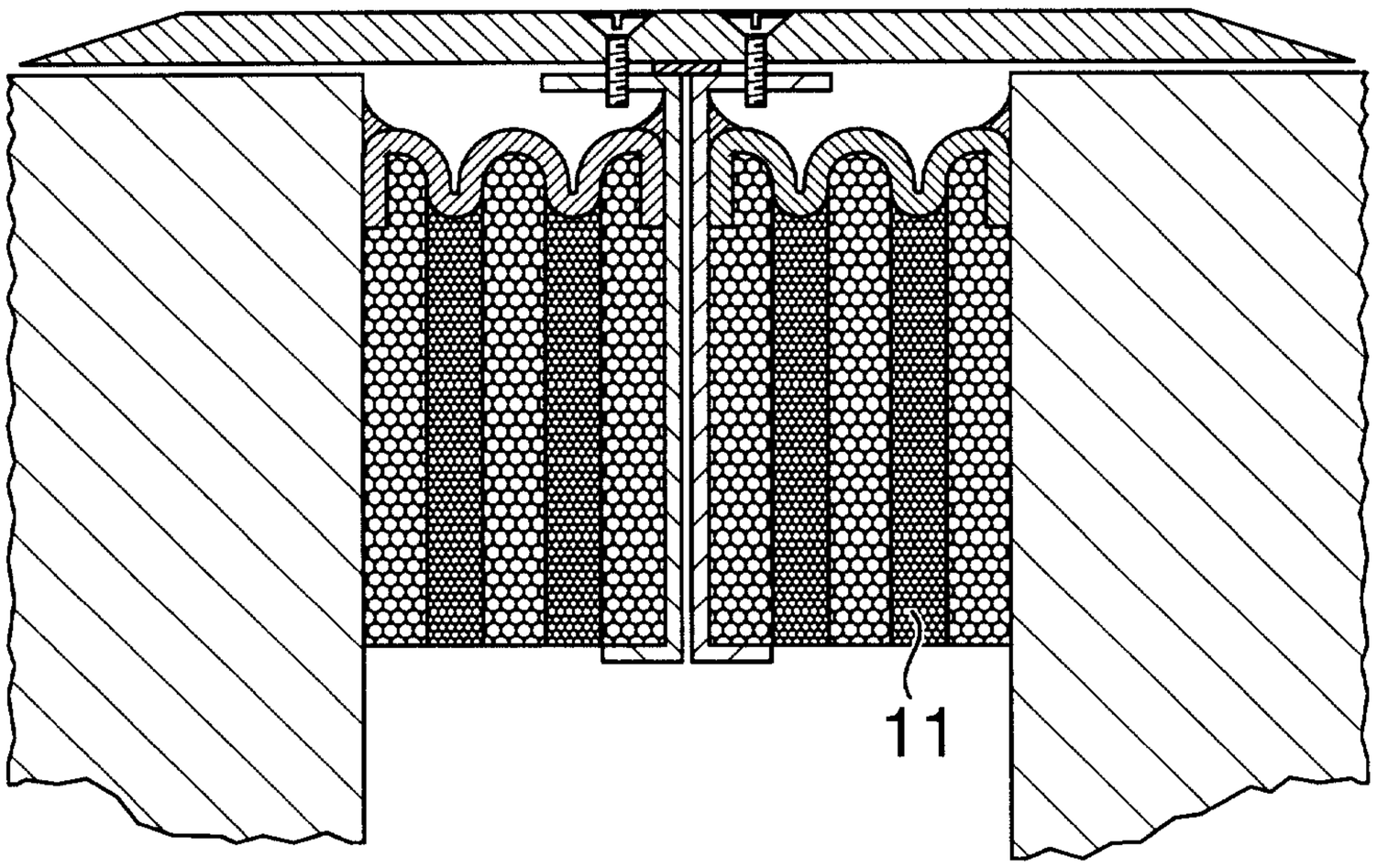


FIG. 8

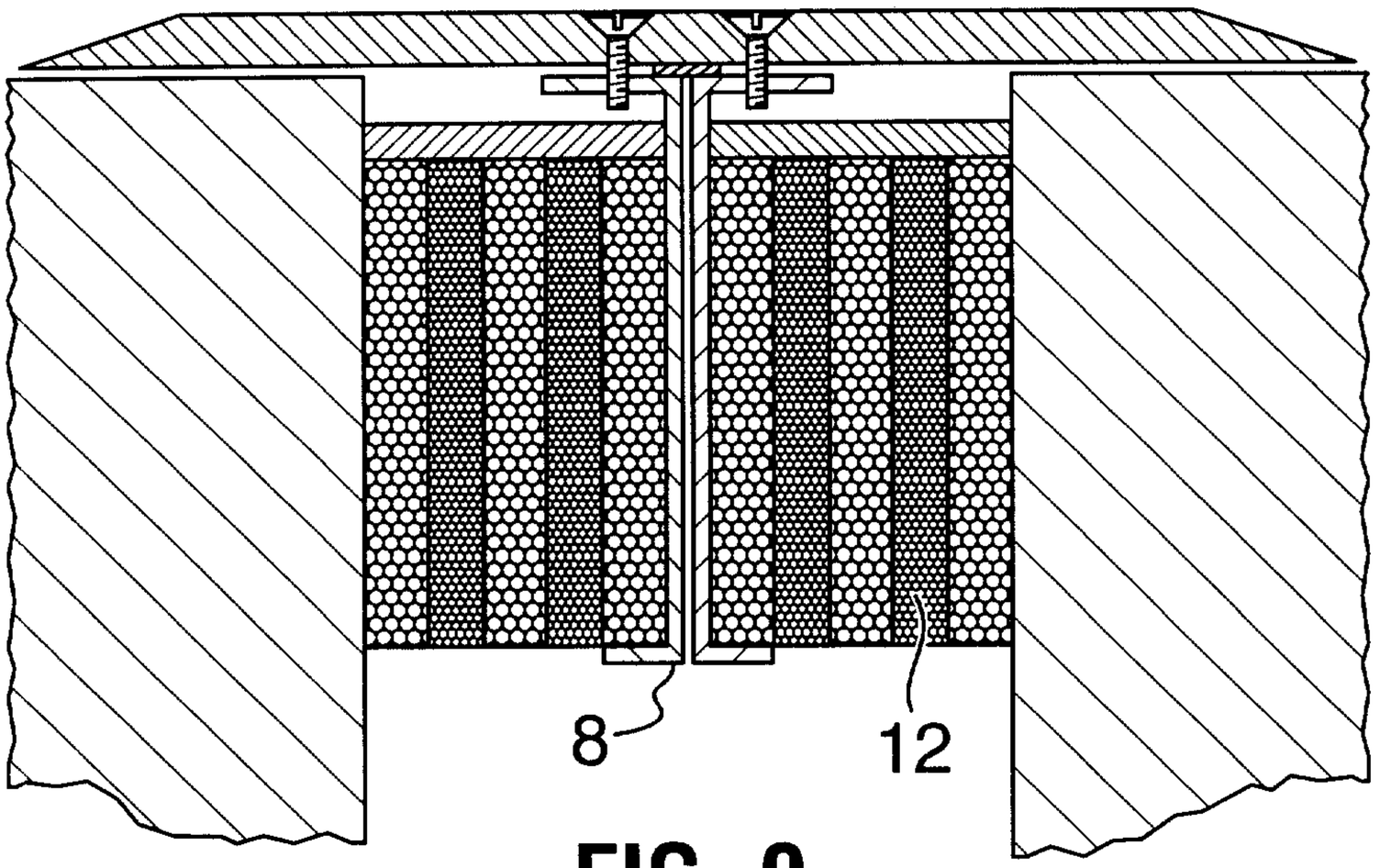


FIG. 9

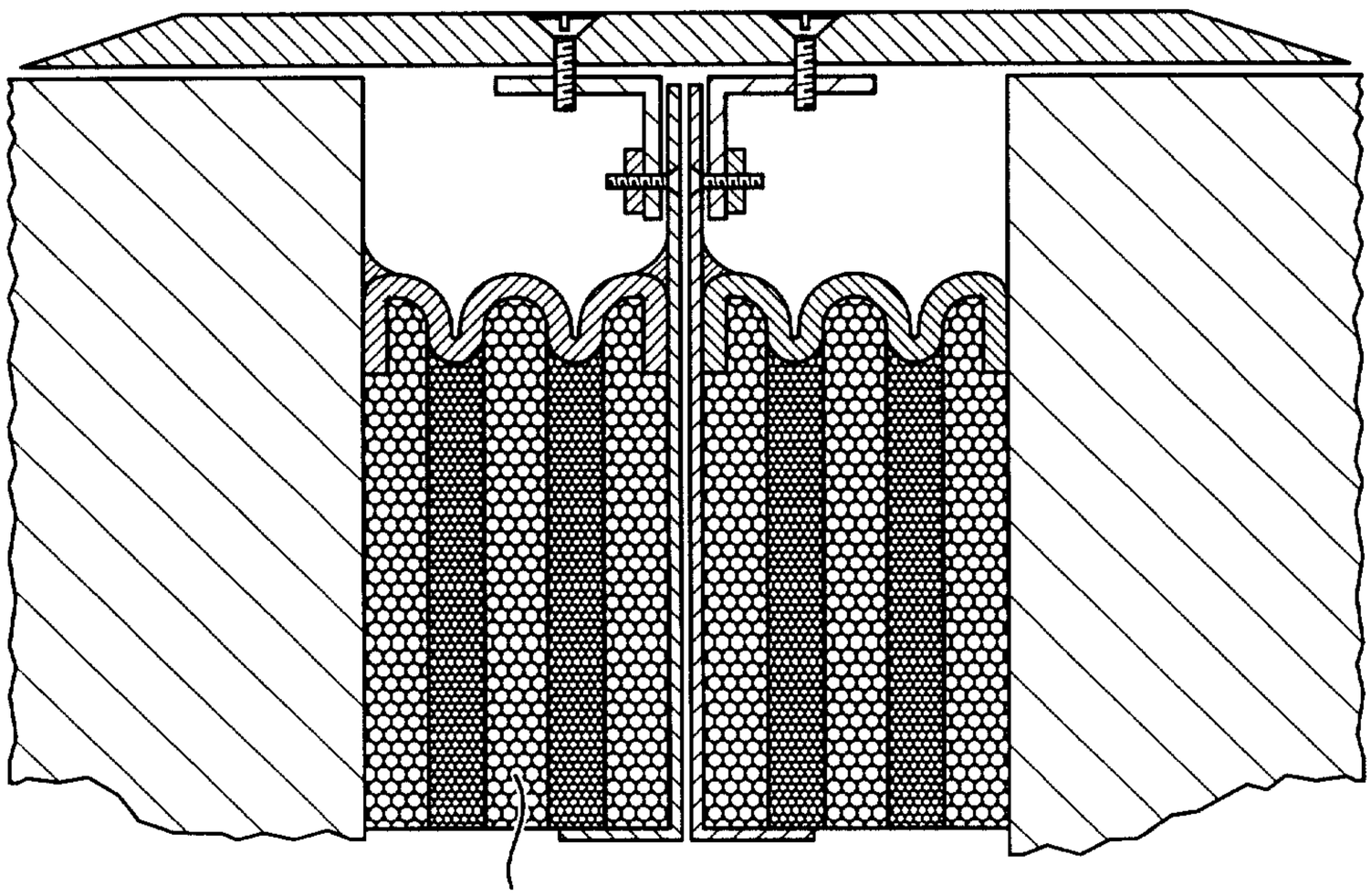
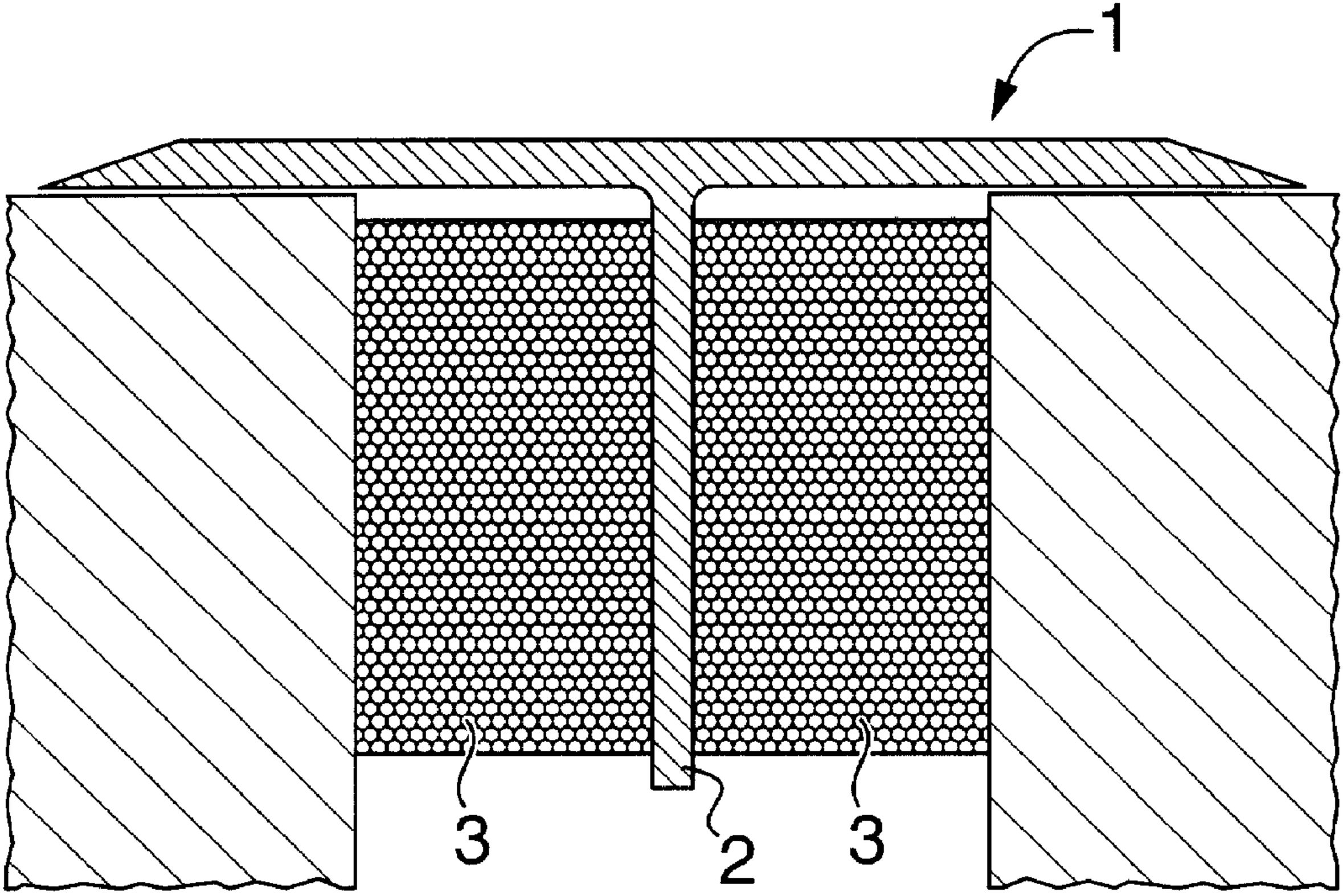


FIG. 10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