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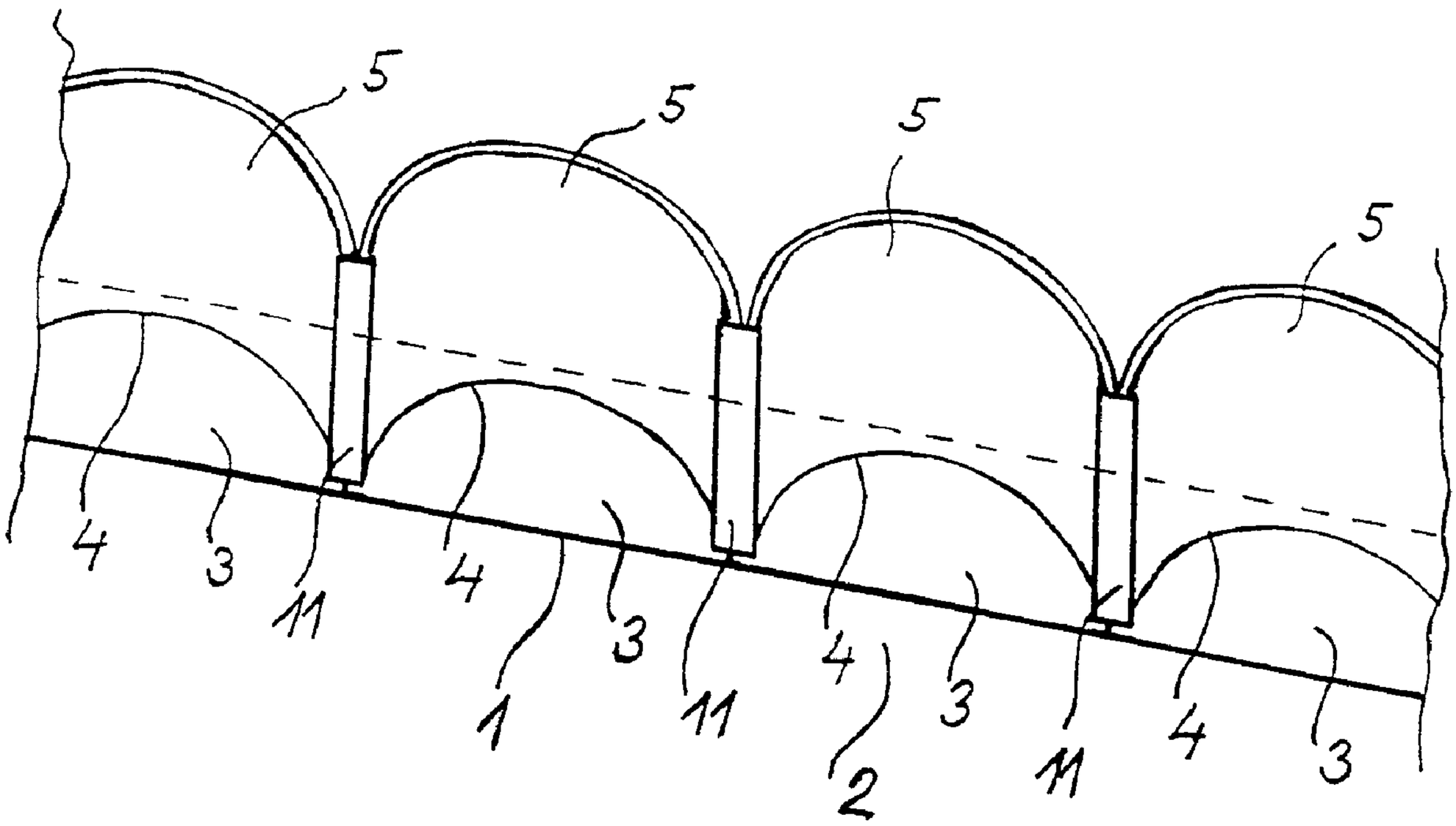

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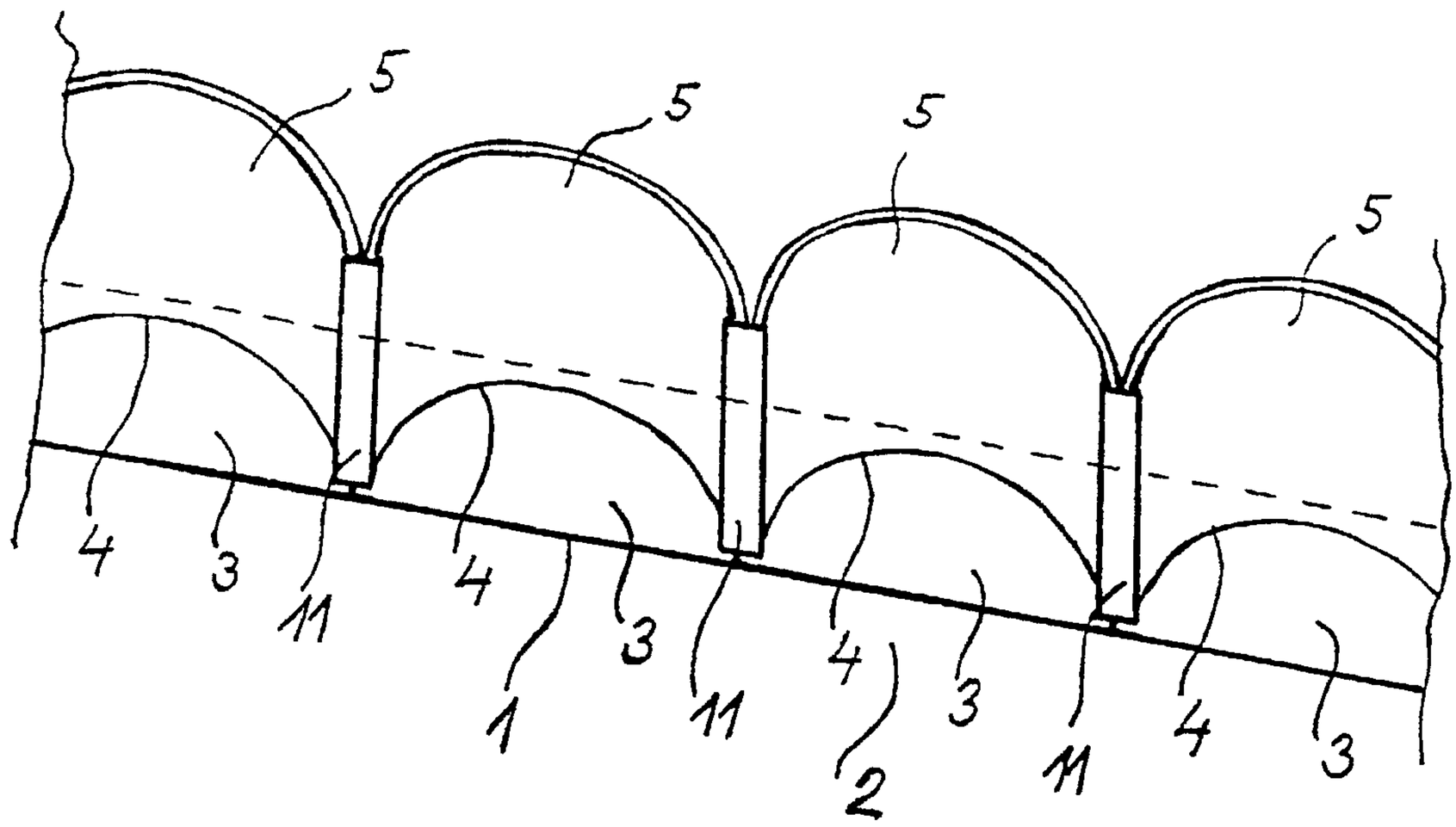

(57) Abstract: The solution of an anti-flood barrier, especially for preventing floodwater from penetrating into lower located residential and/or commercial facilities and against overflow of water streams to the adjacent land resides in that it consists of a set of firmly located foundation bodies (3, 7, 9) in a foundation trench (1), each body being provided with one arched stabilization groove (4) accommodating an arched wall element (5) orientated with its convex side against flood water, each pair of adjacent wall elements (5) being provided with vertical packing at the edges.

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Anti-flood barrier

Field of technology

The invention relates to anti-flood barriers, especially for preventing water from inundating lower located residential and business facilities, and against overflowing of streams to contiguous land.

Prior art

Current water management systems are the basis of the protection of housing areas, of the residents and their property, as well as business property, such as factories with machines and equipment, with storage of material and finished products against flood.. Such systems are intended, primarily, for the catchment and retention of increased water volumes in rivers, and usually consist of dams and various water basins. Also the embankments of water streams are adapted so as to withstand increased throughflow of water. However, all sorts of provisions based upon long term experience and characteristics can not cover extraordinary situations that can occur in inundation territories. Especially long term changes of the climate of the Earth impact upon temperature and precipitation conditions in various parts of our planet. Another share is due to human interventions into Nature, not always well skilled ones, related to building new river beds, yet without proper maintenance. All that, together with further aspects, is the cause of problems during snow melting and in periods of frequent rain.

In conurbations and communities built-up and reinforced area is steadily increasing, which reduces the possibility of natural water seepage. The related rise of river levels followed by water diffusion from their

basins causes numerous problems. As a rule, they are tackled by building temporary dams made of sacks, which is very demanding both as to human potential and technology. The sacks should be made of high quality impermeable material, the sand fill itself being water permeable. The large amounts of sand sacks required for protective interventions practically rules out building temporary dams exceeding 1 meter height.

Another known solution of this problem is a partition system created by a set of hollow aluminium sections to be inserted into foundations built in advance. Due to the high price of aluminium elements such solution is affordable for few customers only; less than 20 structures have been implemented in Western Europe over the recent five years. In addition to high price another drawback is seen in the small flexibility of positioning such walls.

Also a solution is known using large volume pouches made of heavy duty fabrics that can be filled, e.g., by pumping quickly solidifying mixtures on the basis of flue-dust with cement. The disadvantage of such approach is high consumption of the mixture, only single use of the same, and low efficiency if used in conurbations. A not negligible drawback consists in the necessity of using rather heavy machinery, such as mobile concrete mixers, their accessories and heavy-duty concrete pumps.

Substance of the invention

It is an aim of the present invention to do away with the disadvantages and deficiencies of the known solutions of flood fighting in offering an anti-flood system being at least partially mobile, allowing quick fixing in the required places, being affordable, requiring no heavy machinery and allowing installation with minimum numbers of people.

This task is met by the present anti-flood barrier, especially against the penetration of flood water into lower located residential and commercial facilities and against overflow of water streams to the adjacent land according to the present invention, the substance of which consists of a set of firmly located foundation bodies in a foundation trench, each body being provided with one arched stabilization groove accommodating an arched wall element orientated with its convex side against flood water, each pair of adjacent arched wall elements being provided with vertical packing at their edges.

According to the invention the foundation body can be a rectangular block cast of concrete with a curved core providing an arched stabilization groove directed with its both ends to the rear wall where the lateral walls are provided with vertical slots each of which being connected with one end of the arched stabilization groove, or the foundation body can be an arched foundation body with curved front wall and curved rear wall, lining the arched stabilization groove at a certain distance.

Another preferable embodiment consists of a foundation body in form of a box foundation body open at the top, having a bottom, a pair of lateral walls, a front wall and a rear wall, and accommodating, in the inside, an arched body with an arched stabilization groove over the whole length of the arched body, reaching with its ends to the rear wall of the box-like foundation body where the ends protrude from both lateral walls in the vertical slots.

It is an advantage if the foundation body in form of a box foundation body that is open at the top is provided with an opening in the central part of the bottom for inserting an anchoring body for the anchorage of the box foundation body to the ground.

The box-like open-top foundation body can have lateral walls, at least to a certain height, provided with recesses at the front wall allowing to attach two adjacent box-like foundation bodies with steel fittings.

The vertical packing can consist of a U-shape sealing section. The flanches of such sealing section can be provided with borders created by bending their free edges towards the inside of the sealing section.

It is preferable if the vertical packing is created by a channel sealing column provided at both its edges with lengthwise sealing strips, a set of screws anchored to the convex bottom from the outer side, and having a flat bottom, and at least one U-shape anchoring yoke provided with holes for the bolts, and a pair of flanges.

The arched wall element of the anti-flood barrier according to the invention can be provided with a horizontal sealing strip at its convex side, said strip being arranged at a distance from its bottom end.

The box-like open-top foundation body can be preferably made of plastics, such as polypropylene or polyvinylchloride.

The arched wall elements can be also made of plastics of the polypropylene or the polyvinylchloride type, or of glass fibre.

The advantage of the anti-flood barrier according to the present invention resides in the perfect preparedness of the foundation bodies for the moment of endangerment. The completion of the anti-flood barrier requiring minimum personnel is not time consuming. The arched wall elements can be stored in a stack requiring minimum storage room.

Brief description of the drawings

Examples of the embodiments of the invention can be readily understood in the light of the drawings where Fig 1 represents an axonometric view of an anti-flood barrier, Fig. 2 is an axonometric view of a foundation body in the shape of a rectangular block, Fig. 3 is an axonometric view of an arched foundation body, Fig. 4 is an axonometric view of a box-like foundation body, Fig. 5 is a ground plan of a box-like foundation body according to Fig. 4, Fig. 6 is a ground plan of the contact area of a pair of adjacent arched wall elements inserted into the foundation bodies and provided with vertical packing according to the first example of embodiment, Fig. 7 is an axonometric view of the vertical packing created by a sealing section according to Fig. 6, Fig. 8 is an axonometric view of the vertical packing according to Fig. 7 provided with borders, Fig. 9 is a ground plan view of the contact area of a pair of adjacent arched wall elements with vertical packing according to the second example of embodiment, Fig. 10 is an axonometric view of a channel type sealing column of the vertical packing according to Fig. 9, Fig. 11 is an axonometric view of the anchoring yoke of the vertical sealing according to Fig. 9 and Fig. 12 is an axonometric view of the arched wall element provided with a horizontal sealing strip.

Examples of preferred embodiments of the invention.

The anti-flood barrier according to Fig. 1 is created by a system of foundation bodies 3 arranged next to one another and following one another in the foundation trench 1 established in the ground 2 and provided with one arched stabilization groove 4 created in lengthwise direction and

serving for the insertion of a vertically orientated arched wall element 5. The arched wall elements 5 are orientated with their convex side towards the floodwater.

The foundation body 3 according to Fig. 2 is made in shape of a rectangular block cast of concrete using a not illustrated curved core in form of the future arched stabilization groove directed with both its ends to the rear wall 6 of foundation body 3 at its lateral walls 7, 8. The lateral walls 7, 8 are provided with vertical slots 9, 10 at the rear wall 6, each of the grooves being connected with one end of the arched stabilization groove 4 and serving for the insertion of the bottom end of vertical packing created by the U-shape sealing section 11 (Figs. 6, 7) with flanges 28 and attached to the marginal portions of two adjacent arched wall elements 5 inserted into the arched stabilization grooves 4. The purpose of the sealing section 11 is to seal the gap between the said arched wall elements 5 against the seepage of floodwater. For better contact with the surface of the marginal parts of the arched wall elements 5 the sealing section 11 can be provided with borders 29 created by reverse bending of the free edges of its flanges 28 to the inside, as illustrated in Fig. 8. According to Fig. 3 the foundation body 3 is also made of concrete, but has the shape of arched foundation body 12, its front curved wall 13 and rear curved wall 14 only bordering, at a certain distance, the arched stabilization groove 4. The ends of this arched stabilization groove 4 are modified as illustrated in Fig. 2. Such foundation bodies 3,12 are intended for being accommodated in the foundation trench 1 wherein they are packed by stamped earth or they can be fixed by pouring not illustrated concrete mix. The mentioned not illustrated arched cores can be also put into the building trench 1 and the whole trench can be filled with concrete mix. The arched cores should be

removed from the arched stabilization groove 4 after the concrete will have solidified. They can be re-inserted into the groves for preventing the penetration of impurities, such as loose earth, so as to be easily removable in case of emergency prior to inserting the arched wall elements 5.

According to Figs. 4 and 5 the foundation body 3 is made of plastics, e.g. polypropylene or polyvinilchloride, and namely as a box-like foundation body 15 with a bottom 16, a pair of lateral walls 17, 18, a front wall 19 and a rear wall 20. The inside of box-like foundation body 15 is provided with an arched body 21 having an arched stabilization groove 4 extending over the whole length of arched body 21, its ends reaching to the rear wall 20 of the box-like foundation body 15. The lateral walls 17, 18 are provided with vertical slots 22, 23 at the rear wall 20, each of the slots connected with one end of the arched stabilization groove 4 being intended for accepting the sealing section 11 for covering the marginal part of two adjacent parts wall elements 5 and for sealing the gap between them. The central part of arched body 21 contacts the front wall 19 of the box-like foundation body 15. The lateral walls 17, 18 are provided, at least to a certain part of their height, with recesses 24, 25 at the front wall 19, always for connecting two adjacent box-like foundation bodies 15 with the aid of not illustrated steel reinforcements. The central part of bottom 16 has an opening 26 for inserting a not illustrated anchoring body for the anchorage of the box-like foundation body 15 to the ground 2. The internal space of the box-like foundation body 15 can be provided with reinforcement ribs 27.

The arched wall elements 5 that can be used for insertion into the arched stabilization grooves 4 in all examples of embodiment of the foundation bodies 3, 12, 15, and also for inserting into the arched

stabilization grooves 4 created with the aid of curved cores fixed by concrete mix poured into the foundation trench 1, are preferably made of plastics, such as polypropylene or polyvinilchloride, or of laminated glass fibres.

The internal space of all box-like foundation bodies 15, after the bodies have been accommodated in the foundation trench 1 and after the not illustrated anchoring bodies and the not illustrated steel reinforcements have been put in place, will be filled with concrete blend that also fills the remaining free room in the foundation trench 1. It is preferable to close the arched stabilization groove 4, e.g., with a not illustrated plug or cover against the penetration of impurities.

Such system of foundation bodies 3, 12. 15 built into the ground 2 is prepared for the case of flood endangerment; in such case not illustrated cores or plugs, and possibly the not illustrated covers of the arched stabilization 4 are removed and the arched wall elements 5 are inserted into these grooves. Then the sealing sections 11 are inserted at the lateral parts of two adjacent arched wall elements 5, their bottom ends are introduced into the vertical gaps 9, 10, 22, 23 in each foundation body 3, 12, 15.

As floodwater impacts the arched wall elements 5, its pressure will affect the marginal parts, pushing them against the flanges 28 of the sealing sections 11 or, possibly, against their borders 29 to which they cling, thus preventing the seepage of floodwater. The internal walls of flanges 28 of the sealing sections 11 can be provided with not illustrated sealing strips, e.g. made of rubber.

For improved sealing of the edges of the arched wall elements 5 a vertical packing is inserted between these edges along their whole height above each foundation element 3, 12, 15, said vertical packing being

created by a channel sealing clamp 30 with both its edges provided with sealing strips 31, e.g. made of rubber, and with a set of screws 32 that are anchored, e.g. welded, to the convex bottom 33 from the outer side. The screws 32 carry U-shaped anchoring yokes 34 and, namely, either in short intervals one yoke per screw 32, or at longer intervals one yoke on a plurality of bolts 32 or, possibly, all screws 32 can be used simultaneously. Fig. 11 shows an anchoring yoke 34 provided with three holes 35 in its bottom part intended for the portion of the channel sealing column 30 with three screws 32. The anchoring yokes 34 are equipped with flanges 36 serving to push every anchoring yoke 34 from the internal side to the marginal parts of the adjacent arched wall elements 5 (Fig. 9). As can be readily understood from Fig. 10, the channel-type sealing column 30 is provided with a flat bottom 37 at its lower part.

After the arch wall elements 5 have been inserted into the arched stabilization grooves 4, the channel-type sealing column 30 is inserted between the border parts of both adjacent arched wall elements 5, and namely so as to allow the flat bottom 37 of said column to contact the upper surfaces of two adjacent foundation bodies 3, 12, 15. Then the necessary number of anchoring yokes 34 are pushed with their openings 35 onto the screws 32 of the channel-type sealing column 30, the flanges 36 of said yokes 34 contacting the border parts of adjacent wall elements 5. The screws 32 are then provided with nuts 38 by whose fastening the channel-type sealing column 30 approaches the anchoring yokes 34, which results in the longitudinal sealing strips 31 of the channel-type sealing column 30 pressing firmly against the border parts of two adjacent arched wall elements 5, thus preventing any seepage of floodwater.

As obvious in Fig 12, each arched wall element 5 can be provided with an attached, e.g. glued, horizontal sealing strip 39, e.g. made of rubber, arranged on its convex side, spaced from its bottom end. When the arched wall element 5 is pushed into the arched stabilization groove 4, this horizontal sealing strip 39 enters into the arched stabilization groove 4 which will be filled by floodwater at its upper edge. For improving the stability of the arched wall element 5 the remaining part of the width of the arched stabilization groove 4 at the opposite side of the arched wall element 5 can be fastened by not illustrated wedged pins made preferably of plastics, such as polypropylene or polyvinylchloride.

Commercial applicability

Anti-flood barriers according to the invention can be utilized for preventing, or at least for reducing damage due to floods.

CLAIMS

1. Anti-flood barrier, especially against the penetration of flood water into lower located residential and/or commercial facilities and against overflow of water streams to the adjacent land, containing a set of foundation bodies firmly located in a foundation trench, each body being provided with one groove accomodating a wall element orientated with its convex side against flood water, characterized in that the groove in each foundation body (3, 12, 15) is a half-cylindrical stabilization groove (4) for the anchorage of a half-cylindrical compact self-supporting wall element (5) accomodated therein, a vertical packing being arranged between each pair of adjacent half-cylindrical compact self-supporting wall elements (5).

2. Anti-flood barrier according to claim 1, characterized in that the half-cylindrical stabilization groove (4) is made using a curved core having a shape of a half-cylindrical stabilization groove (4) in the foundation body (3) formed by a rectangular block cast of concrete, the half-cylindrical stabilization groove (4) being directed with its both ends towards the rear wall (6), the ends being followed with vertical slots (9, 10) arranged in the lateral walls (7, 8).

3. Anti-flood barrier according to claim 1, characterized in that the half-cylindical stabilization groove (4) is formed on the foundation body (12) with a curved front wall (13) and a curved rear wall (14) lining the half-cylindrical stabilization groove (4) at a certain distance, both of its ends being followed by vertical slots (9, 10) protruding from the curved rear wall (14).

4. Anti-flood barrier according to claim 1, characterized in that the half-cylindrical stabilization groove (4) is formed at the whole length of the supporting body (21) that makes a part of the open-top box-like foundation body (15) having a bottom (16), a pair of lateral walls (17, 18), a front wall (19), and a rear wall (20), both ends of the half-cylindrical stabilization groove (4) being followed by vertical slots (22, 23) protruding from both of the lateral walls (17, 18) of the box-like foundation body (15) close to its rear wall (20).

5. Anti-flood barrier according to claim 4, characterized in that the open-top box-like foundation body (15) is provided with an opening (26) in the central part of the bottom (16) for inserting an anchoring body for the anchorage of the box-like foundation body (15) to the ground (2).

6. Anti-flood barrier according to claims 4 and 5, characterized in that the open-top box-like foundation body (15) has lateral walls (17, 18) provided, at least to a certain height, with recesses (24, 25) at the front wall (19) allowing to attach two adjacent box-like foundation bodies (15) with steel fittings.

7. Anti-flood barrier according to claim 1, characterized in that the vertical packing can consist of a U-shape sealing section (11) and can be provided with flanges (28).

8. Anti-flood barrier according to claims 1 and 4, characterized in that the flanges (28) of such sealing section (11) can be provided with borders (29) created by bending their free edges towards the inside of the sealing section.

9. Anti-flood barrier according to claim 1, characterized in that the vertical packing is created by a channel sealing column (30) provided at both its edges with lengthwise sealing strips (31), a set of screws (32) anchored to the convex bottom (33) from the outer side, and has a flat bottom (37) and at least one U-shaped anchoring yoke (34) provided with holes (35) for the screws (32), and a pair of flanges (36).

10. Anti-flood barrier according to claim 1, characterized in that the half-cylindrical compact self-supporting wall element (5) is at its convex side provided with a horizontal sealing strip (39) arranged at a distance from its bottom end.

11. Anti-flood barrier according to claims 4, 5 and 6, characterized in that the open-top box-like foundation body (15) is made of plastics, such as polypropylene or polyvinylchloride.

12. Anti-flood barrier according to claim 1, characterized in that the half-cylindrical compact self-supporting wall element (5) is made of plastics, such as polypropylene or polyvinylchloride, or of fiberglass reinforced plastic - such as polyester, epoxy and others.

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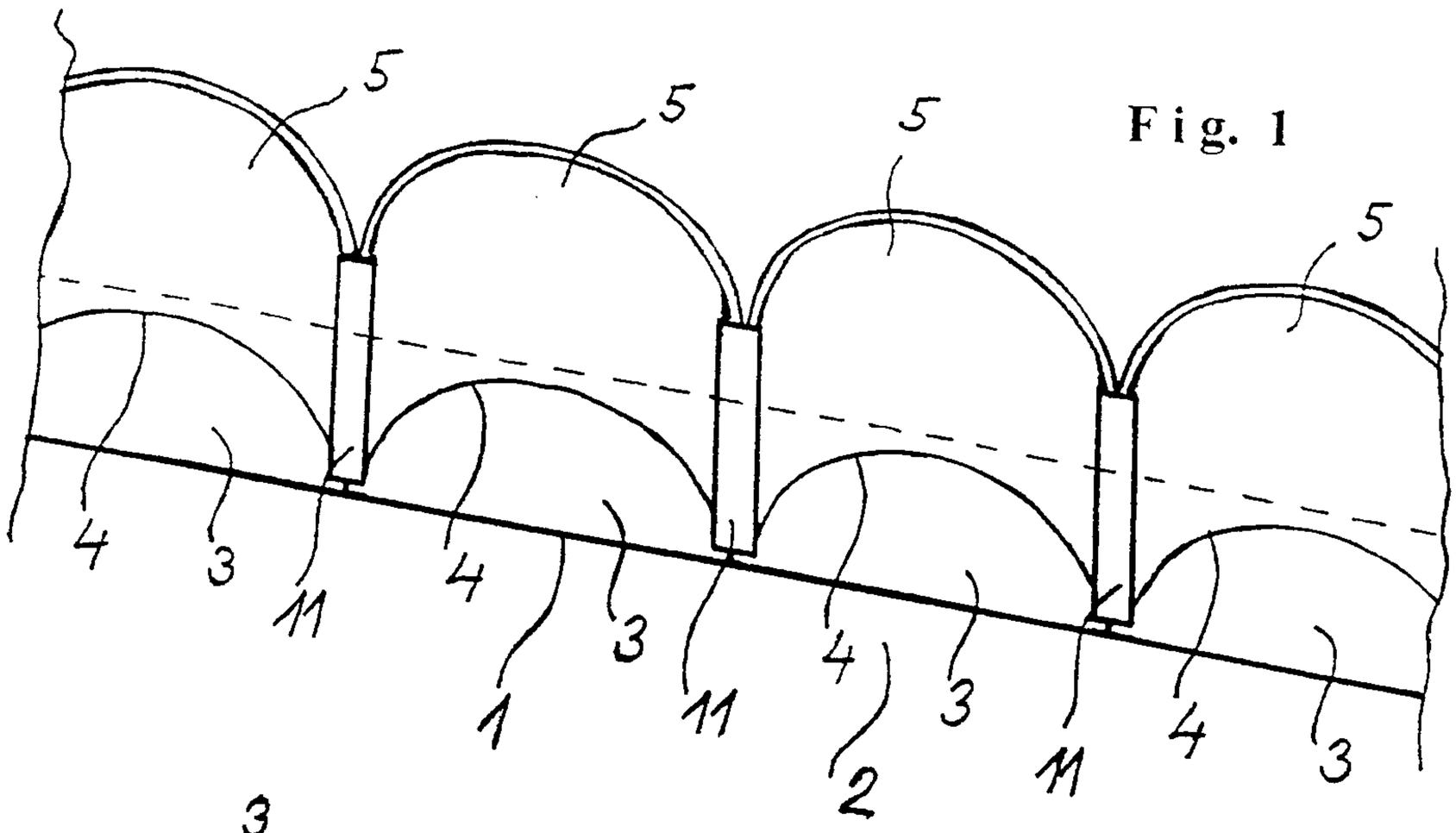


Fig. 1

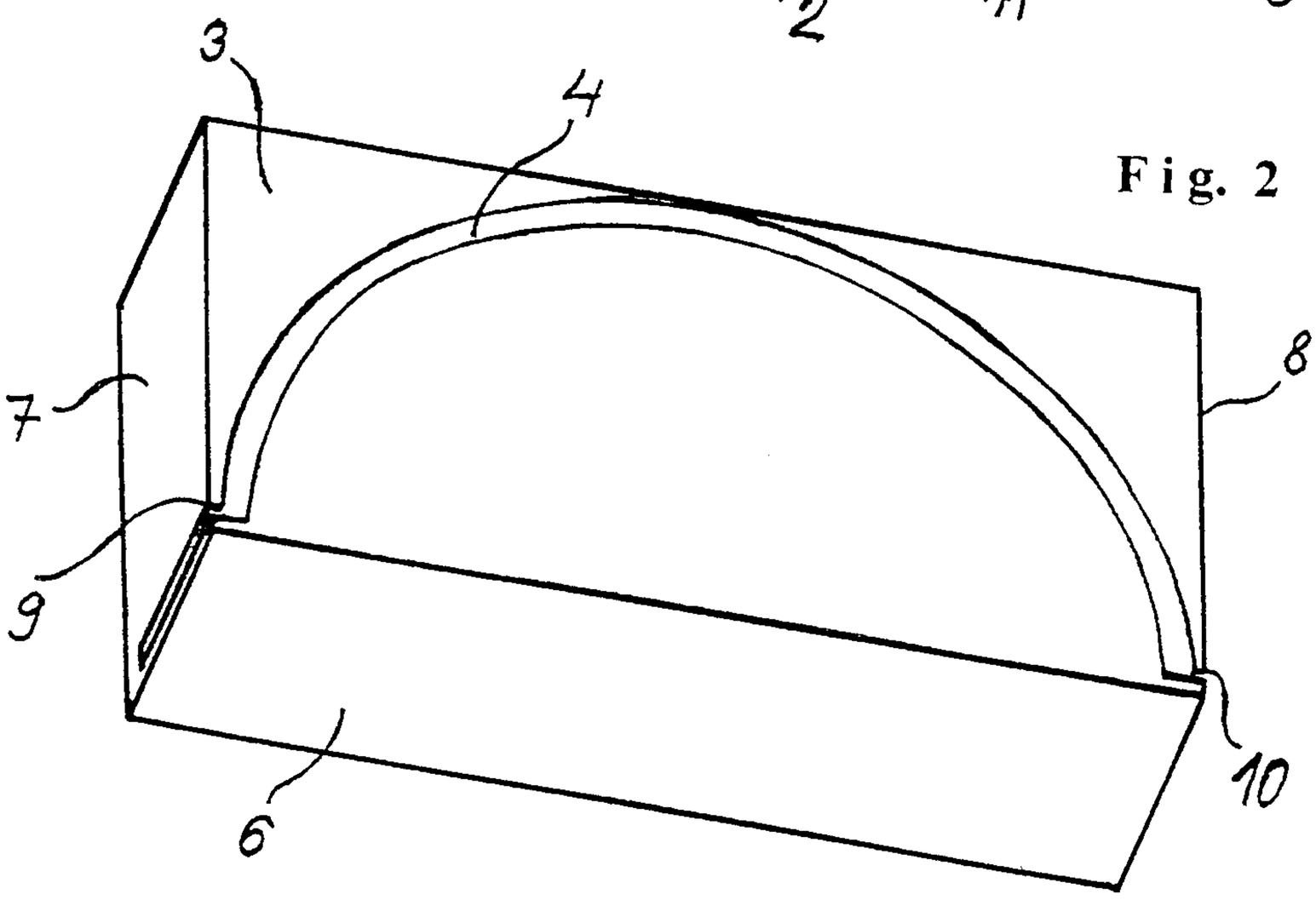
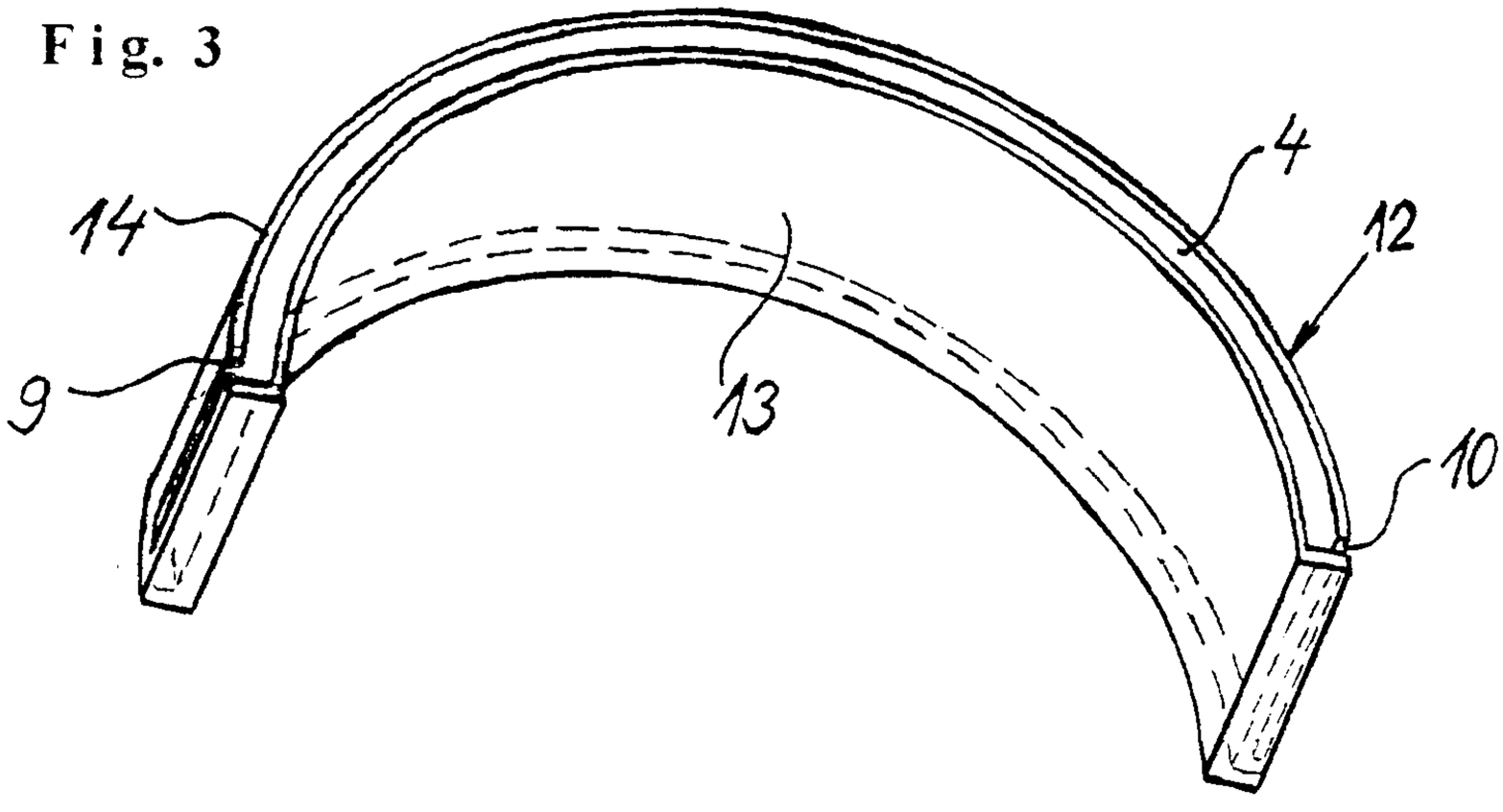


Fig. 2

Fig. 3



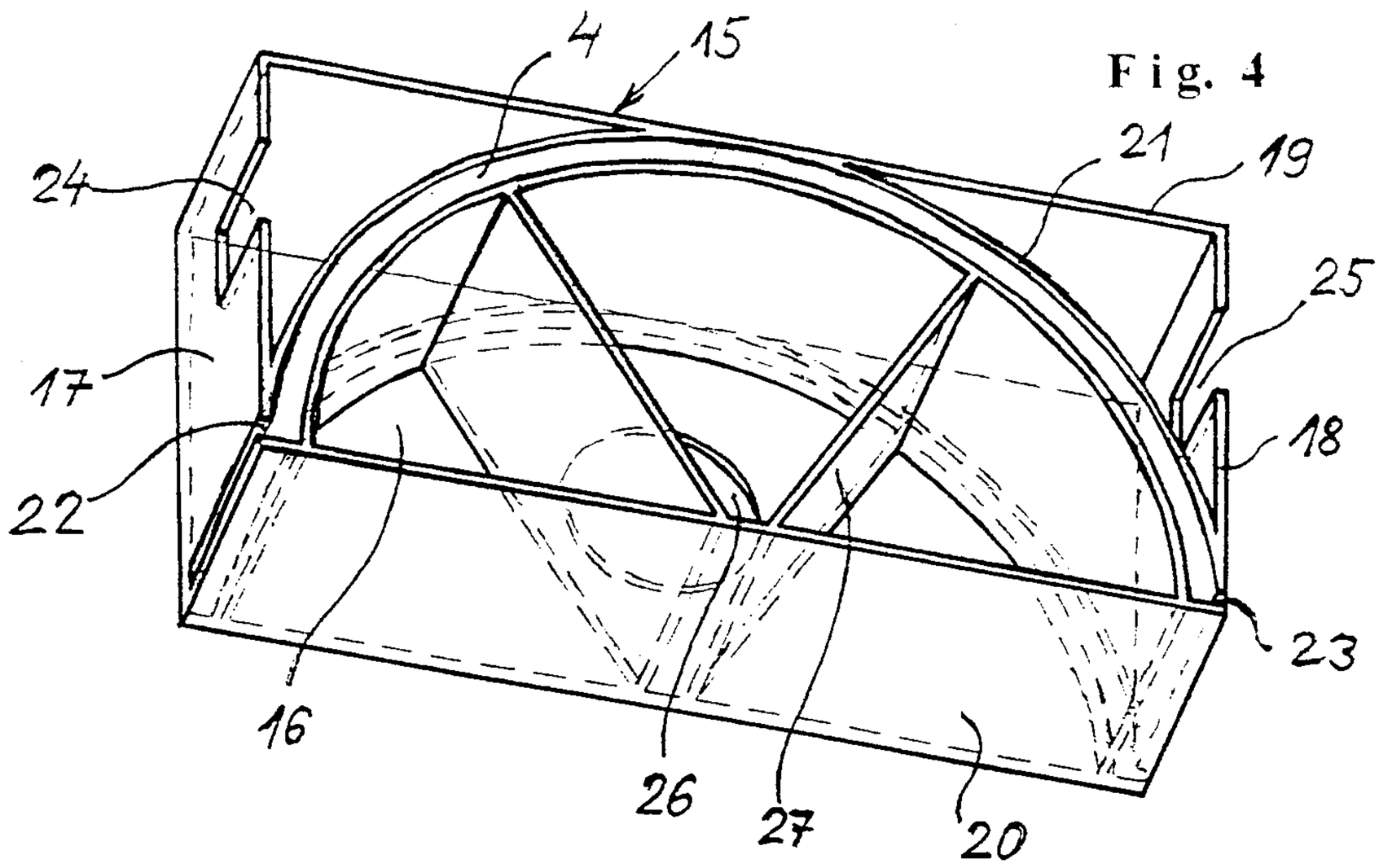


Fig. 4

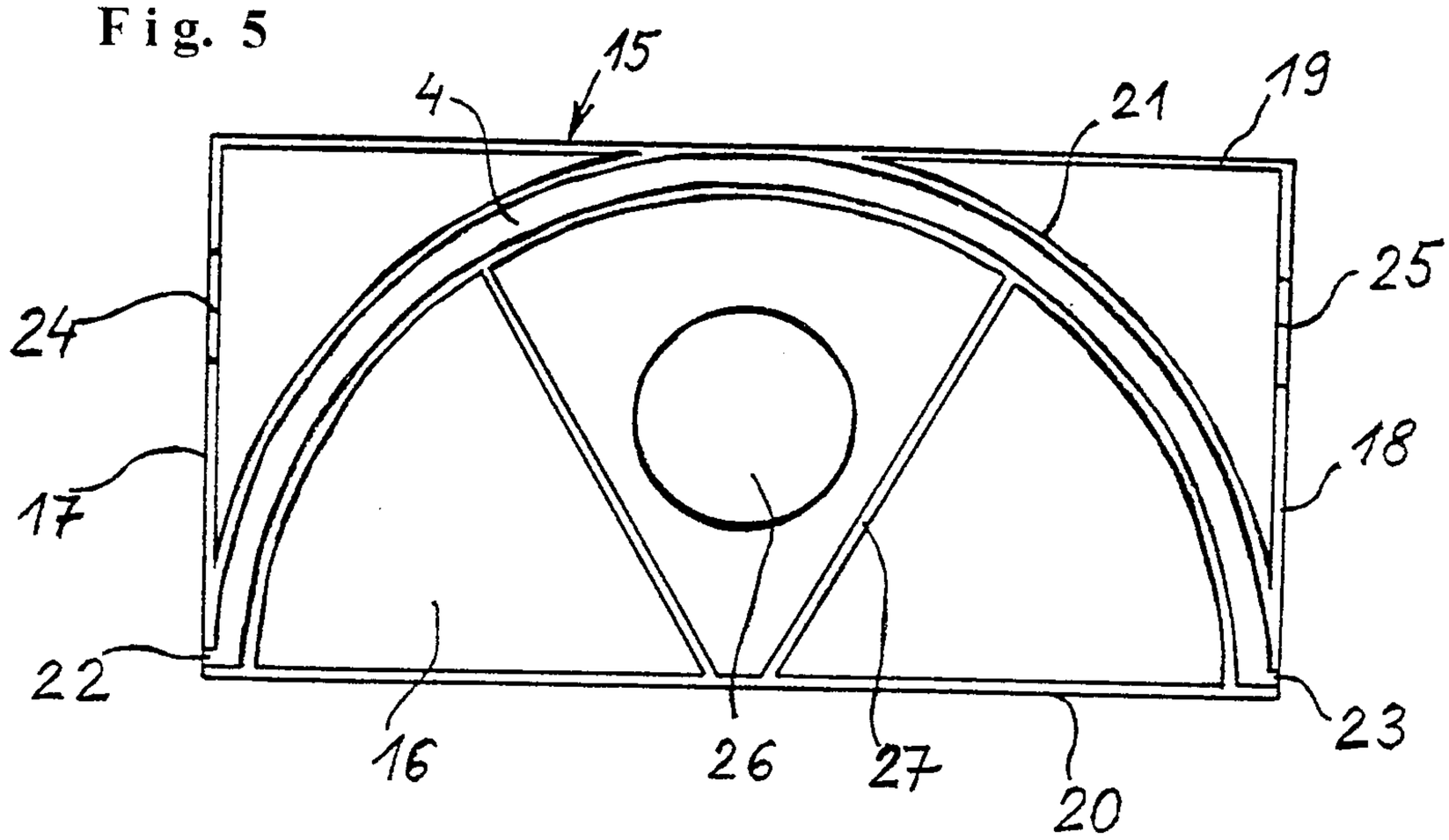


Fig. 5

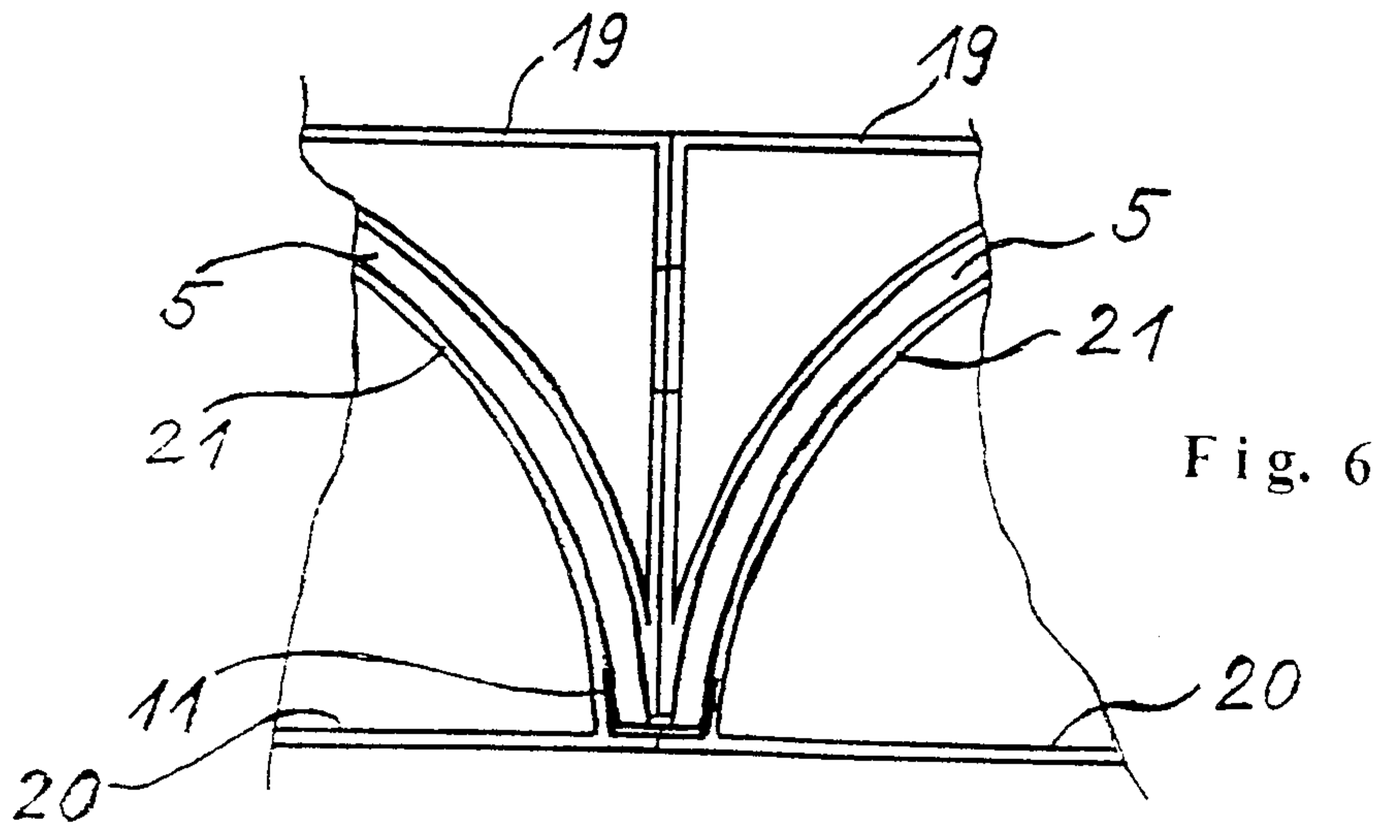


Fig. 6

Fig. 7

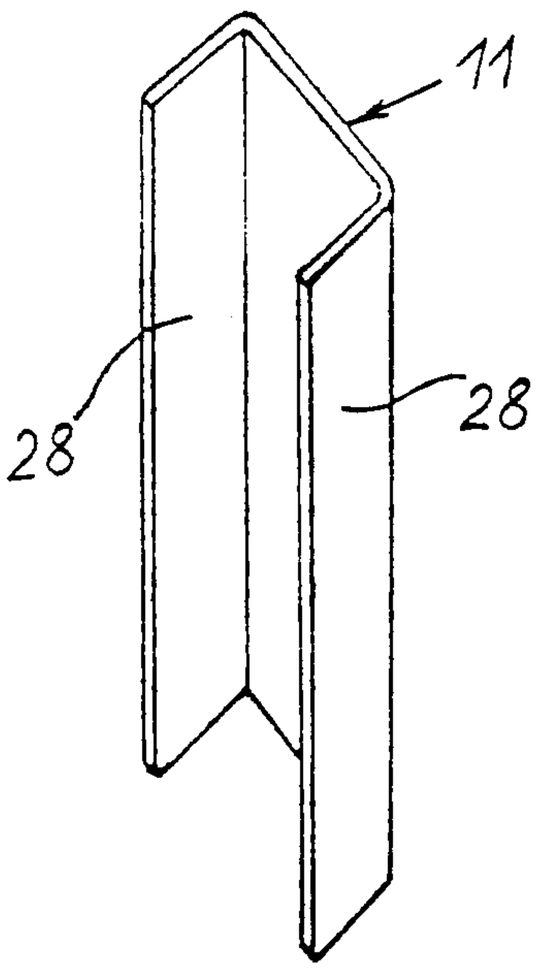


Fig. 8

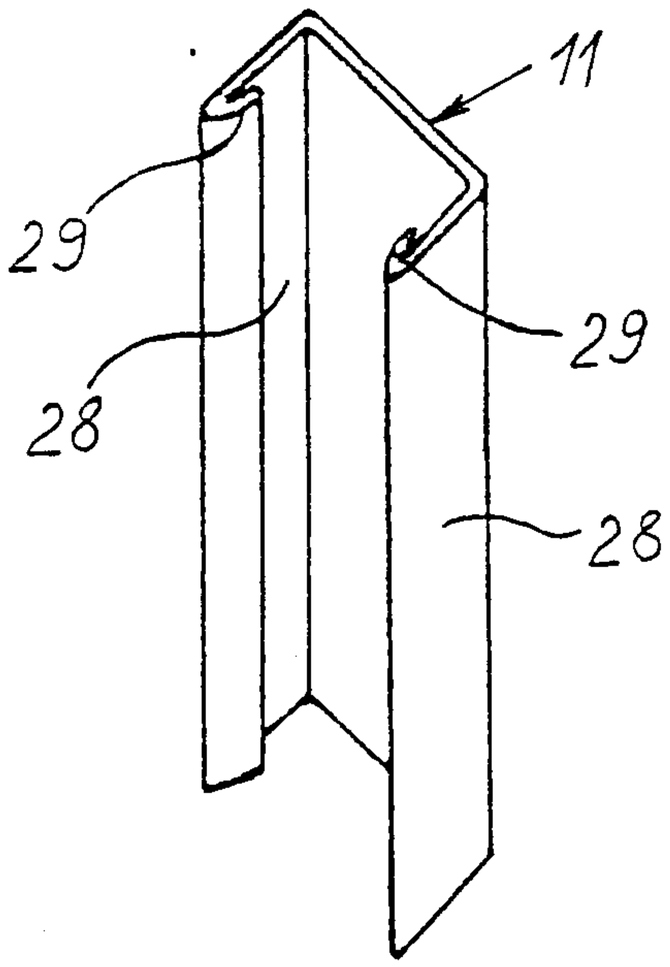


Fig. 10

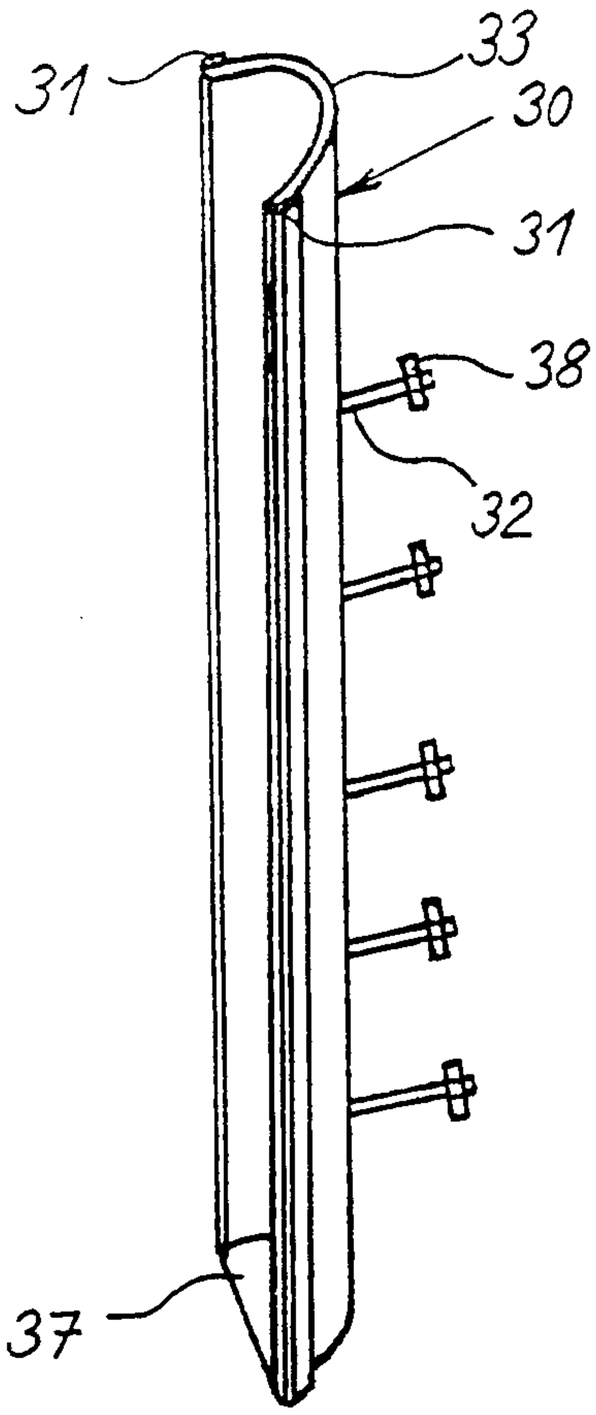


Fig. 9

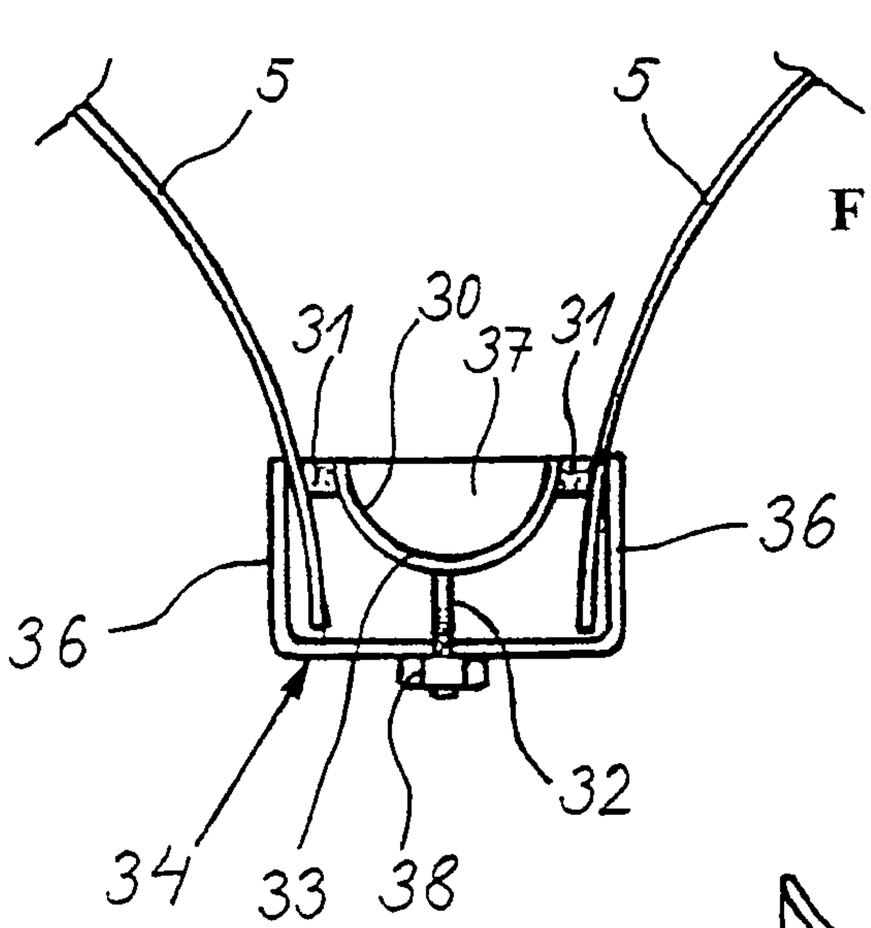


Fig. 11

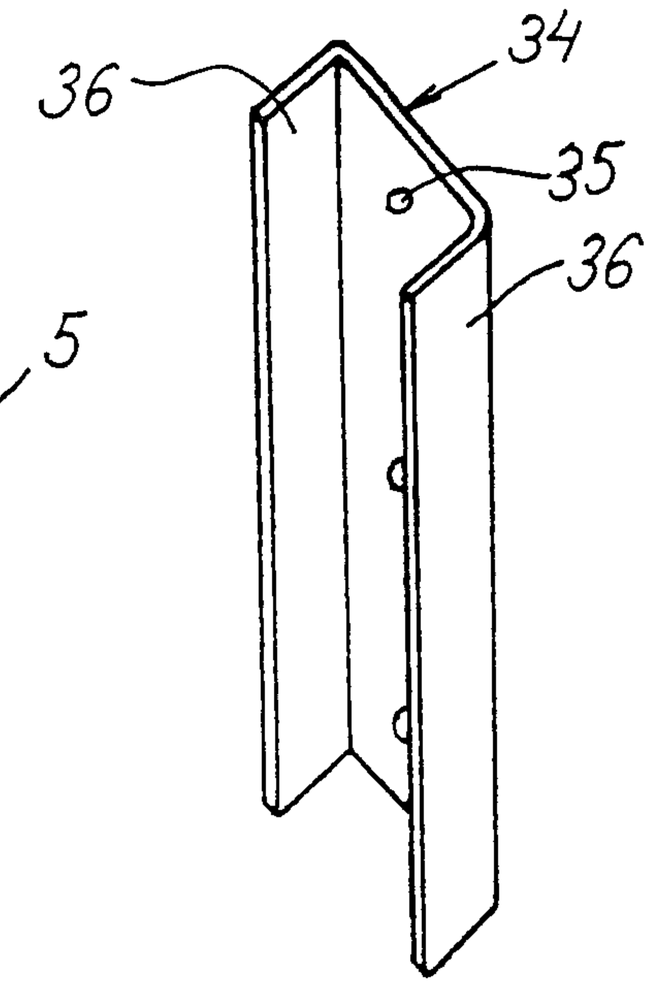
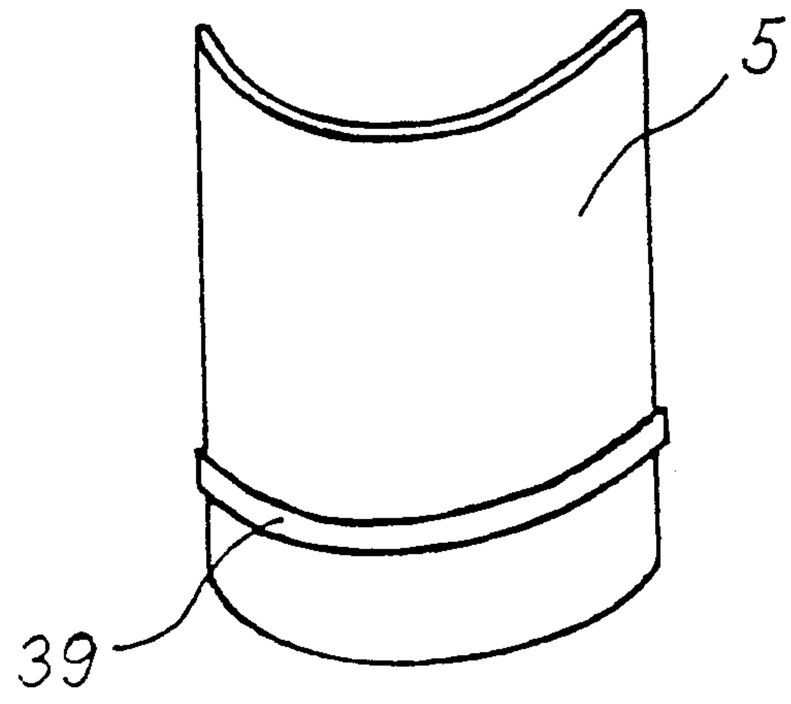
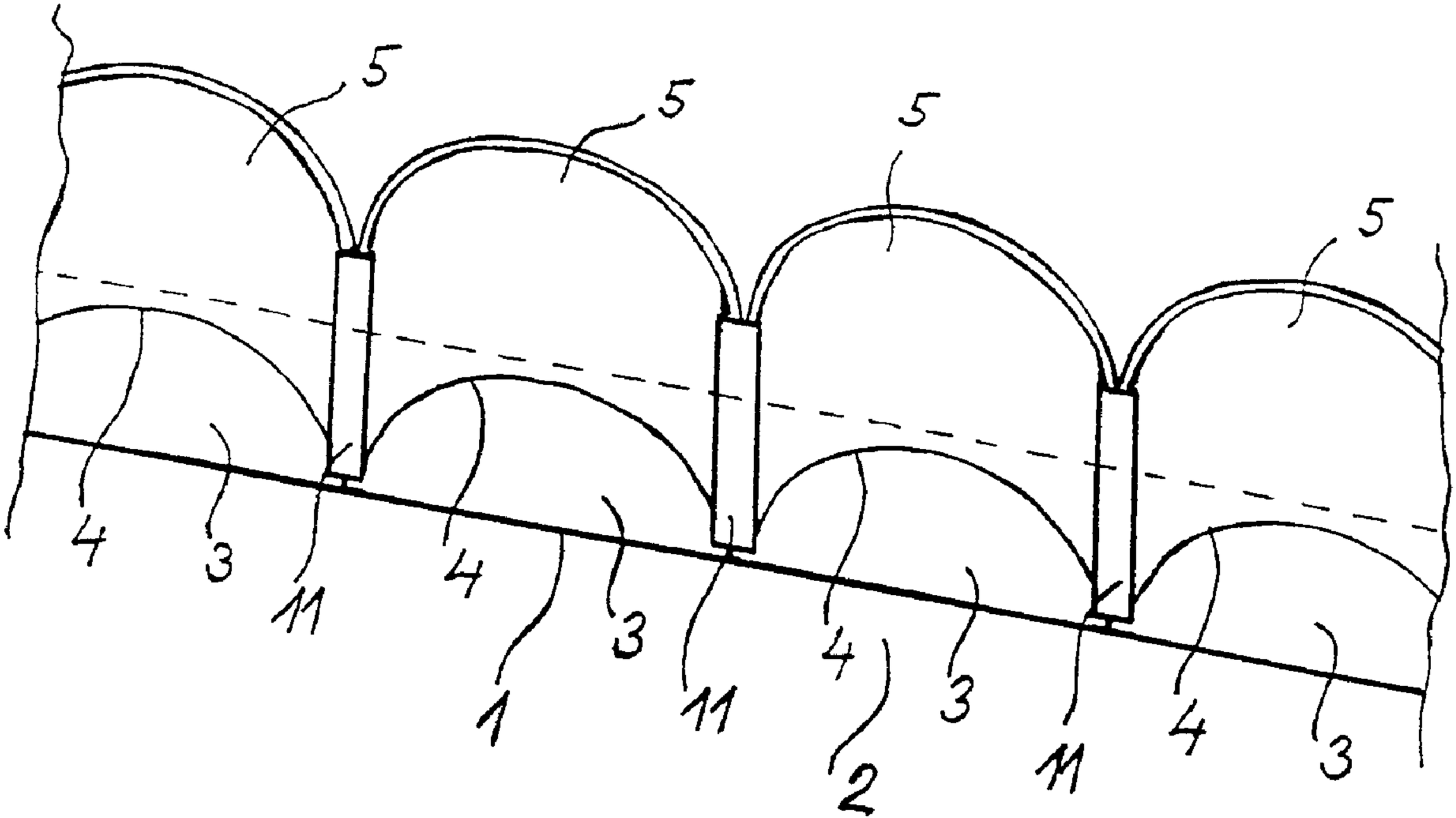


Fig. 12

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