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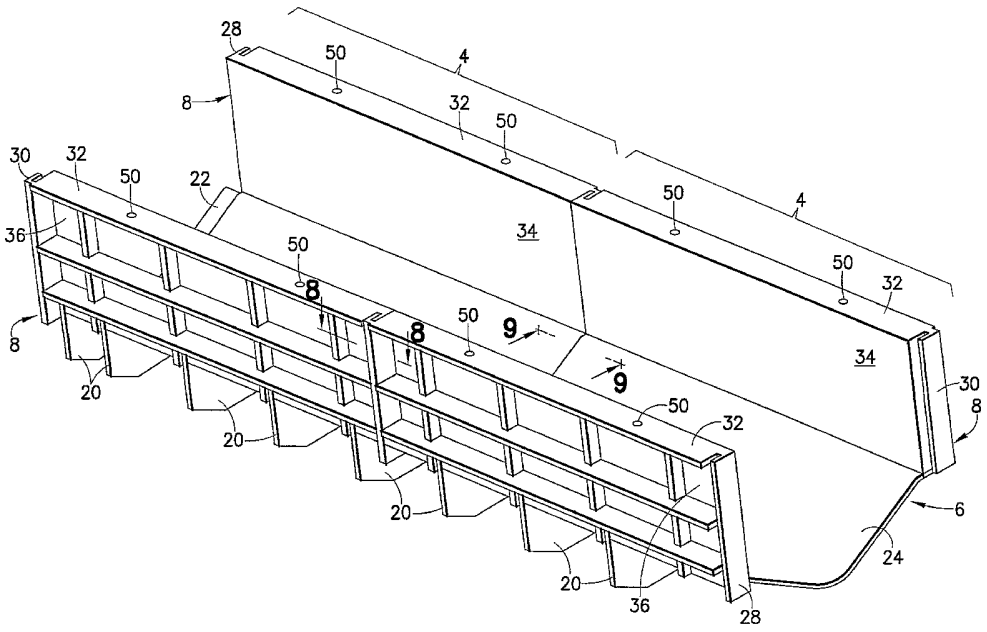
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(54) Title: MODULAR TRENCH DRAIN




(57) Abstract: A modular trench drain system including a plurality of drain segments composed of a base and a pair of spaced apart side members attached to edges of the base. Adjacent bases are connected together by overlapping a stepped-down portion at the end of one base with an end of an adjoining base. Adjacent side members are connected together via interlocking structures at their ends. The system may be used with bases and side members of various dimensions to accommodate particular installation requirements.

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

# MODULAR TRENCH DRAIN

## BACKGROUND OF THE INVENTION

Field of the Invention

**[0001]** The present invention relates to trench drains, more particularly to a modular trench drain including interlocking side members and base segments.

Description of Related Art

**[0002]** Trench drains are used where extensive amounts of liquid must be moved from one location to another and, typically, transport the liquid to a drainage sewer. Trench drains are often U-shaped or V-shaped troughs and are usually installed adjacent to either roadways or buildings. They are installed in the ground and secured in concrete. To prevent injury to people and avoid debris entering the trench drains, a grate often covers the trough.

**[0003]** Trench drain systems include several basic designs of concrete, metal and plastic. Generally, concrete trench drain systems use forms that are placed in a ditch dug in the ground. Concrete is then poured around the forms, which are removed after the concrete has set. Concrete trench drain systems are relatively expensive systems due to the cost of installing and removing the forms.

**[0004]** Many of the expenses associated with concrete trench drain systems have been overcome with the advent of polymeric trench drains that can be left in place after the concrete has been poured into place and has set. These trench drains perform two functions. First, they act as a form for the concrete; and second, they act as a liner. The associated manufacturing and transportation costs with this type of trench drain are significantly less than the other types of trench drains.

**[0005]** Commercially available polymeric trench drains include those manufactured by Zurn Industries, Inc. and sold under the FLO-THRU trademark which have become a standard in the industry. Typically, the FLO-THRU trench drains include a channel member made of a polymeric material, such as either fiberglass or plastic, that defines a flow passageway. Grates are received on the top of the channel member. The trench drain typically is set in concrete and held in place either adjacent a roadbed, sidewalk or building.

**[0006]** These polymeric trench drains are relatively expensive to manufacture. Each installation of a trench drain has particular physical constraints on the size and configuration of the drain. As such, customized drains are created which require separate molds for each width and depth of the trench drain. Creating customized molds to produce polymeric drains in various dimensions is costly.

[0007] Accordingly, it is an object of the present invention to provide a polymeric trench drain that is less expensive to manufacture and which can be used in a variety of installation configurations. Another object of the present invention is to provide a trench drain that is easy to install, remove and clean of debris.

## SUMMARY OF THE INVENTION

[0008] The present invention includes a trench drain made from modular components that can be attached to one another to form trench drains of various dimensions. These components include a base and two side members. Preferably, the trench drain components are made of a polymer such as a high density polyethylene. The side members may be attached to the base by vibratory fusion, mechanical joining, adhesive pinning or channel welding. A frame is then secured to the trench drain segment for receiving a grate and to hold the trench drain segments together.

[0009] One end of each base includes a portion for connecting with an end of a base of an adjoining drain segment, and one end of each side member connects with an end of a side member of the adjoining drain segment. In this manner, a plurality of drain segments may be connected together to produce a trench drain. A main wall of the side member is received in a longitudinal slot at the edge of the base. The side of the main wall facing the channel is smooth and the other side is ribbed. The ribs of the main wall are received in notches defined in the longitudinal edges of said base. The base portion for connecting with an end of a base of an adjoining drain segment includes a stepped portion that receives an end of the adjoining drain segment. Each side member includes an end wall having a tab. The tabs of the end walls of adjoining drain segments are engageable with each other to connect one end of each end wall with an end wall of a side member of the adjoining drain segment. The base may include reinforcing ribs on its lower surface, and the upper surface may be curved or flat.

[0010] A complete understanding of the invention will be obtained from the following description when taken in connection with the accompanying drawing figures wherein like reference characters identify like parts throughout.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Fig. 1 is a perspective view of the trench drain of the present invention including bases, side members and grate frame;

[0012] Fig. 2 is an exploded view of the trench drain shown in Fig. 1;

[0013] Fig. 3 is a perspective view of the base segment shown in Fig. 1;

[0014] Fig. 4 is a plan view of the base segment shown in Fig. 3;

**[0015]** Fig. 5A is a sectional view of the base segment shown in Fig. 4 taken along lines 5A-5A;

**[0016]** Fig. 5B is a sectional view of the base segment shown in Fig. 4 taken along lines 5B-5B;

**[0017]** Fig. 6 is a perspective view of the side wall shown in Fig. 1;

**[0018]** Fig. 7 is a perspective view of the trench drain shown in Fig. 1 without the grate frame;

**[0019]** Fig. 8 is a partial sectional view of adjoining base segments shown in Fig. 7; and

**[0020]** Fig. 9 is a partial sectional view of adjoining side members shown in Fig. 7.

## DETAILED DESCRIPTION OF THE INVENTION

**[0021]** For purposes of the description hereinafter, the terms "upper", "lower", "right", "left", "vertical", "horizontal", "top", "bottom" and derivatives thereof shall relate to the invention as it is oriented in the drawing figures. However, it is to be understood that the invention may assume various alternative variations and step sequences, except where expressly specified to the contrary. It is also to be understood that the specific devices and processes illustrated in the attached drawings, and described in the following specification, are simply exemplary embodiments of the invention. Hence, specific dimensions and other physical characteristics related to the embodiments disclosed herein are not to be considered as limiting.

**[0022]** Figs. 1 and 2 show one embodiment of the present invention of a modular trench drain system 2. The trench drain system 2 includes one or more trench drain segments 4 composed of a base 6 and a pair of side members 8. A grate frame 10 is positioned on the side members 8 and extends over one or more of the trench drain segments 4. The base 6 and side members 8 together define a channel 12 for flow of fluid through the trench drain system 2. Referring to Figs. 3-5, an upper surface 14 of the base 6 preferably is curved with sloped sides 16 which enhance fluid flow through the channel 12. The base 6 may also have other configurations, such as flat or V-shaped. The underside 18 of the base 6 includes one or more strengthening ribs 20 that may extend the width of the base 6. One end of the base 6 includes a stepped portion 22 that is configured to receive an end 24 of another base 6. In this manner, two or more bases 6 may be connected together as shown in the detail of Fig. 9.

**[0023]** Side member 8 includes a main wall 26, end walls 28 and 30 and an upper ledge 32. Main wall 26 has a smooth side 34 facing the channel 12 and a ribbed side 36 with ribs 38 and 40. Ribs 38 and 40 of ribbed side 36 are shown as being arranged in orthogonal planes, but this is not meant to be limiting. Tabs 42 and 44 extend along the length of end walls 28

and 30, respectively, and are configured to interlock thereby connecting together adjoining side members 8 as shown in the detail of Fig. 8. Main wall 26, end walls 28 and 30, and ribs 38 terminate in a common plane for connection to base 6.

**[0024]** Referring to Figs. 4 and 5A, the sloped sides 16 of the base 6 terminate in longitudinally extending base slots 46. The base slots 46 are sized and configured to receive the main walls 26 of side members 8. Slots 46 further define a plurality of notches 48 for receiving end walls 28, 30 and ribs 38 as shown in Figs. 4 and 5B.

**[0025]** Preferably, the base 6 and the side members 8 are made of polymeric material, such as high density polyethylene. As such, the side members 8 may be secured to the base 6 via welding, such as vibratory fusion, mechanical and/or channel welds, or an adhesive.

**[0026]** Figs. 1, 2 and 7 show two trench drain segments 4 secured to each other by interlocking the tabs 42, 44 of the side member end walls 28, 30 and overlapping the stepped portion 22 of one base 6 by end 24 of an adjoining base 6. The trench drain segments 4 may be produced in a variety of dimensions. For typical fluid drainage, each of the trench drain segments 4 is about forty inches long.

**[0027]** Upper ledge 32 of the side member 8 defines fastener receiving holes 50 that may be internally threaded. The grate frame 10, which is typically made of metal, is secured to one or more trench drain segments 4; two trench drain segments 4 are shown as attached to one grate frame 10 in Figs. 1 and 2. The grate frame 10 includes two spaced apart angle brackets 52 with Nelson studs 54 extending therefrom. The angle brackets 52 are secured to a plurality of C-shaped members 56 having depending legs 58. The grate frame 10 is secured to ledge 32 via fasteners (not shown) extending through frame holes 60 defined in the angle brackets 48 and ledge holes 50. It will be appreciated that other configurations for the grate frame are possible for use in the trench drain system. A grate (not shown) may be received between the angle brackets 52.

**[0028]** The depending legs 58 of the C-shaped members 56 can be attached to rebar in a manner well-known in the art and are adapted to be received in concrete. Likewise, the Nelson studs 54 are similarly adapted to be received in concrete poured around the trench drain system 2. The ribs 38, 40 of the side members 8 and the base ribs 20 also provide structures and surfaces for securing the trench drain system 2 to concrete. In addition, a plastic pipe or other spacer materials, such as Styrofoam or wood (not shown), may be installed in the channel 12 between the side members 8 to prevent collapse of the trench drain system 2 during installation. The spacer material is then removed after concrete has set around the trench drain system 2.

**[0029]** An advantage of the present invention is that the width of the trench drain system 2 can be easily modified by providing bases 6 in various widths. Hence, the same side members 8 can be utilized whether a trench drain system 2 is fourteen inches wide, twenty-four inches wide or any other width. The present invention reduces the cost of manufacturing conventional polymeric trench drains that require a separate mold for each size of trench drain.

**[0030]** Further, while the bases 6 can either be sloped or straight, the same side members 8 may be used for either configuration. Just as the base 6 may be produced in various widths, the side members 8 may also be produced in varying heights to accommodate particular installation requirements. The present invention provides for interchangeability of the base 6 and the side members 8.

**[0031]** It will be readily appreciated by those skilled in the art that modifications may be made to the invention without departing from the concepts disclosed in the foregoing description. Such modifications are to be considered as included within the following claims unless the claims, by their language, expressly state otherwise. Accordingly, the particular embodiments described in detail herein are illustrative only and are not limiting to the scope of the invention which is to be given the full breadth of the appended claims and any and all equivalents thereof.

THE INVENTION CLAIMED IS

1. A modular trench drain comprising a plurality of drain segments, each said drain segment comprising:

a base; and

a pair of spaced apart side members configured to connect to said base, said side members together with said base defining a channel for fluid flow,

wherein one end of each said base includes a portion for connecting with an end of a base of an adjoining drain segment and one end of each of said side member connects with an end of a side member of said adjoining drain segment.

2. The trench drain of claim 1 wherein each said side member comprises a main wall and said base defines longitudinal slots for receiving said main walls.

3. The trench drain of claim 2 wherein said longitudinal slots are located at longitudinal edges of said base.

4. The trench drain of claim 3 wherein said main walls each include one side facing said channel and an opposing ribbed side having ribs, wherein ends of said ribs are received in notches defined in said longitudinal edges of said base.

5. The trench drain of claim 4 wherein said sides of said main walls facing said channel are smooth.

6. The trench drain of claim 1 wherein said base portion for connecting with an end of a base of an adjoining drain segment comprises a stepped portion that receives an end of said adjoining drain segment.

7. The trench drain of claim 1 wherein each said side member comprises an end wall having a tab, said tabs of said end walls of adjoining drain segments being engageable with each other to connect one end of each said end wall with an end wall of a side member of said adjoining drain segment.

8. The trench drain of claim 1 wherein a lower surface of said base comprises reinforcing ribs.

9. The trench drain of claim 1 wherein said base and said side members comprise a polymeric material.

10. The trench drain of claim 9 wherein said polymeric material comprises high-density polyethylene.

11. The trench drain of claim 10 wherein said side members are adhered to said base by a process selected from the group consisting of vibratory fusion, mechanical joining, adhesive pinning and channel welding.

12. The trench drain of claim 1 wherein an upper surface of said base is curved.

13. The trench drain of claim 1 wherein an upper surface of said base is flat.

14. The trench drain of claim 1 further comprising a frame received by said side members, said frame being configured to receive a grate.

15. The trench drain of claim 14 wherein each said side member comprises an upper wall for receiving said frame.

16. A trench drain segment comprising:

a base; and

a pair of spaced apart side members configured to connect to said base, said side members together with said base defining a channel for fluid flow,

wherein one end of said base includes a portion for connecting with an end of another base of an adjoining drain segment and one end of each of said side member being connectable with an end of another side member of an adjoining drain segment.

17. The trench drain segment of claim 16 wherein each said side member comprises a main wall and said base defines longitudinal slots for receiving said main walls.

18. The trench drain segment of claim 17 wherein said longitudinal slots are located at longitudinal edges of said base.

19. The trench drain segment of claim 17 wherein said main walls each include one side facing said channel and an opposing ribbed side having ribs, wherein ends of said ribs are received in notches defined in said longitudinal edges of said base.

20. The trench drain segment of claim 19 wherein said sides of said main walls facing said channel are smooth.

21. The trench drain of claim 16 wherein said base portion for connecting with an end of a base of an adjoining drain segment comprises a stepped portion for receiving an end of an adjoining drain segment.

22. The trench drain of claim 16 wherein each said side member comprises an end wall having a tab, said tabs of said end walls being engageable with an end wall of a side member of an adjoining drain segment.

23. The trench drain of claim 16 wherein a lower surface of said base comprises reinforcing ribs.

24. The trench drain of claim 16 wherein said base and said side members comprise a polymeric material.

25. The trench drain of claim 24 wherein said polymeric material comprises high-density polyethylene.

26. The trench drain of claim 25 wherein said side members are adhered to said base by a process selected from the group consisting of vibratory fusion, mechanical joining, adhesive pinning and channel welding.

27. The trench drain of claim 16 wherein an upper surface of said base is curved.

28. The trench drain of claim 16 wherein an upper surface of said base is flat.

29. A method of installing a trench drain comprising the steps of:

providing components of a modular trench drain comprising at least one base and a pair of spaced apart side members configured to connect to the base, the side members together with the base defining a channel for fluid flow;

selecting a base sized to accommodate a desired width of the trench drain;

selecting a pair of side members sized to accommodate a desired height of the trench drain; and

connecting each of the side members to the base.

30. The method of claim 29 comprising:

selecting a plurality of bases sized to accommodate a desired width for the trench drain and selecting a plurality of pairs of side members sized to accommodate a desired height of the trench drain;

connecting each pair of side members to one of the bases;

connecting an end of one side member to an end of an adjoining side member; and

connecting an end of one base with an end of an adjoining base.

31. The method of claim 30 wherein said step of connecting the bases comprises overlapping end portions of adjoining bases.

32. The method of claim 30 wherein said step of connecting the side members comprises engaging tabs on the ends of the side members with each other.

33. The method of claim 29 wherein the base and side members are made of a polymeric material.

34. The method of claim 33 wherein the step of connecting the side members to the base comprises a process selected from the group consisting of vibratory fusion, mechanical joining, adhesive pinning and channel welding.

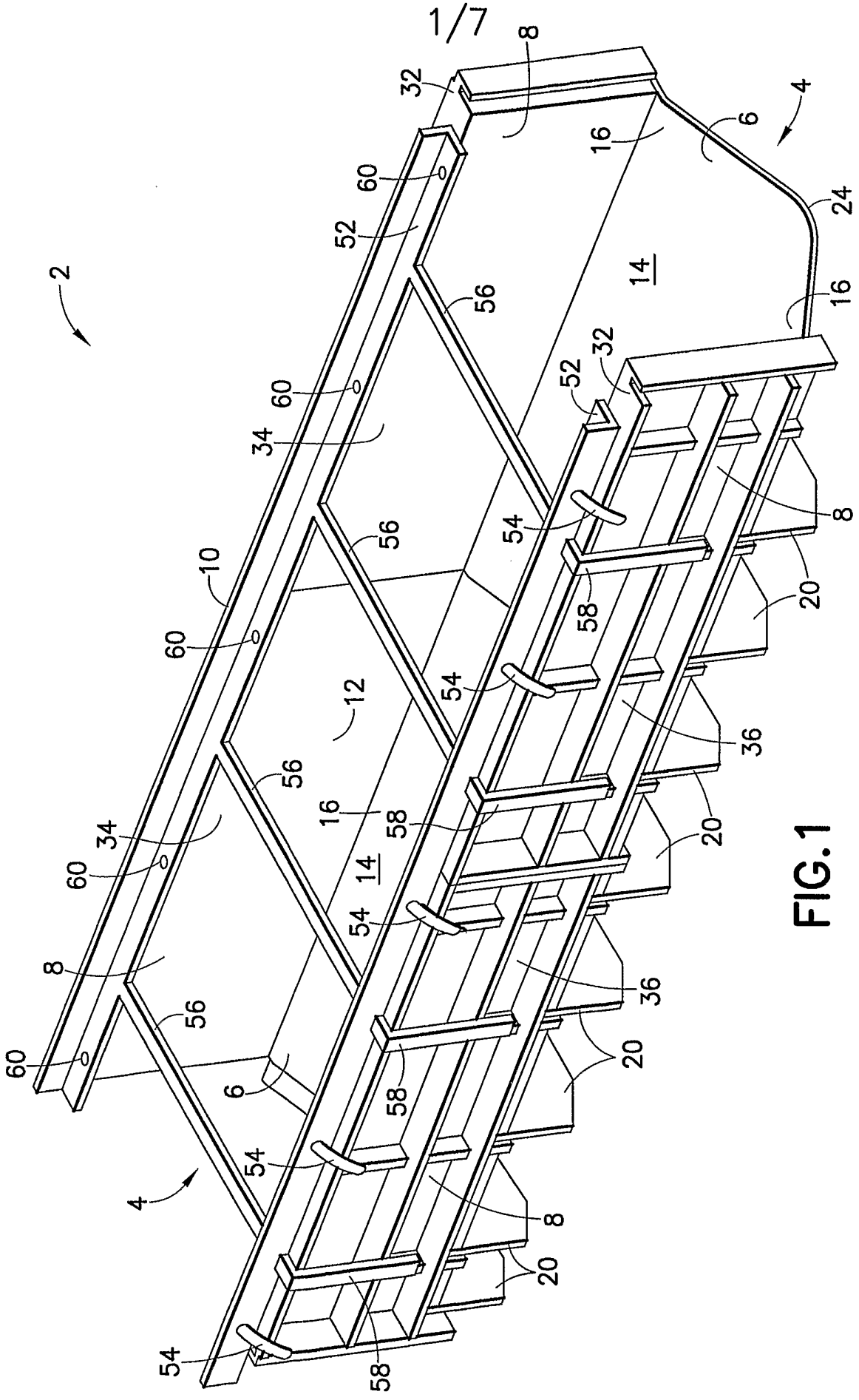



FIG. 1

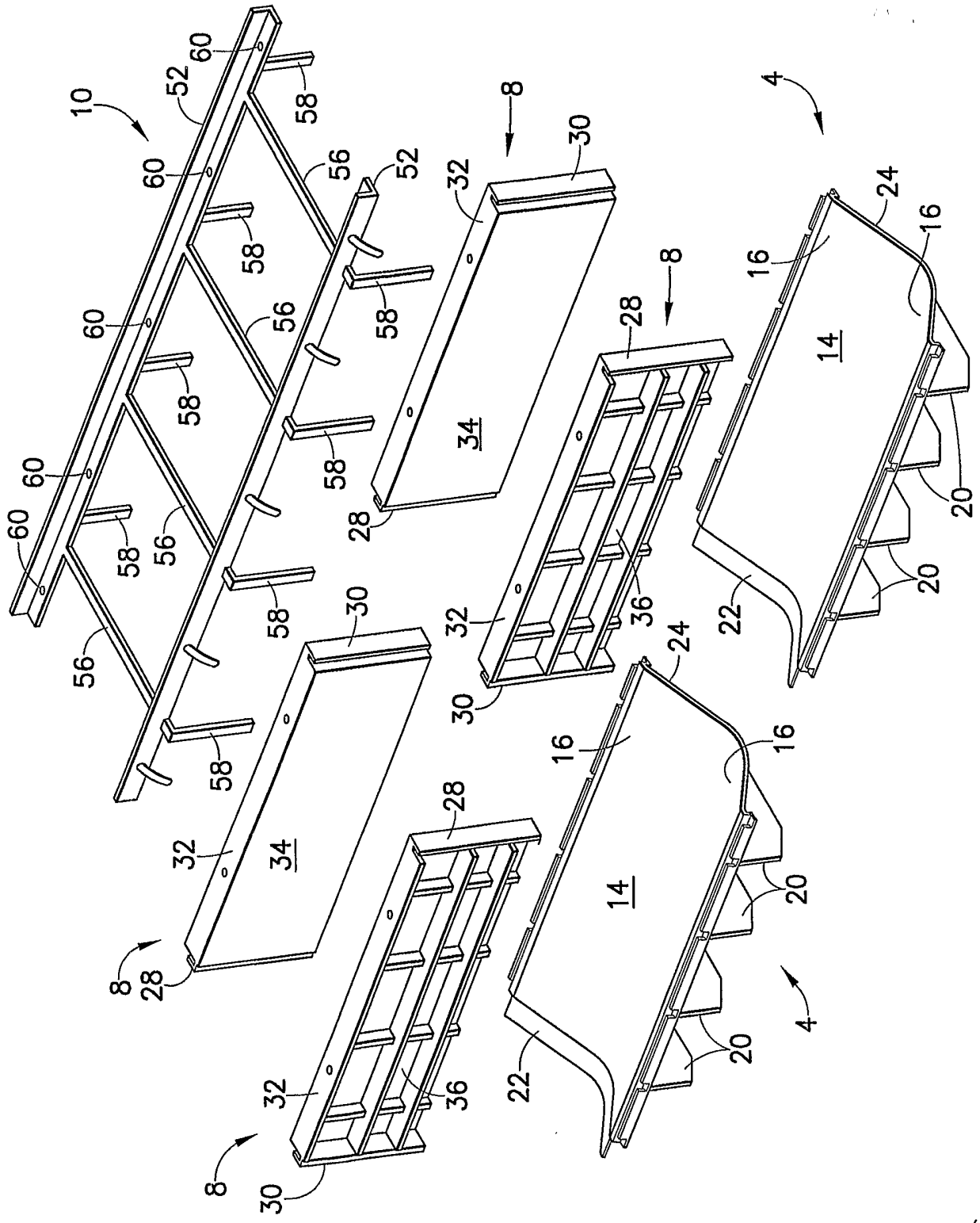



FIG.2

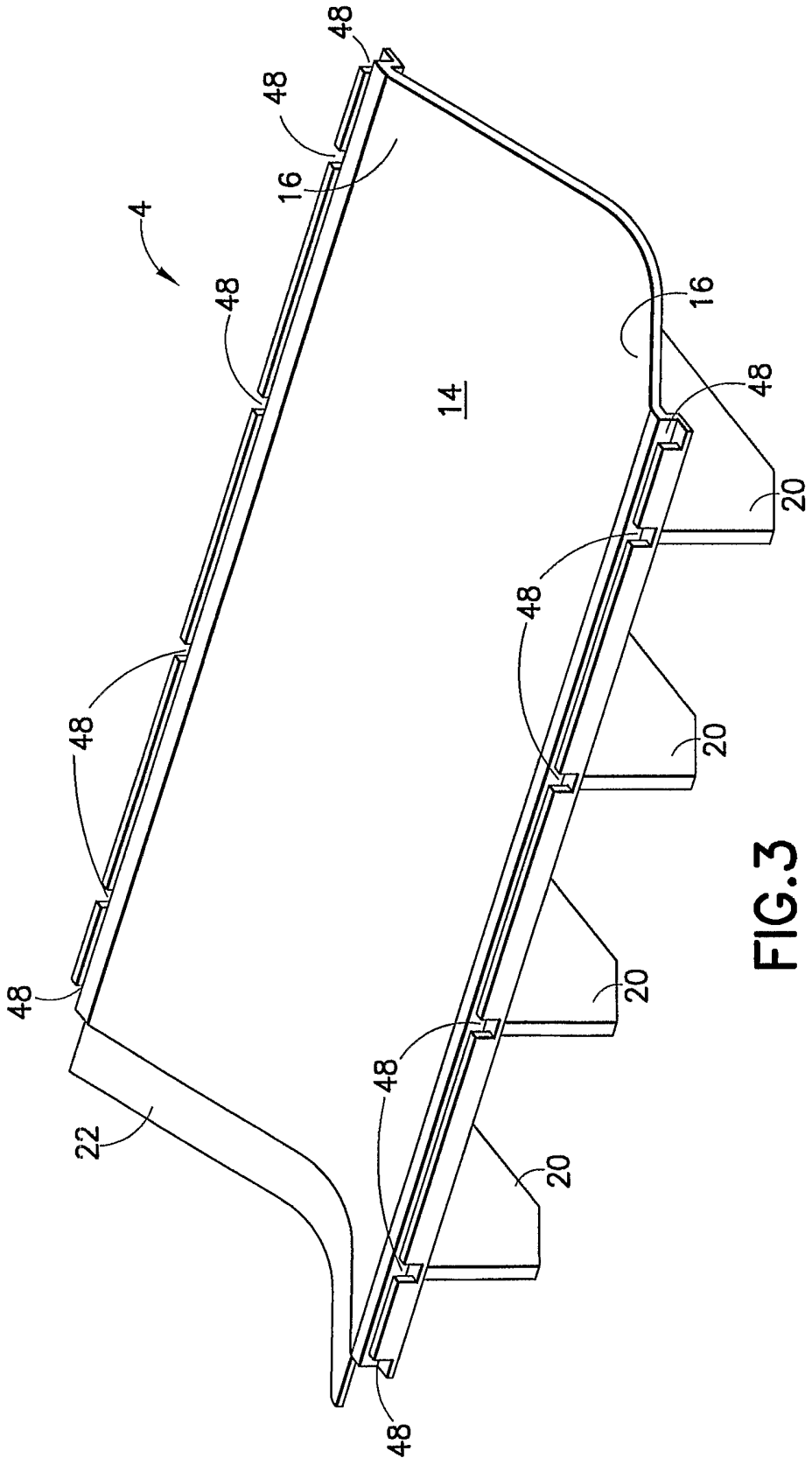



FIG.3

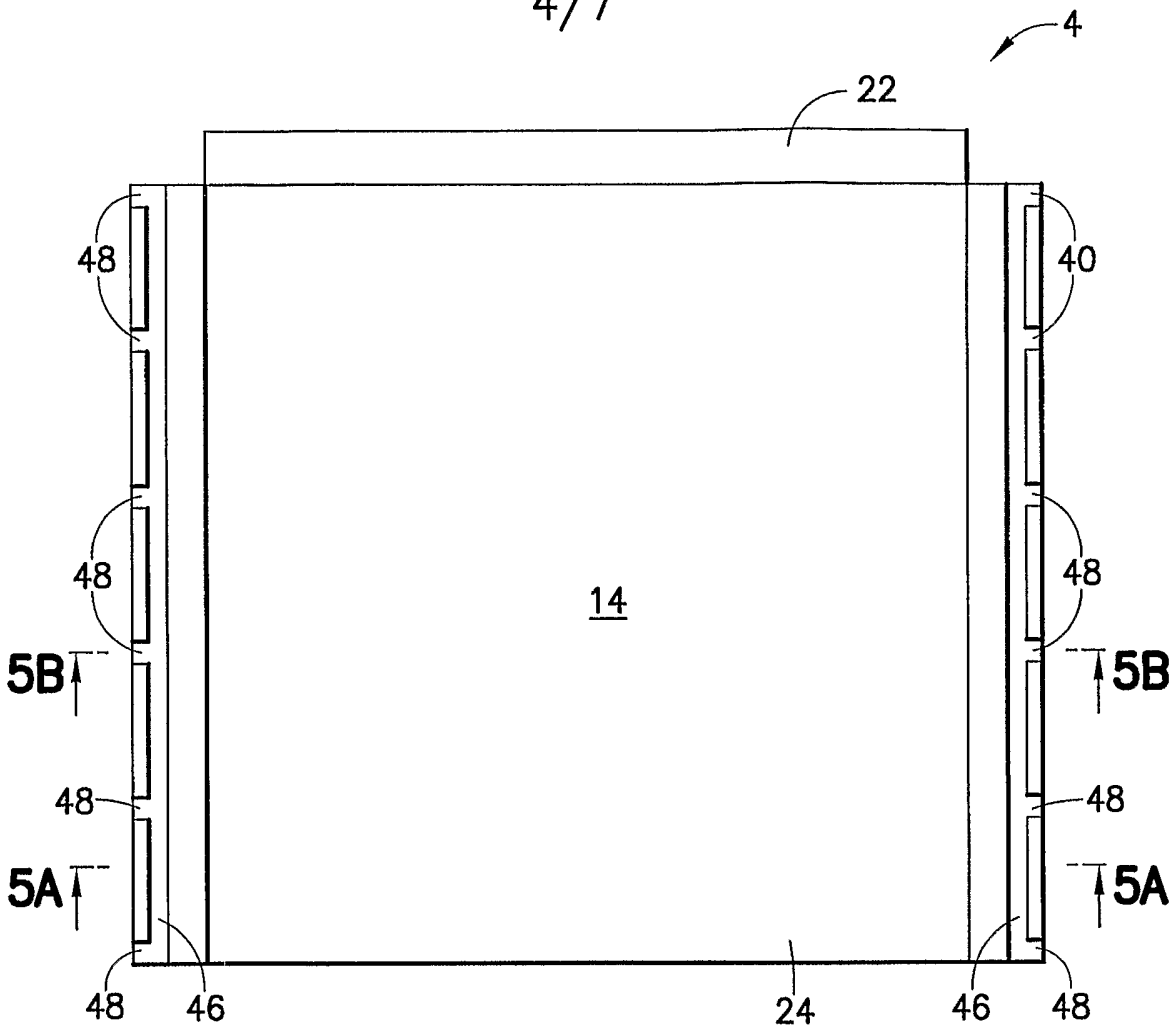



FIG.4

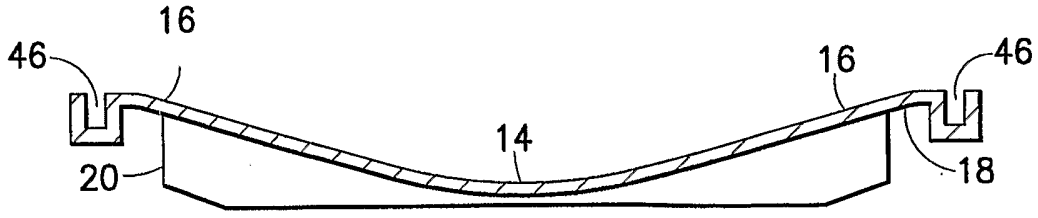



FIG.5A

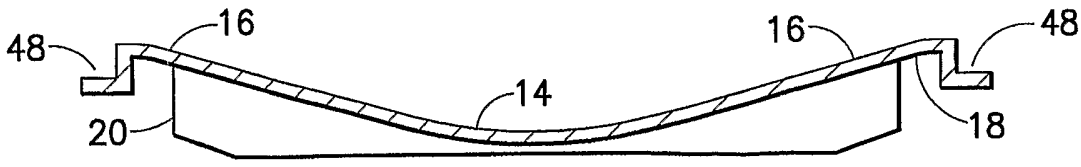



FIG.5B

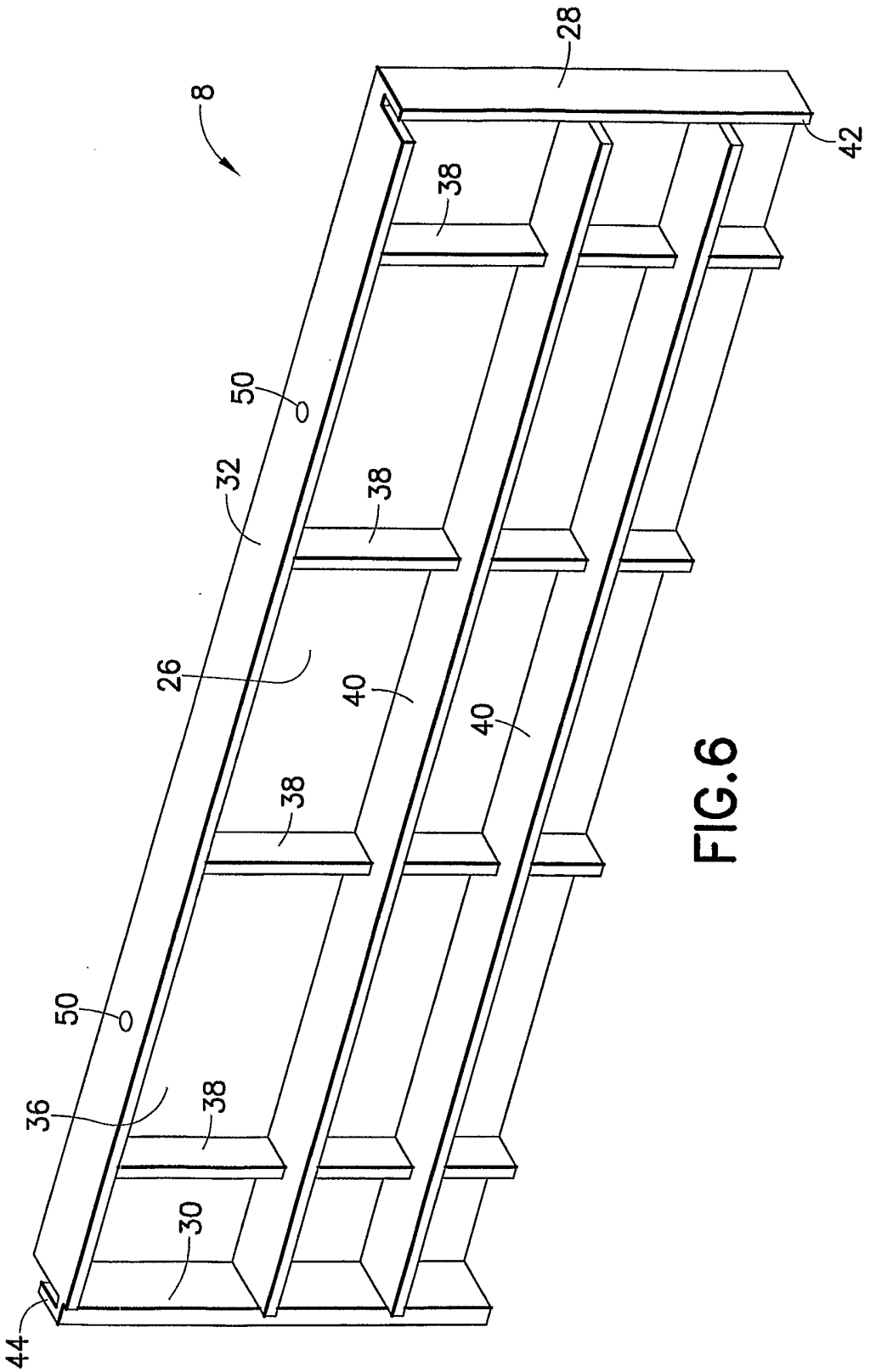



FIG.6

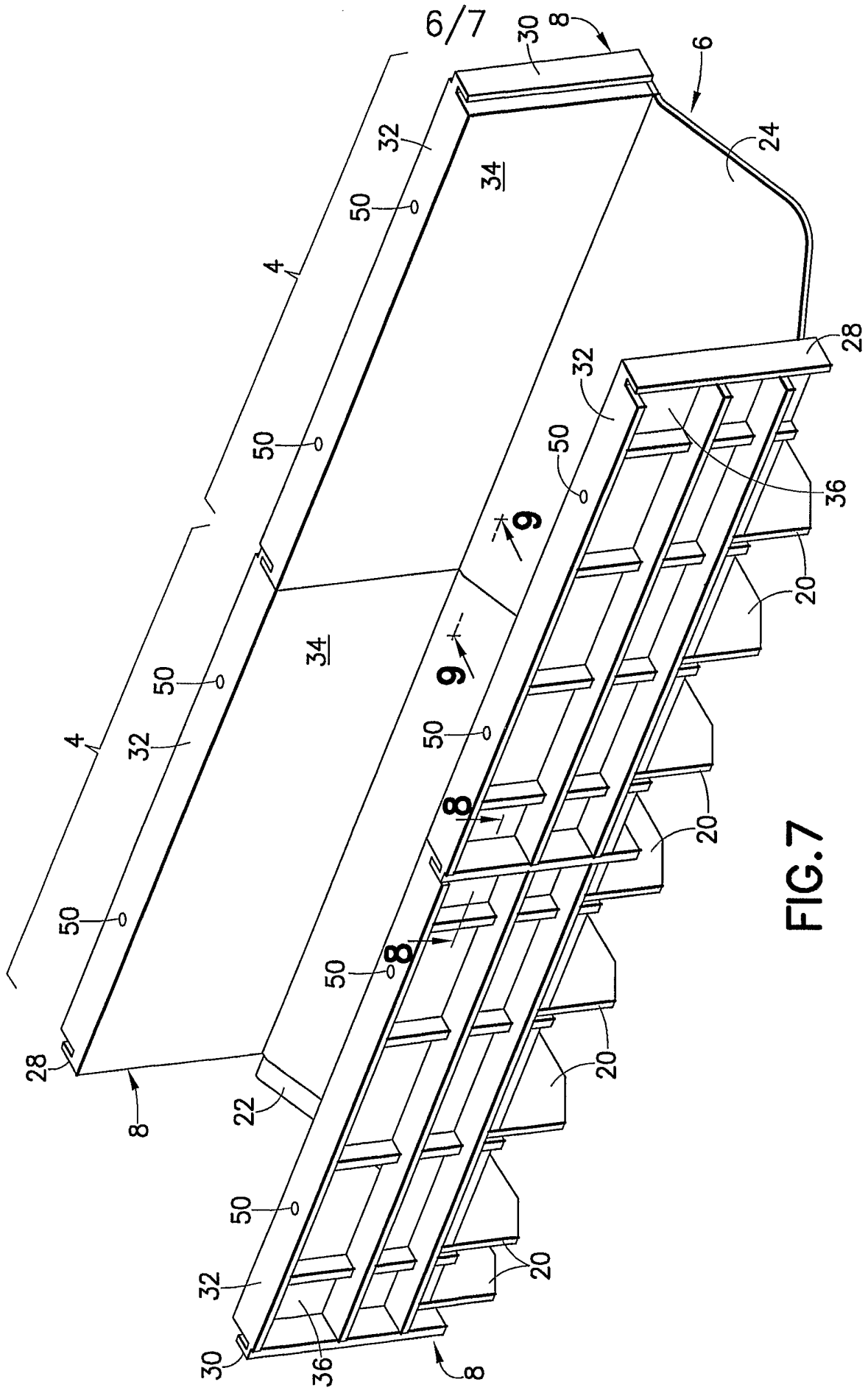



FIG.7

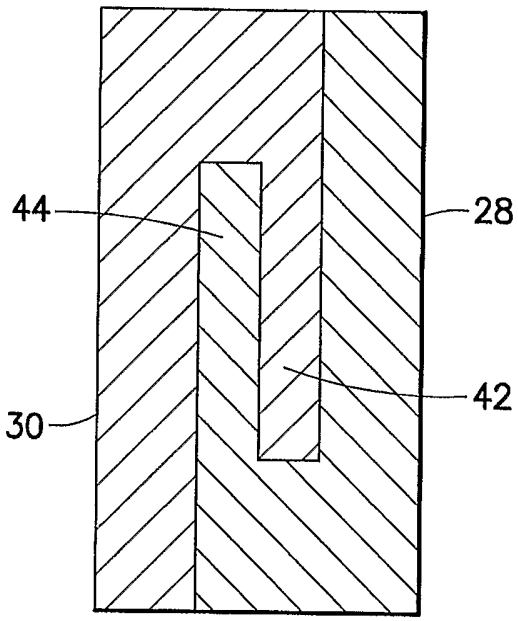



FIG.8

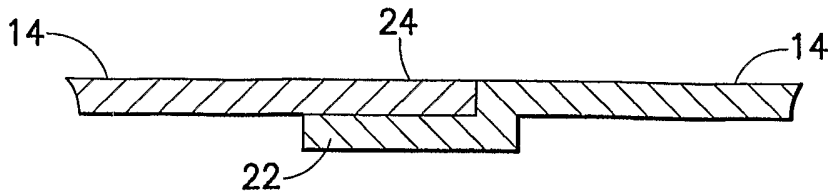



FIG.9