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(54) **TRENCH DRAIN SYSTEM**

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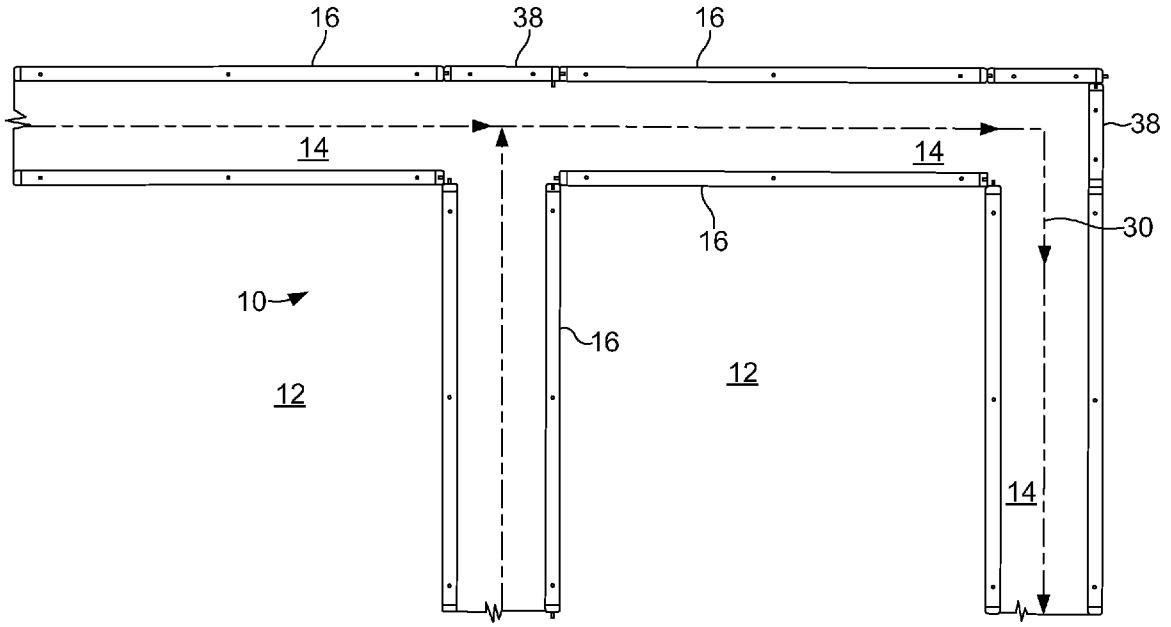
(57) **ABSTRACT**

A method of forming a trench drain including a step of positioning a plurality of form members including a first form member and a second form member, each having at least one set of openings arranged in a generally vertical manner. The sets of openings include a first opening, a second opening and a third opening. There is a vertical distance from the first opening to the second opening that is substantially equal to a vertical distance from the second opening to the third opening. The first form member is substantially parallel with the second form member. The set of openings of the first member are aligned with the set of openings of the second form member. An opening in the first form member and a corresponding opening in the second form member are selected dependent upon a predetermined slope for the trench drain thereby defining a selected opening in each of the first and second form members. The first form member is connected with the second form member by way of a cross member. The cross member has a first end associated with the selected openings.



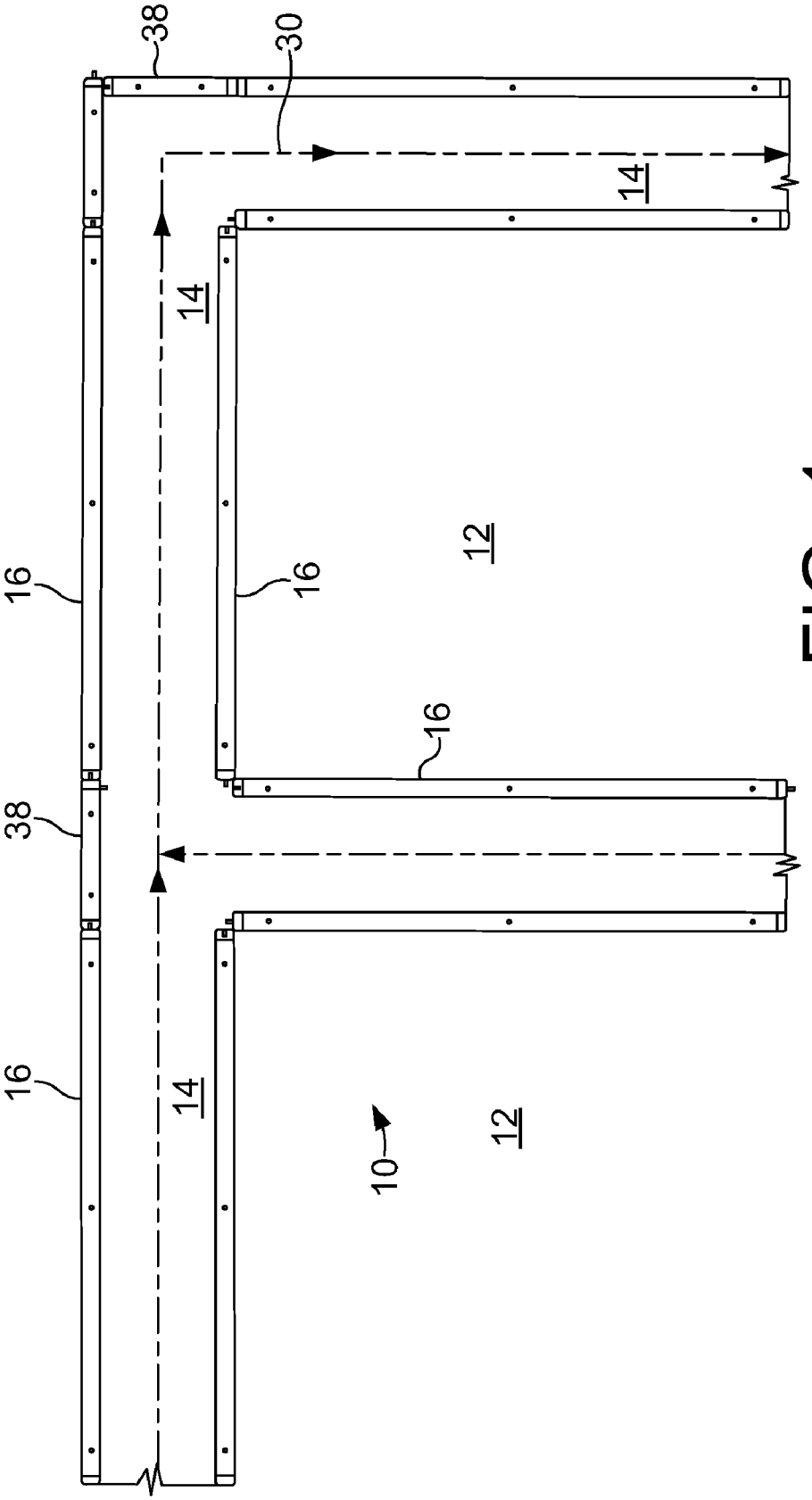


FIG. 1

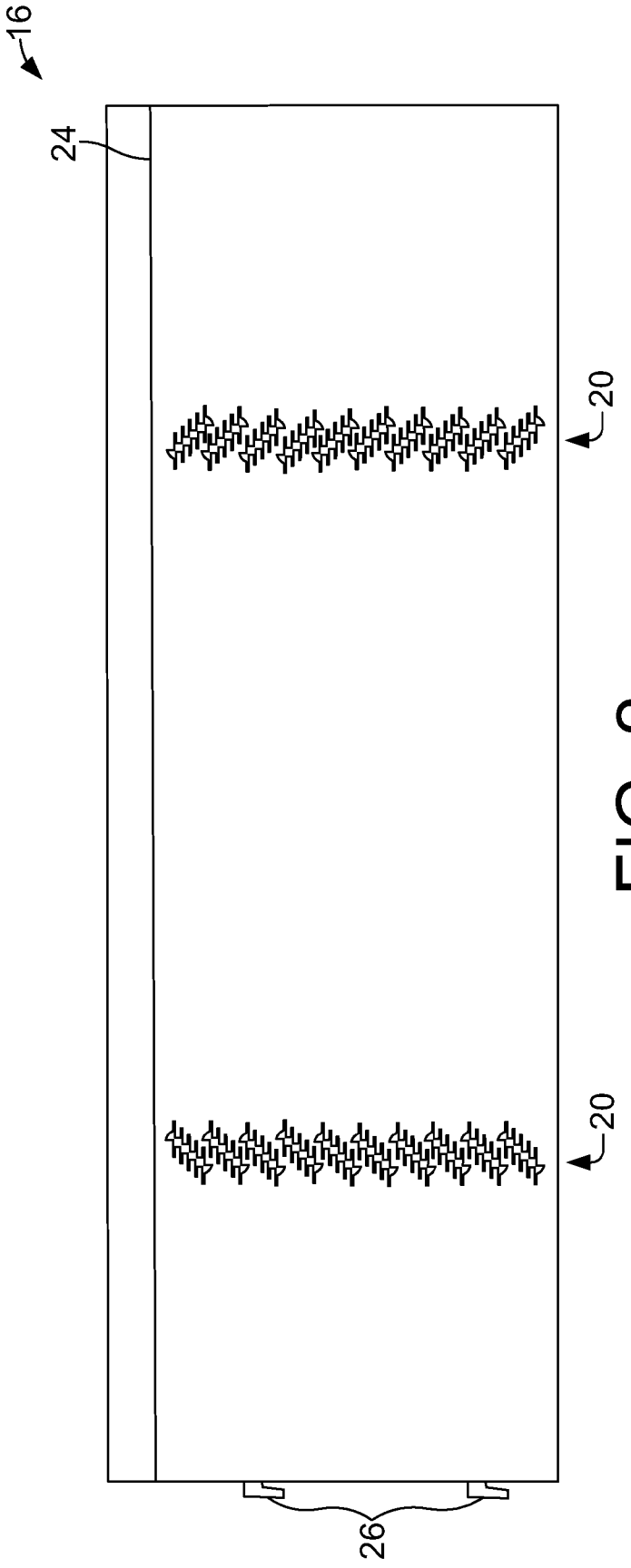


FIG. 2

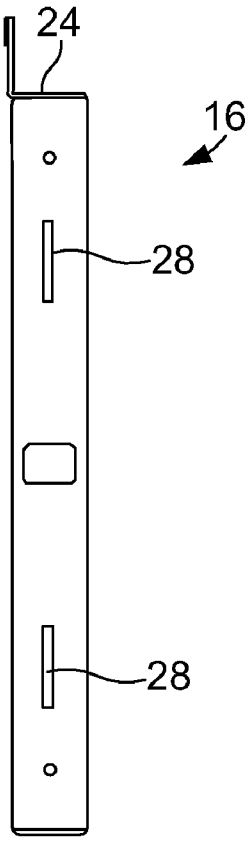


FIG. 3

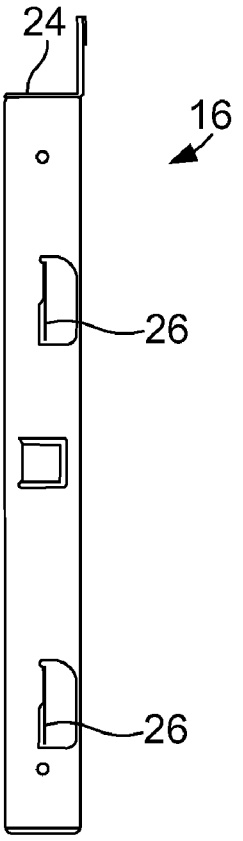


FIG. 4

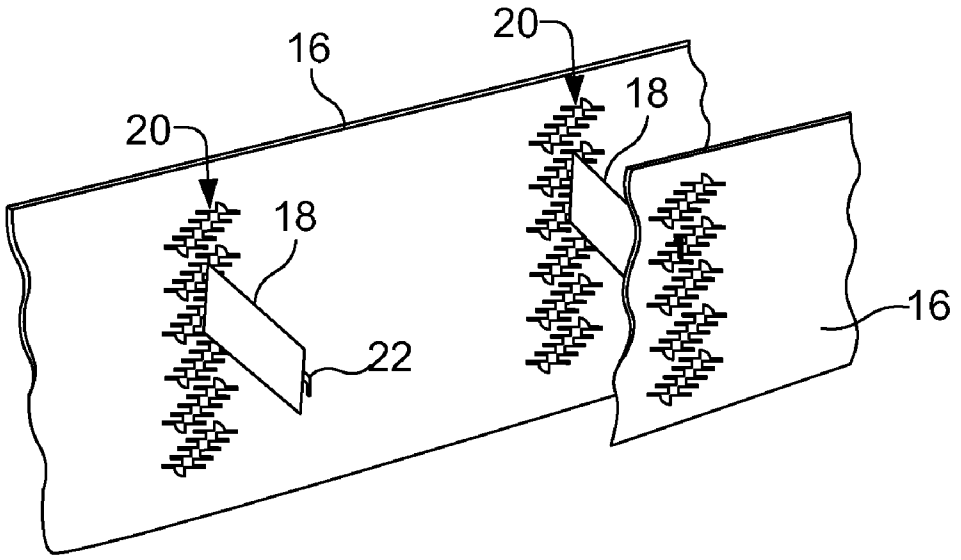


FIG. 5

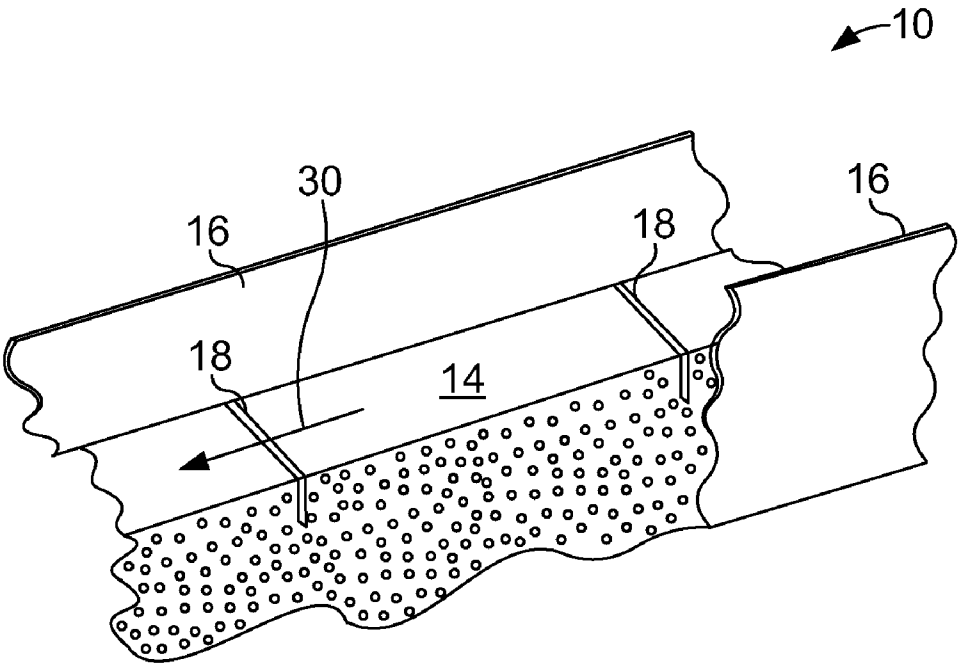


FIG. 6

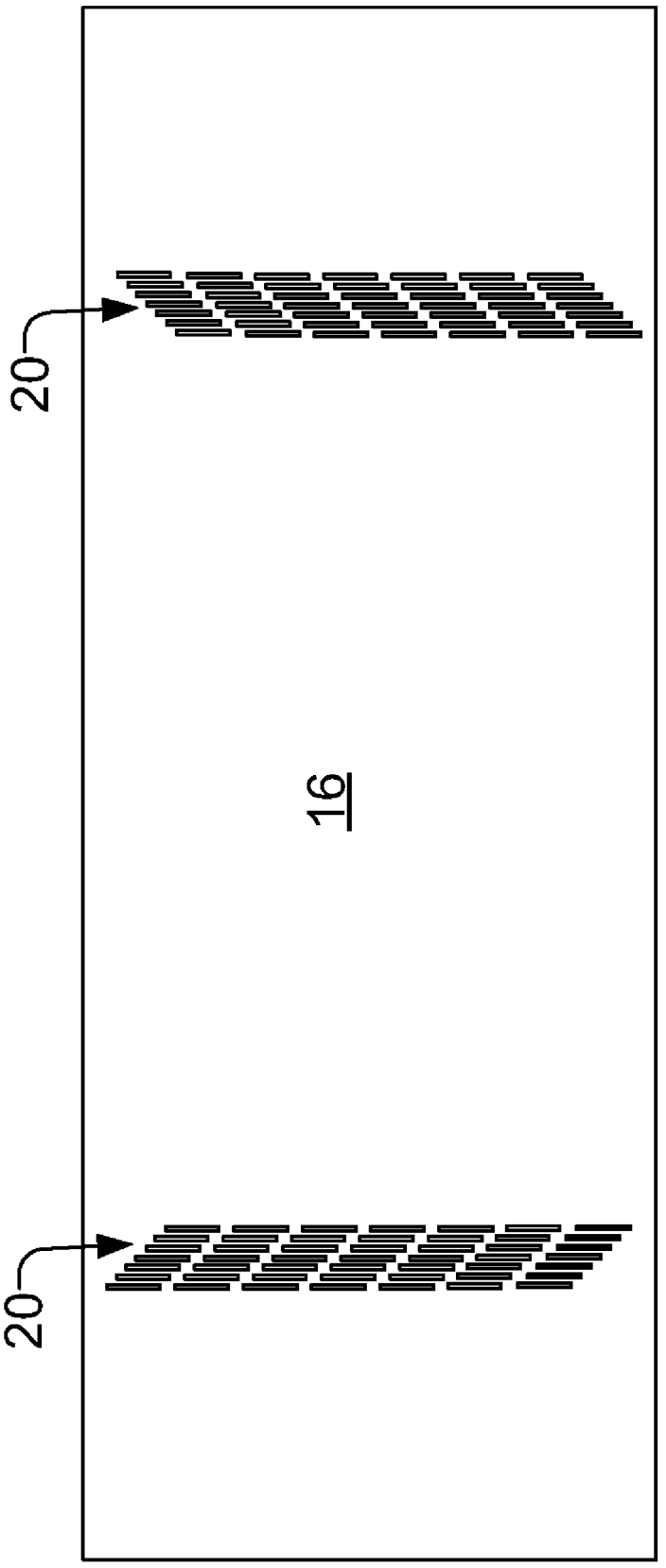


FIG. 7

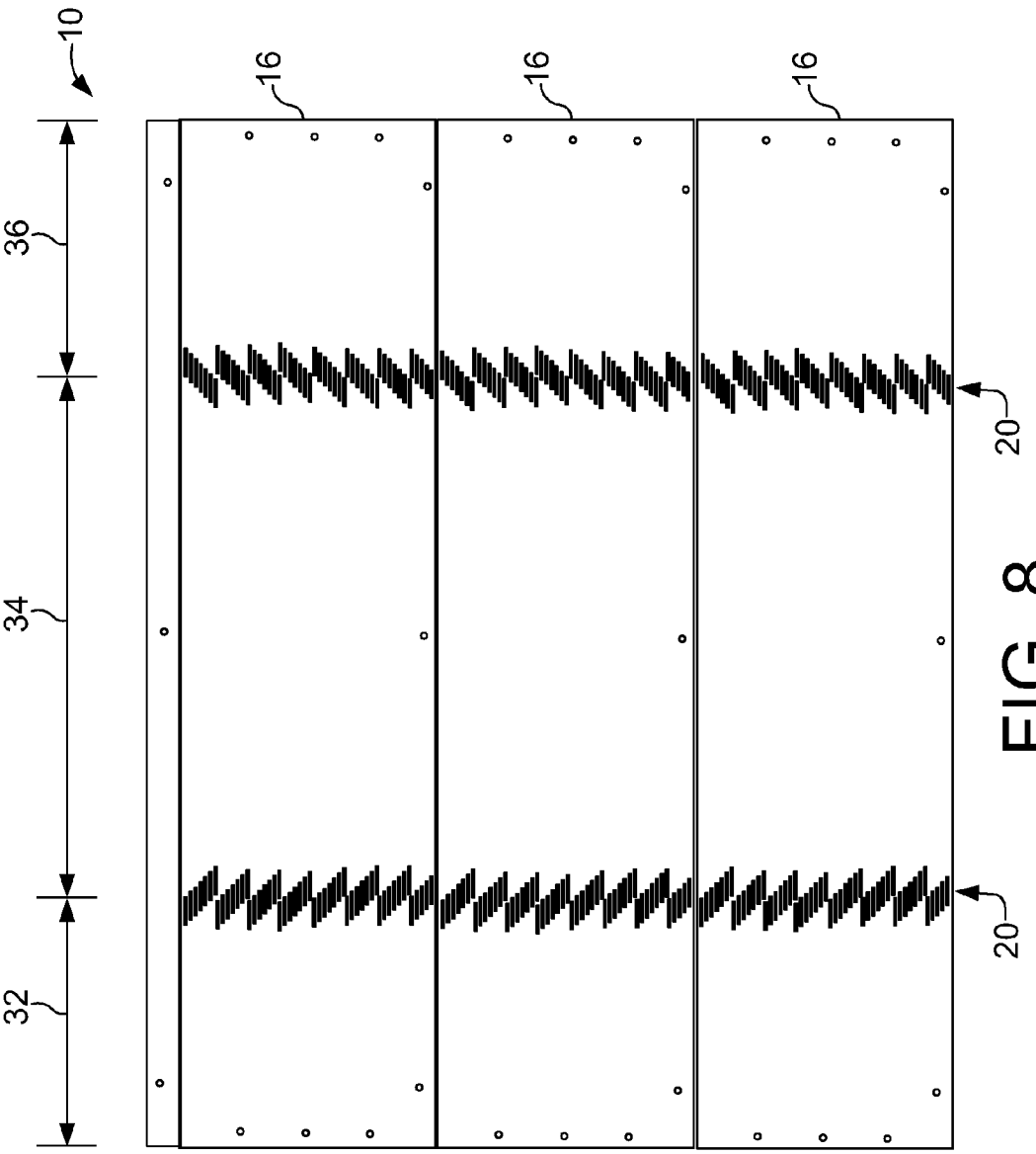


FIG. 8

TRENCH DRAIN SYSTEM

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a forming system for use with concrete, and, more particularly, to a trench drain forming system for use with concrete.

[0003] 2. Description of the Related Art

[0004] Trench drains are known and are generally used in situations requiring a large extensive drainage system of an area subject to heavy amounts of fluid run off, such as exterior portions of buildings, building perimeters, paved areas such as parking lots and roadways. Generally a trench drain is covered with a grating system allowing liquid to enter thereby and to drain therethrough into a larger drainage system such as a sewer or ditch. Additionally, the liquid may be stored in a tank or holding pool for later processing.

[0005] A modular trench system is disclosed in U.S. Pat. No. 3,225,545 that includes a V-shaped conduit with male and female formations at opposite ends with an integral flange for the support of a grating.

[0006] U.S. Pat. No. 5,066,165 discloses a modular end trench drain system having channels, grate frames, anchors, spacer bars and grating. The channel is vacuum formed from a fiberglass mat impregnated with resins. The bottom of the trough has a pair of upwardly extending diverging side walls.

[0007] What is needed in the art is an easy effective way of building an inclined drainage system.

SUMMARY OF THE INVENTION

[0008] The present invention provides a trench drainage system that easily controls the inclination of the drain formed by concrete within the form system.

[0009] The invention in one form is directed to a method of forming a trench drain including the steps of positioning a plurality of form members, aligning at least one set of openings, selecting a set of openings and connecting the form members to cross members. The positioning step includes positioning a plurality of form members including a first form member and a second form member, each of the plurality of form members having at least one set of openings arranged in a generally vertical manner. The sets of openings include a first opening, a second opening and a third opening. There is a vertical distance from the first opening to the second opening that is substantially equal to a vertical distance from the second opening to the third opening. The first form member is substantially parallel with the second form member. The aligning step includes aligning the at least one set of openings of the first member with the at least one set of openings of the second form member. The selecting step includes selecting one of the openings in the first form member and a corresponding one of the openings in the second form member dependent upon a predetermined slope for the trench drain thereby defining a selected opening in each of the first and second form members. The connecting step includes connecting the first form member with the second form member by way of a cross member. The cross member has a first end associated with the first selected opening in the first form member and a second end associated with the selected opening in the second form member.

[0010] An advantage of the present invention is that the slope of the concrete that is poured within the form members is determined by the positioning of the cross members.

[0011] Another advantage of the present invention is that the openings along the form members have pre-selected vertical positions allowing for the ease of installation as well as rapidly laying out the inclination of the trench drain.

[0012] Yet another advantage of the present invention is that the forming members are very modularized and can be interconnected allowing several heights of forming members to be utilized in the trench drain system.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The above-mentioned and other features and advantages of this invention, and the manner of attaining them, will become more apparent and the invention will be better understood by reference to the following description of embodiments of the invention taken in conjunction with the accompanying drawings, wherein:

[0014] FIG. **1** is a top view of an embodiment of a trench drain system of the present invention;

[0015] FIG. **2** is a side view of an embodiment of a form member used in the trench drain system of FIG. **1**;

[0016] FIG. **3** is an end view of the form member of FIG. **2**;

[0017] FIG. **4** is another end view of the form member of FIG. **2**;

[0018] FIG. **5** is a partially sectioned perspective view of the trench drain system of FIG. **1** utilizing form members of FIGS. **2-4**;

[0019] FIG. **6** is another sectioned perspective view of the trench forming system of FIGS. **1-5** having concrete poured within;

[0020] FIG. **7** is a side view of another embodiment of a form member of the present invention; and

[0021] FIG. **8** is a side view utilizing several form members of FIGS. **1-7**.

[0022] Corresponding reference characters indicate corresponding parts throughout the several views. The exemplifications set out herein illustrate one embodiment of the invention and such exemplifications are not to be construed as limiting the scope of the invention in any manner.

DETAILED DESCRIPTION OF THE INVENTION

[0023] Referring now to the drawings, and more particularly to FIG. **1**, there is shown a trench form system **10** that is installed in conjunction with a floor **12**. Typically a trench form system **10** is positioned with a top edge that is substantially coplanar with the surface of floor **12**. Once trench form system **10** is in place, concrete is poured to form floor **12**. After floor **12** has hardened then typically concrete is then poured into trench form system **10** so as to result in inclined trench **14** to thereby direct the flow of a fluid in the trench drain.

[0024] Now, additionally referring to FIGS. **2-8**, there are shown additional details of trench form system **10** including form members **16**, also known as wall panels **16**, and cross members **18**. Wall panels **16** each include a series of predefined slots or openings **20** positioned at spaced locations along a portion of wall panel **16**. Slots **20** may be grouped in slot subsets that are offset by a measured predetermined distance. For example, a set of slots may include four slots each a quarter inch lower than the previous slot and then the slot sets repeat being horizontally offset so that each slot can be easily selected based on its slot subset and then the relative slot within the slot subset. The slots subsets of a slot set **20**, may appear as in FIG. **7**, which has repeating sets of seven

slots that are positioned so that the bottom of the lowest end slot is the same vertical distance from the highest slot in the next set as there is between each of the individual slots of the first set. Although there is somewhat of a horizontal offset it is not significant when dealing with the draining of fluids along a predetermined inclined trench. The selection of a slot on each side of the connection of a cross member **18** is thereby easily determined as being a certain slot of a certain slot subset. In the direction **30** in which the fluid is to flow the next lower slot may be selected for the next cross member **18** to thereby determine the slope of the overall drain. For example, if the distance **34** between the two substantially vertical sets of slots in any form member **16** are two feet apart then if the slots are positioned to be each a quarter inch different in height then the selection of the next lower slot in the separated sets of slots equates to a one-eight inch per foot slope in the finished trench. A different slope can be selected by the selection of the slots that correspond to the desired slope.

[0025] Cross members **18** include gauging protrusions **22** that interact with slot **20** of a form member **16** and with another corresponding slot **20** on an opposite side of cross member **18** of a second form member **16**. This defines a predetermined space between the two form members **16**. The length of a cross member **18** is selected to define the width of inclined trench **14**. The top edge of cross members **18** may be flat, curved or angled to assist in the forming of a shaped inclined trench **14** by the concrete worker that utilizes the top edge of cross member **18** to predefine the slope and perhaps even the shape of inclined trench **14**. As previously mentioned, cross members **18** are selectively positioned in a slot **20** that corresponds to another slot **20** on another form member **16** and the next cross member **18** may be positioned in a slot **20** that is one increment lower than an adjoining cross member **18**. For example, as shown in FIG. **5**, the rightmost cross member **18** is positioned at a higher point than the leftmost cross member **18**. When concrete or other aggregate or forming material is poured into trench form system **10** to form incline trench **14** it is leveled proximate to the top edges of these pre-positioned cross members **18** to thereby form the grade for incline trench **14**. While the top portions of cross members **18** are shown in FIG. **6**, the people forming the inclined trench may utilize the top edges of cross members **18** as a guide and actually have the top edges embedded slightly underneath the surface of trench drain **14**. This advantageously allows cross members **18** to serve the purpose of pre-positioning the wall panel and providing structural strength to trench forming system **10** and to predefine the grade based upon the positioning of the cross members **18** along multiple form members **16**.

[0026] The ends of form members **16** are illustrated in FIGS. **3** and **4** where a ledge **24** can be seen upon the top portion of form member **16** allowing the vertical stacking of several form members **16**. Ledges **24** additionally allow positioning of grates in the finished trench floor system along the top surface of floor **12**. Engaging protrusions **26** extend out to engage receiving slots **28** of an adjoining form member **16**. This allows for an easy positioning and construction of trench form system **10**. The inclined trench **14** fines the flow **30** of fluid within trench form system **10**. Although trench form system **10** is illustrated in FIG. **1** as trenches form members **16** it can also be utilized to form larger areas such as holding areas by simply positioning form member **16** in a desired construct to form a larger holding area or drainage catch basin.

[0027] When utilizing cross members **18** engaging protrusions **22** may be such that they are slid through slots **20** then cross member **18** is then repositioned to lock cross member **18** together with to form members **16**. Although only one cross member **18** is shown with each vertical set of slots **20**, it is also contemplated to use additional cross members **18** at different vertical levels so as to provide structural rigidity to trench form system **10**. In this way when concrete is poured in to form incline trench **14**, cross members **18** may be completely immersed in the concrete with only the top sets of cross members **18** being positioned to define the inclined portion of trench **14**. The positioning of cross members **18** substantially below the finish grade of trench **14** is a matter of preference within the normal techniques of those engaged in setting up forms for the pouring and finishing of concrete.

[0028] Slots **20** may be arrange along portions of form member **16** such that when form members **16** are assembled end to end that the location of slots **20** in multiple form members **16** can correspond to provide the linear grading of inclined trench **14**. Trench form system **10** advantageously allows for the flow of liquid along path **30** as illustrated by the arrows in FIG. **1**. The mirror image of the patterns of slots **20** as shown in FIGS. **2**, **7** and **8** allow for the correspondence of slots in form members **16** that are parallel but are reversed to allow the proper positioning of ledge **24** along floor **12** and the alignment of the slots so that cross members **18** are properly positioned so that they are substantially perpendicular to form members **16**. In FIG. **5** slots **20** are not in a mirror relationship to illustrate that this pattern is also contemplated.

[0029] Distance **32** as illustrated in FIG. **8** and corresponds generally to a vertical set of slots **20** from an end of form member **16**. Distance **34** corresponds to the distance between vertical sections of slots **20** within form member **16**. Distance **36** corresponds to the distance from another end of form member **16** and a set of generally vertical slots **20**. Distance **34** is selected so that the distance **32** plus **36** equals **34** so that the horizontal interlinking of form members **16** provides for the same linear selection of a grade in inclined trench **14** along the entire distance of multiple form members **16**. As shown in FIG. **8**, multiple form members **16** may be stacked to thereby allow the selection of an inclined trench **14** over a considerable distance. Form members **38** are shortened versions to allow for the necessary accommodation for corners and interconnection of form members **16**. Further, form member **16** may be cut to provide customizable lengths of inclined trench **14**. Temporary braces may be utilized along the top edge of form member **16**, particularly when floor **12** is being poured. Shortened form members **38** also include protrusions and slots to cooperatively interact with ends of form member **16**.

[0030] Form members are generally positioned in a parallel fashion and the slots or openings therein are aligned so that they can be easily selected and interconnected with cross members. The cross members although illustrated as having protrusions that interact with slots, there may also be other connecting features that interconnect the forming members with the cross members.

[0031] The materials utilized to make form members **16** and cross members **18** can be metals or plastics or any material that can be utilized to easily form cross members **18** and form members **16** as described herein. Ledge **24** of form members **16** may be preformed to allow for the positioning of grating, not shown, thereon so as to provide a surface that can be walked on, across, and above inclined trench **14**.

[0032] While this invention has been described with respect to at least one embodiment, the present invention can be further modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains and which fall within the limits of the appended claims.

What is claimed is:

1. A method of forming a trench drain, comprising the steps of:

positioning a plurality of form members including a first form member and a second form member, each of said plurality of form members having at least one set of openings arranged in a generally vertical manner, said at least one set of openings including a first opening, a second opening and a third opening, a vertical distance from said first opening to said second opening being substantially equal to a vertical distance from said second opening to said third opening, said first form member being substantially parallel with said second form member;

aligning said at least one set of openings of said first form member with said at least one set of openings of said second form member;

selecting one of said openings in said first form member and a corresponding one of said openings on said second form member dependent upon a predetermined slope for the trench drain thereby defining a selected opening in each of said first form member and said second form member; and

connecting said first form member with said second form member with a cross member, said cross member having a first end associated with said selected opening in said first form member and a second end associated with said selected opening in said second form member.

2. The method of claim **1**, wherein said plurality of openings are a plurality of slots.

3. The method of claim **2**, wherein said cross member includes a protrusion on each end, said protrusions each extending through a corresponding selected opening.

4. The method of claim **3**, wherein said at least one set of openings includes a first set of slots grouped in a substantially vertical manner and a second set of slots grouped in a substantially vertical manner, said first set of slots positioned a predetermined distance from said second set of slots.

5. The method of claim **4**, wherein said plurality of form members each have a length, said predetermined distance being approximately one half of said length.

6. The method of claim **5**, wherein each set of slots include subsets of a predefined number of said slots.

7. The method of claim **6**, wherein each of said slots in each subset of slots is spaced horizontally and vertically predetermined distances from each other.

8. The method of claim **7**, wherein each of said subset of slots of each said set of slots form a repeating pattern repeated in a vertical manner.

9. The method of claim **4**, wherein said first set of slots is substantially a mirror image of said second set of slots.

10. The method of claim **9**, wherein said plurality of form members include a ledge along a top portion thereof.

11. A trench drain form system, comprising:

a plurality of form members including a first form member and a second form member, each of said plurality of form members having at least one set of openings arranged in a generally vertical manner, said at least one set of openings including a first opening, a second opening and a third opening, a vertical distance from said first opening to said second opening being substantially equal to a vertical distance from said second opening to said third opening, said first form member being positioned substantially parallel with said second form member, said at least one set of openings of said first form member are aligned with said at least one set of openings of said second form member, one of said openings in said first form member and a corresponding one of said openings in said second form member are selected dependent upon a predetermined slope for a trench drain thereby defining a selected opening in each of said first form member and said second form member; and

a plurality of cross members that connect said first form member with said second form member, a corresponding one of said plurality of cross members having a first end associated with said selected opening in said first form member and a second end associated with said selected opening in said second form member.

12. The trench drain form system of claim **11**, wherein said plurality of openings are a plurality of slots.

13. The trench drain form system of claim **12**, wherein each said cross member includes a protrusion on each end, said protrusions each extending through a corresponding selected opening in one of said plurality of form members.

14. The trench drain form system of claim **13**, wherein said at least one set of openings includes a first set of slots grouped in a substantially vertical manner and a second set of slots grouped in a substantially vertical manner, said first set of slots positioned a predetermined distance from said second set of slots.

15. The trench drain form system of claim **14**, wherein said plurality of form members each have a length, said predetermined distance being approximately one half of said length.

16. The trench drain form system of claim **15**, wherein each set of slots include subsets of a predefined number of said slots.

17. The trench drain form system of claim **16**, wherein each of said slots in each subset of slots is spaced horizontally and vertically predetermined distances from each other.

18. The trench drain form system of claim **17**, wherein each of said subset of slots of each said set of slots form a repeating pattern repeated in a vertical manner.

19. The trench drain form system of claim **14**, wherein said first set of slots is substantially a mirror image of said second set of slots.

20. The trench drain form system of claim **19**, wherein said plurality of form members include a ledge along a top portion thereof.

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