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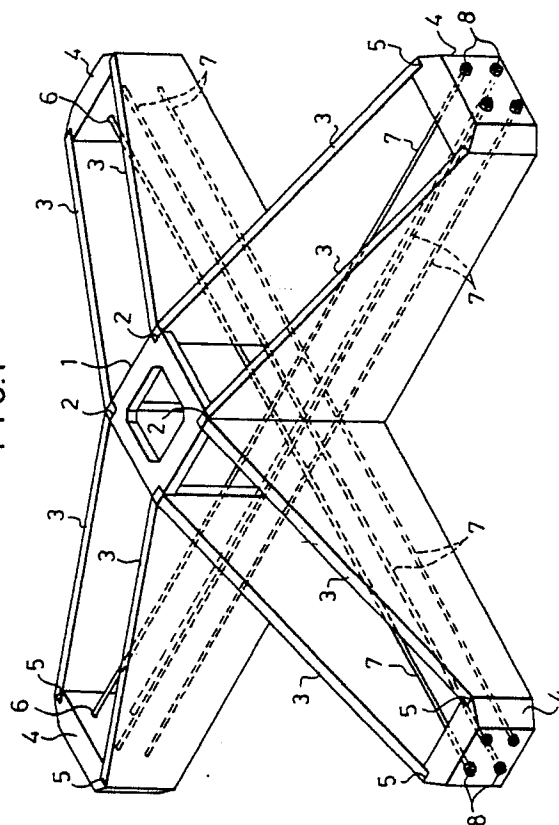
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54 A structure and method for stabilising sloping ground.

57 A structure for stabilising a slope is disclosed, which uses precast concrete members. An independent structure is constructed by charging a cement-containing hardenable member into a space between precast concrete members provided on the slope. First, four pairs of precast concrete side plates are arranged in the form of a cross such that the side plates of each pair are parallel and the height thereof reduces gradually from the centre of the cross toward the free end. A PC steel material is stretched between opposed precast concrete end plates each provided between the free ends of the side plates of each pair, and is given prestress to make the entire structure integral. A cement-containing hardenable material is then charged into a space between the pair side plates, and the structure is secured to the slant natural ground with an anchor. A plurality of the structures as above are arranged on the sloping natural ground. Since the precast concrete members are used, the operation is facilitated. Since the structure is an integrated structure having the shape of a cross, structural calculations can be simplified.

FIG.1



A STRUCTURE AND METHOD FOR STABILISING SLOPING GROUND

This invention relates to a structure for stabilising sloping ground. More specifically, the present invention relates to a structure constructed using precast concrete members for stabilising sloping ground.

Heretofore, there have been suggested various construction processes for stabilising sloping ground. For example, there is known a concrete block stacking process. In this process, precast concrete blocks are brought to the slope and arranged on the slant natural ground to prevent the fall or collapse of the natural ground.

A problem with this known process is that very large concrete blocks can not readily be brought to the slope, and that precast concrete blocks are used, so that the close contact between the concrete blocks and the natural ground surface is unsatisfactory.

In a slope frame process, frames are arranged in a crossing fashion on sloping natural ground, and a cement-containing hardenable material is charged into the frames to construct slope frames, thereby preventing the fall or collapse of the natural ground.

In this process, the on-site construction of the frames on the entire slope is difficult. The hardenable material is not charged until all of the frames are constructed, so that the construction requires a long time. Further, a surface treatment of the charged cement-containing hardenable material is necessary, and this can be cumbersome and inconvenient. Further, the slope frames are continuous over the entire slope, and hence complicated structural calculations are necessary.

According to the present invention, there is provided a structure for stabilising a slope, which uses precast concrete members. An independent structure is constructed by charging a cement-containing hardenable member into a space between precast concrete members provided on the slope. First, four pairs of precast concrete side plates are arranged in the form of a cross such that the side plates of each pair are parallel and the height thereof is reduced gradually from the centre of the cross toward the free end. A PC steel material is structural between opposed precast concrete end plates each provided between the free ends of the side plates of each pair, and is given prestress to make the entire structure integral. The cement-containing hardenable material is then charged into a space between the pair of side plates, and the structure is secured to the slant natural ground with an anchor.

A plurality of the structures as above are arranged on the slant natural ground to prevent the

fall or collapse of the natural ground.

The present invention can solve the above problems in the prior art and has the following pronounced effects.

5 (a) What is obtained by assembling precast concrete plates, which is far lighter in weight compared to the concrete block, is raised on the slope, so that the operation of construction is extremely facilitated.

10 (b) A cement-containing hardenable material is charged into a space between precast concrete side plates. Thus, the hardenable material is attached to the slant natural ground surface to ensure satisfactory contact between the structure and the slant natural ground surface.

15 (c) The precast concrete plates are used as shuttering boards to obtain a finished structure. Thus, it is possible to omit the labour of surface finish and ensure satisfactory appearance.

20 (d) Since the structure has a shape of a cross, it is stable by itself.

25 (e) The height of the structure is high in a central portion to provide for increased mechanical strength of a central portion of the structure which experiences a high bending moment.

(f) Since the structure is a single structure having the shape of a cross, the structural calculations can be extremely simplified.

30 (g) The precast concrete plates may be assembled on-or off-site and then brought to the slope. Therefore, the workability is improved. Further, the structure can be assembled on the slope, so that it is possible to further facilitate the operation.

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Brief Description of the Drawings:

40 Figs. 1 to 5 illustrate an embodiment of the present invention, and in which:

Fig. 1 is a perspective view showing precast concrete members in an assembled state;

Fig. 2 is a plan view of the same;

45 Fig. 3 is a sectional view taken along line III-III in Fig. 2;

Fig. 4 is a plan view showing an arrangement of structure on a slope; and

50 Fig. 5 is a sectional view taken along line V-V in Fig. 4.

Referring to the Figures, reference numeral 1 designates precast concrete base members having the general shape of a cube. The four corners of the base member 1 at the outer periphery are provided with respective engagement notches 2.

Reference numeral 3 designates side plates of

precast concrete. The height of these side plates reduces from one end toward their other end.

Reference numeral 4 designates precast concrete end plates. The opposite side edges of the end plate are formed with engagement notches 5. The end plate 4 has four PC steel material insertion holes 6.

The base number 1, side plates 3 and end plates 4 are assembled in a factory or on-site. First, two base members 1 are disposed at a suitable vertical distance from each other, and two side plates 3 of each of four pairs are erected such that they are parallel and with their taller ends on the side of the base members 1.

The taller end of each side plate 3 is coupled at its upper and lower corners to the engagement notches 2 of the base member 1. Thus, the four pairs of side plates project in cruciform fashion from the base members 1.

Each end plate 4 is coupled to the free ends of the pair of side plates 3 by means of the engagement notches 5 of the end plate 4.

Lengths of PC steel material 7 are stretched between the opposed end plates 4, with their ends inserted through the holes 6. An end of the length of PC steel material 7 is secured to the end plate by means of a wedge or a nut 8. Before securing the lengths of PC steel material 7, prestress is given to them to make the base members 1, side plates 3 and end plates 4 integral.

As the PC steel material 7 there may be used PC steel wires, PC (plain carbon) stranded steel wires and PC steel rods or bars.

The integrated structure thus obtained is then placed on sloping natural ground. Then shuttering 13 is disposed vertically at the centre of the base members 1, and an upper portion of an anchor 9 previously embedded in the sloping natural ground is passed through the shuttering 13. Further, a shuttering board 10, e.g. of plywood, is secured by means of bolts 11 to the tops of each pair of side plates 3.

Subsequently, a cement-containing hardenable material 12, e.g. concrete or mortar, is charged into the spaces defined by the side plates 3 and end plates 4.

After the cement-containing hardenable material 12 has hardened, the shuttering boards 10 are removed, and the structure A is secured on the slant natural ground by giving the anchor 9 prestress.

As the anchor 9 there may be used a lock bolt or the like.

In a modification of the process, the previously embedded anchor 9 may be prestressed for securement because the prestressing of plates produces a considerable effect upon the structure. In this case, the cement-containing hardenable ma-

terial may be subsequently charged into the space between the plates. In this case, the stability of the concrete blocks being constructed is improved.

In the above way, the structure A is secured on the slant natural ground. Figs. 4 and 5 show an arrangement of a plurality of structures A arranged in a crossing fashion and at a suitable interval. In this case, the ends of the cross-like structures A seem to be continuous.

It is to be understood that the present invention relates to a structure for stabilising a slope, and that the structure according to the present invention can be provided on a natural slope surface or upon a pre-arranged slope, for example in any civil engineering field. Further, the construction according to the present invention is constructed using factory-made precast concrete members and subsequently using a cement-containing hardenable material, so that it can be practised in the field of producing concrete material.

Generally speaking the present invention provides a method stabilising a slope, which method comprises the step of:

Arranging four pairs of precast concrete side plates in the form of a cross, the side plates of each pair being parallel and the height thereof reducing gradually from the centre of the cross toward the free end, stretching a PC steel material between opposed precast concrete end plates each provided between the free ends of the side plates of each pair, giving the PC steel material prestress to make the entire structure integral, subsequently charging a cement-containing hardenable material into a space between the pair side plates and securing the structure to the slant natural ground with an anchor.

Preferably PC steel wires are used as said PC material, or PC steel bars are used as said PC steel material.

Preferably cement milk, mortar, or concrete is used as said cement-containing hardenable material.

Preferably a lock bolt or a slant natural ground anchor is used as said anchor.

Claims

1. A mould structure for stabilising a slope, which mould structure comprises four pairs of precast concrete side plates arranged in the form of a cross, the side plates of each pair being substantially parallel and the height thereof reducing gradually from the centre of the cross towards the free end of the said pair, each said pair including an end plate provided at the free end of said

pair and reinforcement means under tension extending between at least one of the pairs of opposed end plates.

2. A structure according to Claim 1, wherein said reinforcement means comprises PC steel wire or PC steel bar. 5

3. A structure according to Claims 1 or 2, wherein anchoring means are provided for anchoring the structure to the slope.

4. A structure according to Claim 3, wherein said anchoring means comprise a lock bolt or a slant natural ground anchor. 10

5. A method of stabilising a slope, which method comprises disposing on the slope, a plurality of mould structures, each as defined in Claim 1, charging into said mould structures a cement-containing hardenable material, and causing said hardenable material to harden thereby to form with said mould structures in situ stabilisation for the slope. 15 20

6. A method according to Claim 5, wherein cement milk, mortar, or concrete is employed as said cement-containing hardenable material.

7. A method of stabilising a slope, in which method a plurality of preformed mould structures is disposed on the slope, each mould structure comprising a plurality of generally radially extending arm positions, and in which method a cement-containing hardenable material is charged into said arm positions and caused to harden therein, thereby to form with said mould structures in situ stabilisation for the slope. 25 30

8. A method according to Claim 7 wherein a said mould structure is formed of an assembly of precast concrete elements. 35

9. A method according to Claims 7 or 8, wherein a said mould structure includes reinforcement means under tension. 40

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FIG.1

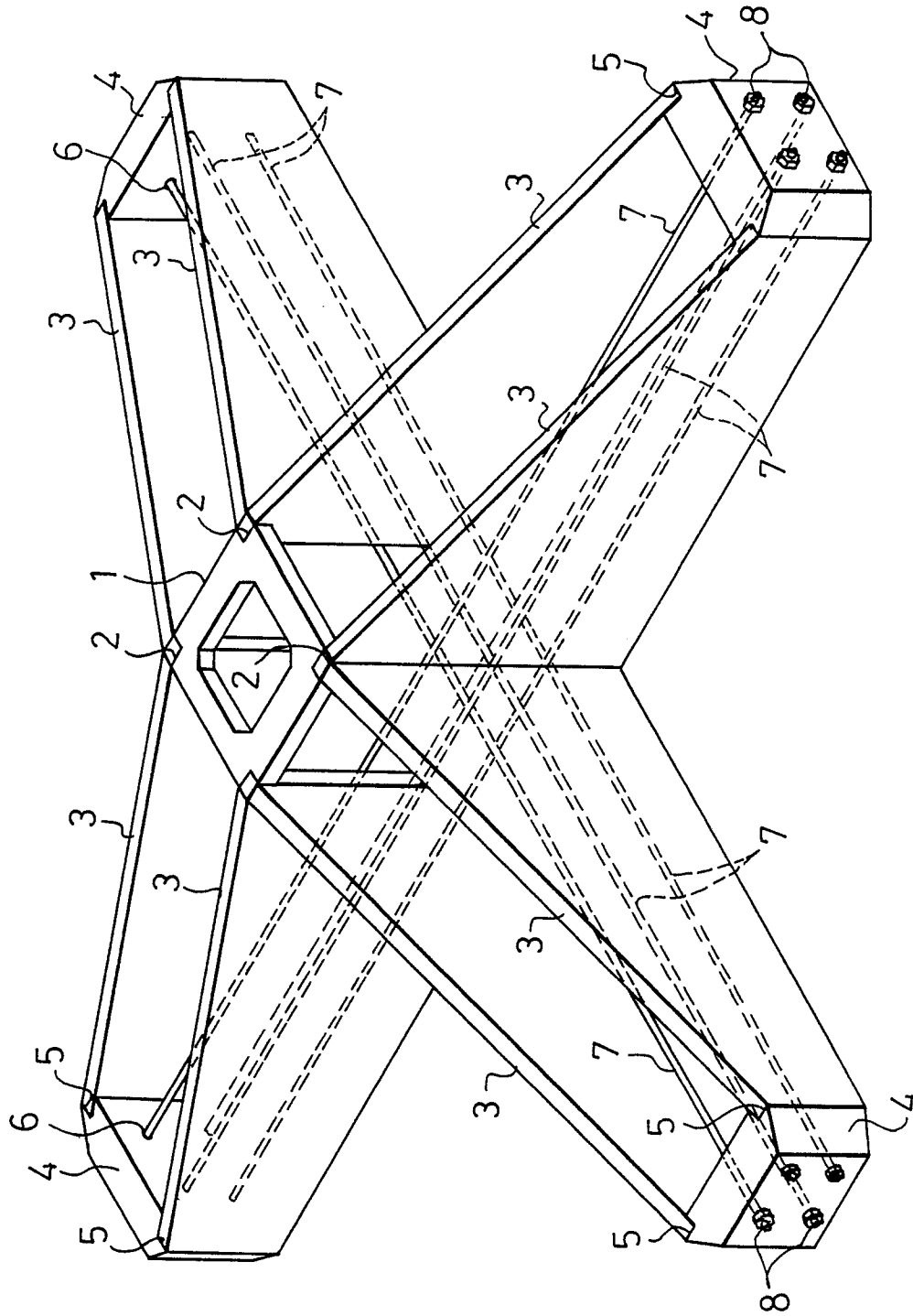


FIG. 2

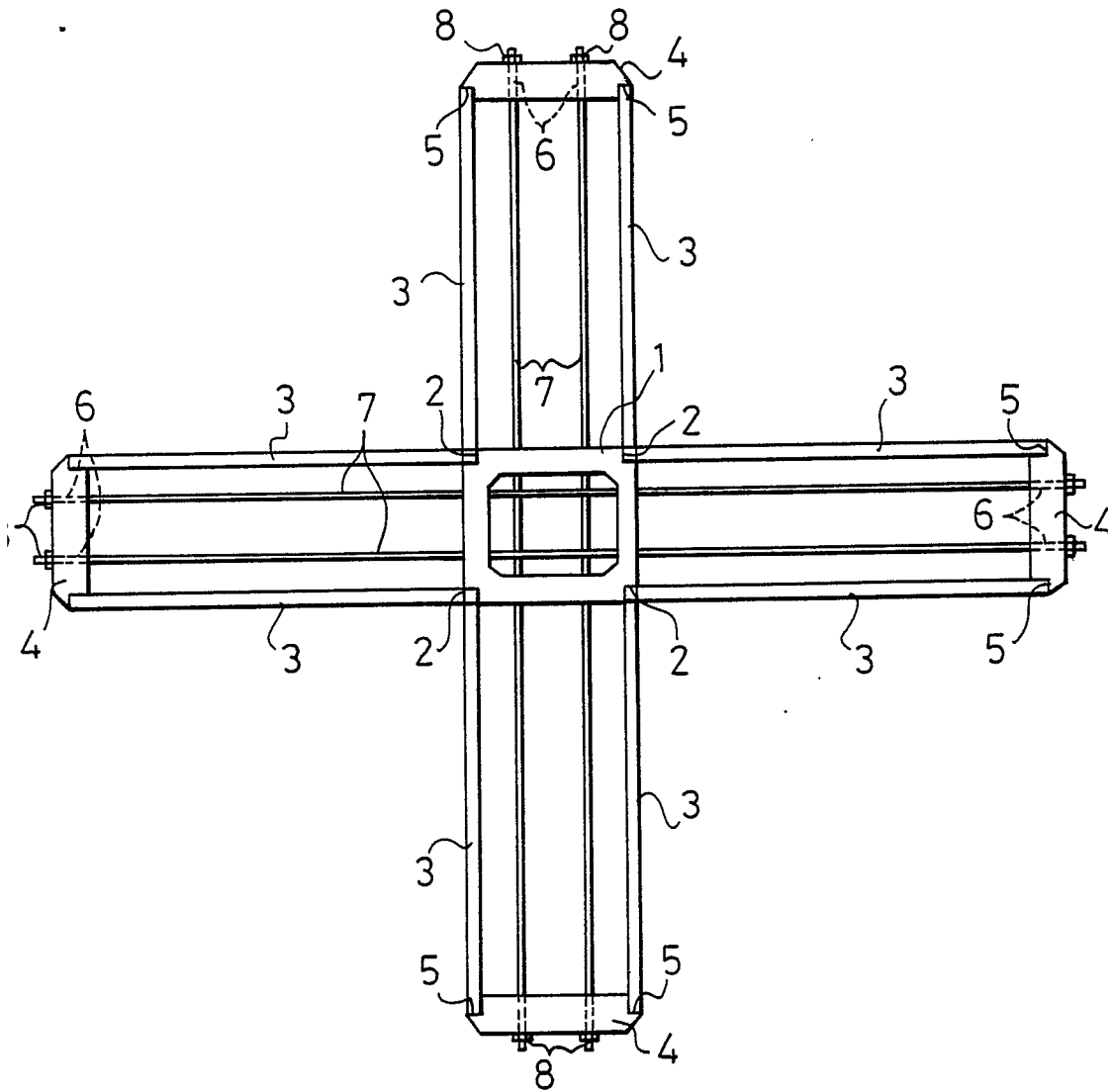


FIG. 3

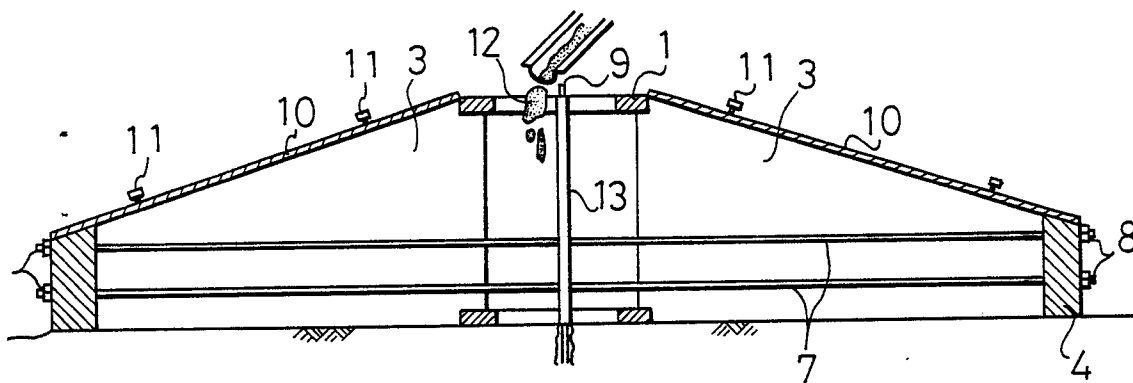


FIG. 4

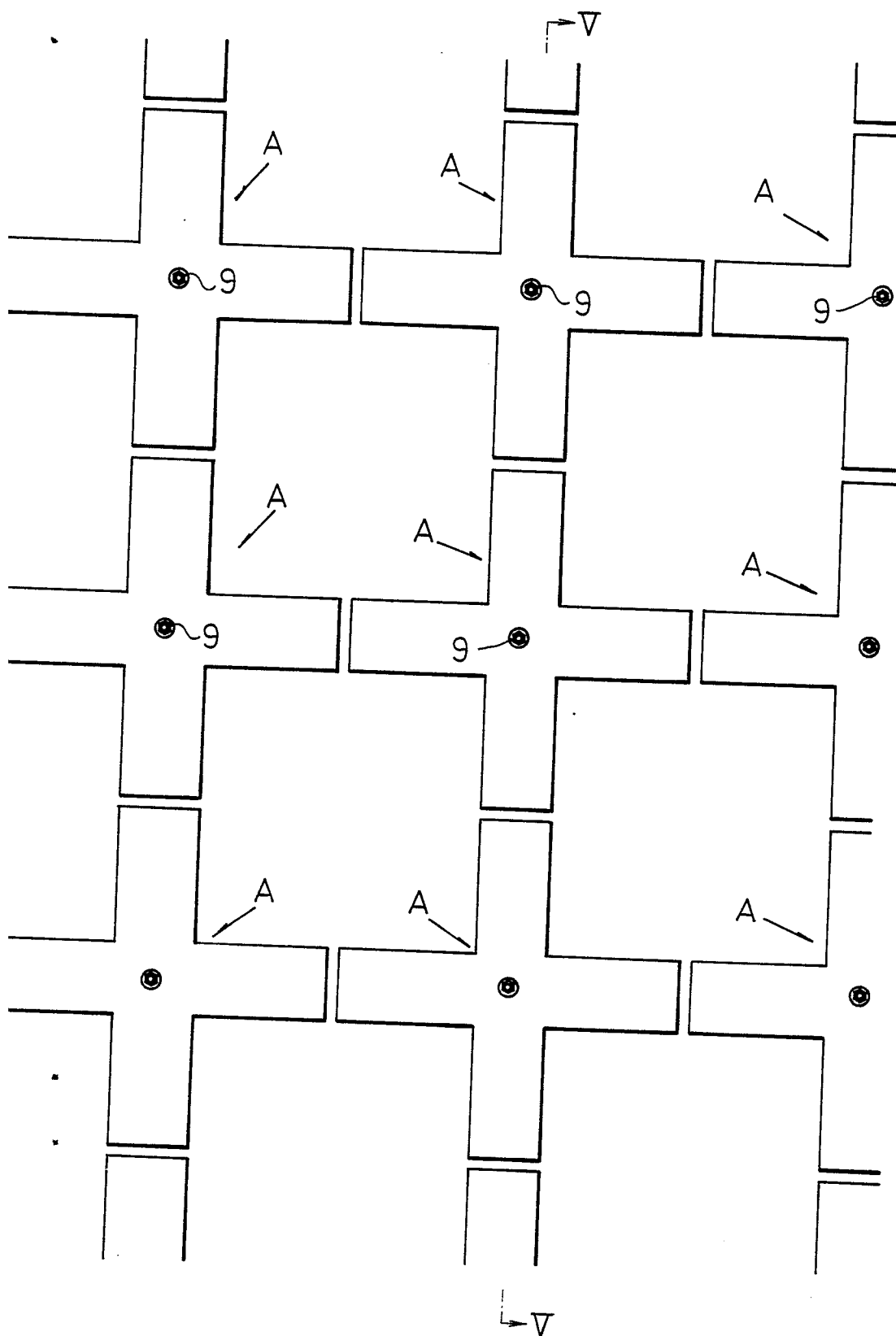


FIG. 5

