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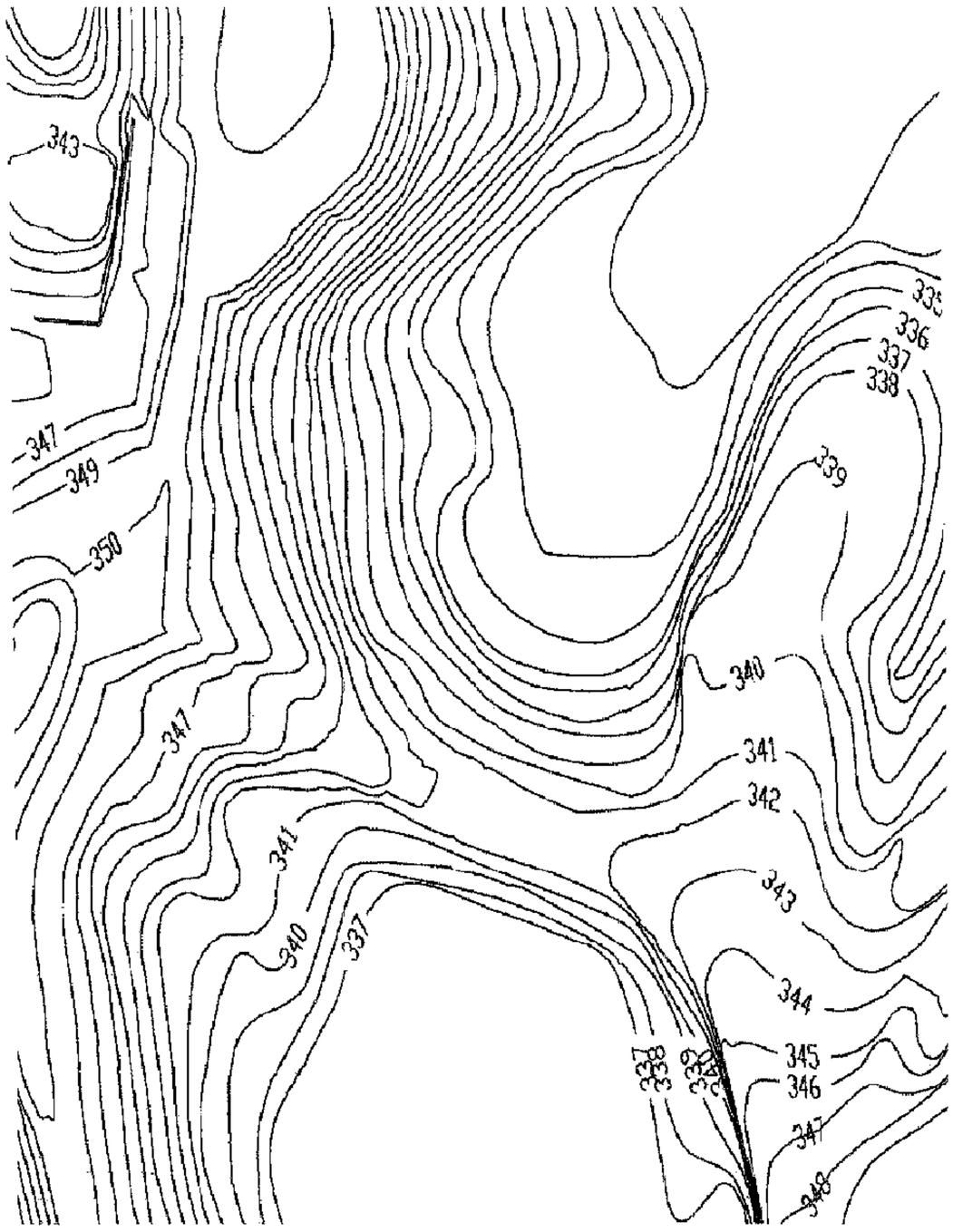
(54) Titre : FABRICATION DE MODELES TRIDIMENSIONNELS A ECHELLE TOPOGRAPHIQUE A DES FINS SCIENTIFIQUES

(54) Title: MANUFACTURING OF THREE-DIMENSIONAL TOPOGRAPHICAL SCALE MODELS FOR THE PURPOSE OF SCIENCE



(57) Abrégé/Abstract:
The invention shows the method to create a hi-accuracy topographical scale mode! for the purpose of science by using mufti-layered/laminated materials. The invention is based on and involves the following steps: The geometry and the data of terrain

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(57) Abrégé(suite)/Abstract(continued):
are measured, collected, and recorded; The data is entered into a computer and design components are added, if needed; Based on these data a three-dimensional surface is created; A block of mufti-layered/laminated materials made of a combination of veneers, or plywoods and veneers or machinable dividers/layers, mounted one on the top of another, is constructed. Based on the three-dimensional surface, a program for a C.N.C machine is generated; Based on the program, the C.N.C. machine cuts/removes the excess material from the block of multi-layered materials. The three-dimensional surface, contour lines, elevations, cross-sections, outlines, and edges are then exposed automatically and are easy visually measurable.

Title: MANUFACTURING OF THREE-DIMENTIONAL TOPOGRAPHICAL SCALE MODELS FOR THE PURPOSE OF SCIENCE

ABSTRACT:

The invention shows the method to create a hi-accuracy topographical scale model for the purpose of science by using multi-layered/laminated materials. The invention is based on and involves the following steps:

The geometry and the data of terrain are measured, collected, and recorded;
The data is entered into a computer and design components are added, if needed;
Based on these data a three-dimensional surface is created;
A block of multi-layered/laminated materials made of a combination of veneers, or plywoods and veneers or machinable dividers/layers, mounted one on the top of another, is constructed.
Based on the three-dimensional surface, a program for a C.N.C machine is generated;
Based on the program, the C.N.C. machine cuts/removes the excess material from the block of multi-layered materials.
The three-dimensional surface, contour lines, elevations, cross-sections, outlines, and edges are then exposed automatically and are easy visually measurable.

TITLE OF THE INVENTION

Manufacturing of Three-Dimensional Topographical Scale Models For The Purpose of Science

FIELD OF THE INVENTION

The present invention relates to the method of creating topographical models. More particularly, the present invention relates to an improved three-dimensional topographical model made of dense materials which allow a person to touch and to feel the surface he/she is investigating with their own hands. Still more particularly, the present invention relates to a topographical model of accuracy compatible to the accuracy of the three-dimensional computer-generated drawing, for the purpose of physical and visual measuring and easy understanding of the landform in any point of the model by technical and non-technical personnel.

BACKGROUND OF THE INVENTION

Topographical, three-dimensional models provide a physical representation of the landform.

The models can be created using a copy of the drawings of the terrain as a reference during model construction or by using a three-dimensional modeling program on a computer to generate a model data.

Traditionally, topographical models are made from a high-density foam, plastic foam, acetate, etc. The models must be enclosed to prevent from touching. The purpose of these models is to see the features of terrain but not to touch them.

The most important disadvantages of the physical models are the inability to measure the elevational differences of the terrain in any point of the model and the lack of accuracy.

To show the elevational differences of the terrain, some of the models are created in stair-stepping style. Other models, are created by printing detailed photo-realistic images on the models carved from a high-density foam. These models can provide a physical representation of the terrain, but they are not made for easy visual measuring because of the lack of an elevation reference, and they are not compatible to the accuracy of the three-dimensional computer-generated drawing.

SUMMARY OF THE PRESENT INVENTION

It is the object of the present invention to provide a three-dimensional topographical model of accuracy compatible to the accuracy of computer-generated three-dimensional drawing, which can be used for a scientific purposes.

It is another object of the present invention to provide a three-dimensional topographical model which has a smooth surface and, without being fully covered with paint or any other texture, can be easy visually understood and measurable.

It is still another object of the present invention to provide a three-dimensional topographical model made of dense materials allowing a person to touch and to feel the surface he/she is investigating with their own hands. These models can also be used as a visualization tool for blind and visually impaired persons.

These and other objects, features, and advantages of the present invention are accomplished through the use of an improved three-dimensional topographical model. The model is comprised of a plurality of layers made of a combination of veneers of various colors, or a combination of plywoods and

veneers or machinable dividers/layers, as required for a designated scale model. Based on the data entered or designed in a computer a three-dimensional surface is created. Based on the three-dimensional surface, a program for a C.N.C machine is generated. Based on this program, the C.N.C. machine cuts/removes the excess material from the block of multi-layered materials. The three-dimensional surface, contour lines, elevations, cross-sections, outlines, and edges are then exposed automatically and are easy to understand and visually measurable.

Objects, features, and advantages of the present invention will become more apparent in the following written description.

BRIEF DESCRIPTION OF THE DRAWINGS

A three-dimensional topographical model embodying features of my invention is described in the accompanying drawings which form a portion of this disclosure and wherein:

Fig 1, Fig 2, and Fig 3 are shown in isometric view.

Fig 4, Fig 5, Fig 6, Fig 7, and Fig 8 are only examples to show and understand the concept of my invention.

Fig 1 shows two-dimensional levels of elevation spread vertically, according to the actual measurement of the elevation, which means that the whole computer drawing is in three dimensions. (Fig 1 is part of real model / project).

Fig 2 shows the surface created in the computer, based on data from Fig 1 (Fig 2 is part of real model / project).

Fig 3 shows the picture which is part of the real model / project. The picture shows a combination of patterns made of 3-ply plywoods and veneers which were used in this model /

project and shows some of the other properties of the project such as access road, name of pond, and part of man-made structure. The picture shows also a coloured adhesive between laminated layers for easy visual separation of the layers.

Fig 4 shows the cross sections of a pattern concept made of a combination of 3-ply plywoods divided by veneers.

Fig 5 shows the cross sections of a pattern concept made of a combination of 4-ply plywoods divided by veneers.

Fig 6 shows the cross sections of a pattern concept made of a combination of a set of 4-veneers every forth veneer.

Fig 7 shows the cross sections of a concept made of a combination of any kind of veneers without pattern.

Fig 8 shows the cross sections of a pattern concept made of a combination of a set of 5-veneers every fifth veneer.

Fig 9 shows an isometric view of the three-dimensional structure based on
cross-sections shown on Fig 4, Fig 5, Fig 6, Fig 7, and Fig 8.

DETAILED DESCRIPTION OF THE INVENTION

A more complete understanding of the invention may be obtained by a reference to the accompanying drawings.

The invention shows the method to create a hi-accuracy topographical scale model for the purpose of science/land development by using multi-layered/laminated or materials that are mounted one on top of another.

The invention is based on and involves the following steps:

The geometry and the data of terrain are measured, collected, and recorded by professionals;

The data is entered into a computer to prepare a contour plan as a hi-accuracy representation of terrain, shown as a series of curved lines where each line has a measured and recorded elevation, set at a fixed vertical contour interval apart, representing lines of equal elevation (Fig 1);

At this stage of the project, the design features of the terrain may be added, as required;

Based on this data, a three-dimensional surface is created (Fig 2). Further in this stage is decided the scale for the model and if a vertical exaggeration is needed;

A block of multi-layered/laminated materials made of a combination of veneers, or plywoods and veneers or machinable dividers/layers, laminated or mounted one on the top of another, is constructed (for example Fig 4, Fig 5, Fig 6, Fig 7, Fig 8). Sometimes, the model is constructed out of segments made of laminated veneers, or plywoods and veneers and/ or machinable dividers/layers, depends on the model designation, as an exchangable parts of the model, to show and to see which design will work, or suit the best a proposal, or a scientific experiment. The model is comprised of a plurality of layers made of a combination of veneers of various colors, or a combination of plywoods and veneers or machinable dividers/layers, as required for a designated scale model. The preferred method of representation of landform on the model is by the use of layers of equal thickness.

Based on the three-dimensional surface (Fig 2), a program for a C.N.C machine is generated;

Based on the program, the C.N.C. machine cuts/removes all excess material (Fig 4, Fig 5, Fig 6 Fig 7, Fig 8), from the block of multi-layered materials. The three-dimensional surface,

contour lines, elevations, cross-sections, outlines, and edges are then exposed automatically and are easy visually measurable (example Fig 3).

Because of the hi-accuracy data, carefully selected layers kept uniform to each other and color patterns or special dividers to mark the elevation height for a visual reference of the level, and by using highly advanced methods for removing of excessive material, the model becomes highly accurate, and from this point it can be used for the purpose of science.

Example:
Land area is 1000 m by 1000 m
Land elevation is 25 m
Required scale of the model is 1:2000
Scale model area is 0.5 m by 0.5 m
Scale model height is 0.0125 m
Selected material and pattern for the scale model: plywood 3-ply thickness 0.0015 m, and veneer thickness 0.0005 m laminated as veneer on plywood on veneer on plywood on veneer (Fig 4) etc. in a block of seven veneers and six 3-ply plywoods for the total size of laminated block equal to 0.5 m x 0.5 m and height equal to 0.0125 m. Excess material is removed by the C.N.C. and the landform is exposed automatically based on the geometry of the three-dimensional surfaces. The elevation on the model is visually recognized on every 0.0005 m layer which is equal to the land elevation of 1.25 m.

Addendum No. 1

Application No. 2,449,633
Owner: Wcislo, Adam
Title: Manufacturing of Three-Dimensional Topographical Scale Models for the Purpose of Science

The Claims for the above-noted Application, were revised as shown on the attached redline and as specified below:

1. Page 2, Claim 4, in line 3 replaced "increments" with "increment".

2. Page 2, Claim 5, in line 13 replaced "increments" with "increment" and in line 14 replaced "or 5 m" with "or 4 m".

3. Page 2, Claim 6, in lines 23 and 24 replaced "every 10 equal layers where one of the dividers will represent a specific height" with "every 6 or every 10 or every 12 layers where one of the veneer's represents an elevational increment every specific height of topographical elevation value".

4. Page 2, Claim 7, in line 30 deleted "wooden" and in line 31 replaced "4.0 mm" with "40 mm".

5. Page 2, Claim 8, in line 36 deleted "wooden" and in line 37 replaced "4.0 mm" with "40 mm".

6. Page 3, Claim 9, in lines 5 and 6 deleted "are made of paper, plastic, foam, or epoxy" and in line 7 replaced "4.0 mm" with "40 mm".

7. Page 3, Claim 10, in line 13 replaced "paper, plastic, foam, or epoxy" with "machinable dividers".

8. Page 3, Claim 11, in line 23 replaced "paper, plastic, foam, or epoxy" with "machinable dividers".

9. Page 3, Claim 12, in lines 32, 33, 34, and 35 replaced "layers of paper, or plastic, or foam, or epoxy which none of them are the same kind or colour, but if needed will be divided by every 3 or every 4 or every 5 or every 10 equal layers where one of dividers will represent a specific height" with "layers made of machinable dividers as needed, and can be divided by every 3 or every 4 or every 5 or every 6 or every 10 or every 12 layers where one of divider's represents an elevational increment every specific height of topographical elevation value".

10. Page 4, Claim 13, in line 4, to the end of claim, added ", and/or the adhesive layer can represent an elevational increment every specific height of topographical elevation value"

11. Page 4, add the following claims 15, 16, and 17:

" 15. The manufacturing of composition of layers laminated or mounted one on top of another in a block as defined in Claim 1, wherein a vertical exaggeration is used as needed.

16. The manufacturing of composition of layers laminated or mounted one on top of another in a block as defined in Claim 1, wherein the layers form a set and sets and/or layers form a block.

17. The manufacturing of composition of layers laminated or mounted one on top of another in a block as defined in Claim 1, wherein the layers are made in a pattern of: layers are made of a machinable dividers of various textures".

Except as modified by this Addendum, the Application previously submitted shall remain unchanged.

Application number numéro de demande: 2449633

Figures: 3

Pages:

Unscannable items
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(Request original documents in File Prep. Section on the 10th floor)

Documents reçu avec cette demande ne pouvant être balayés
(Commander les documents originaux dans la section de préparation des dossiers au 10ème étage)

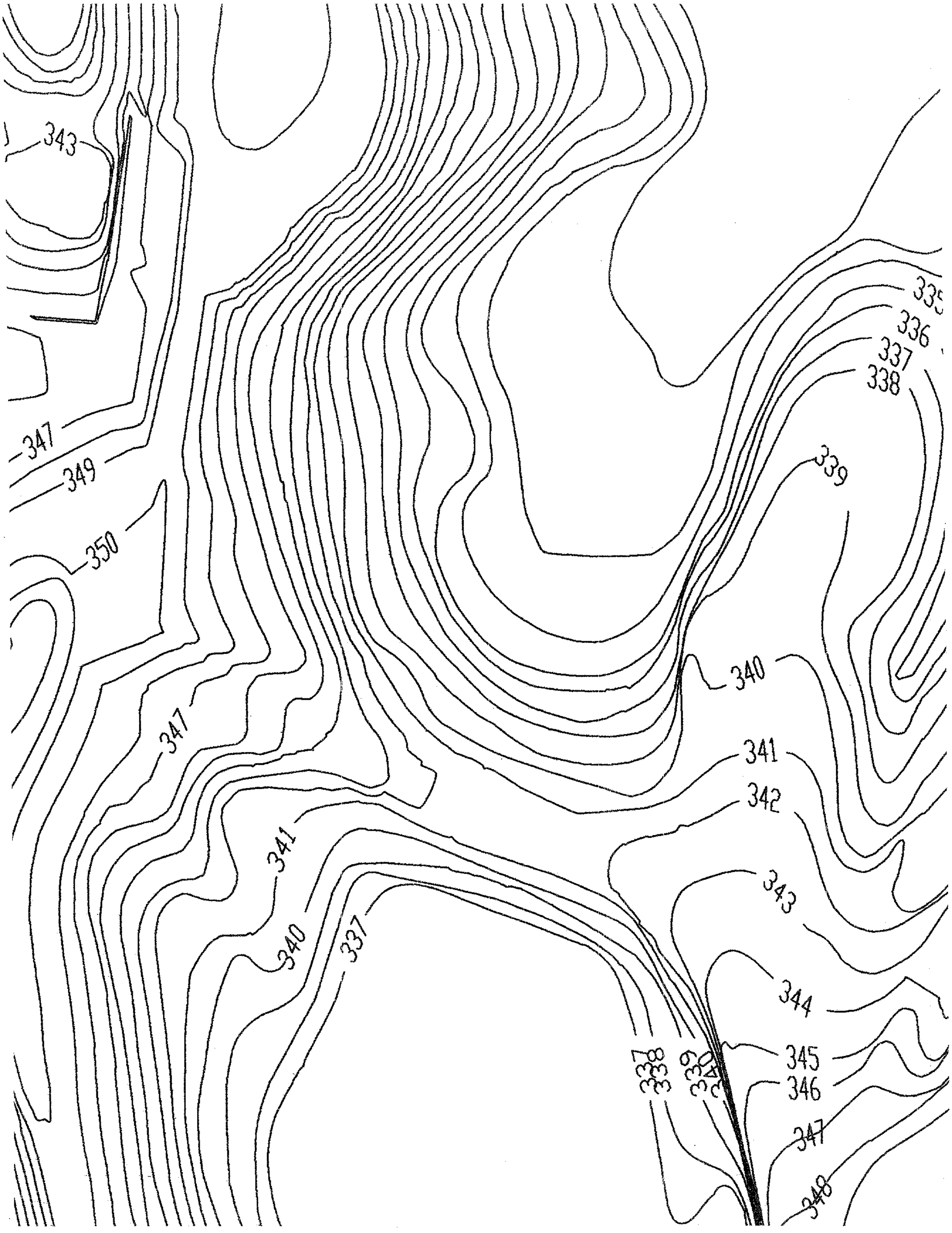
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Fig 1

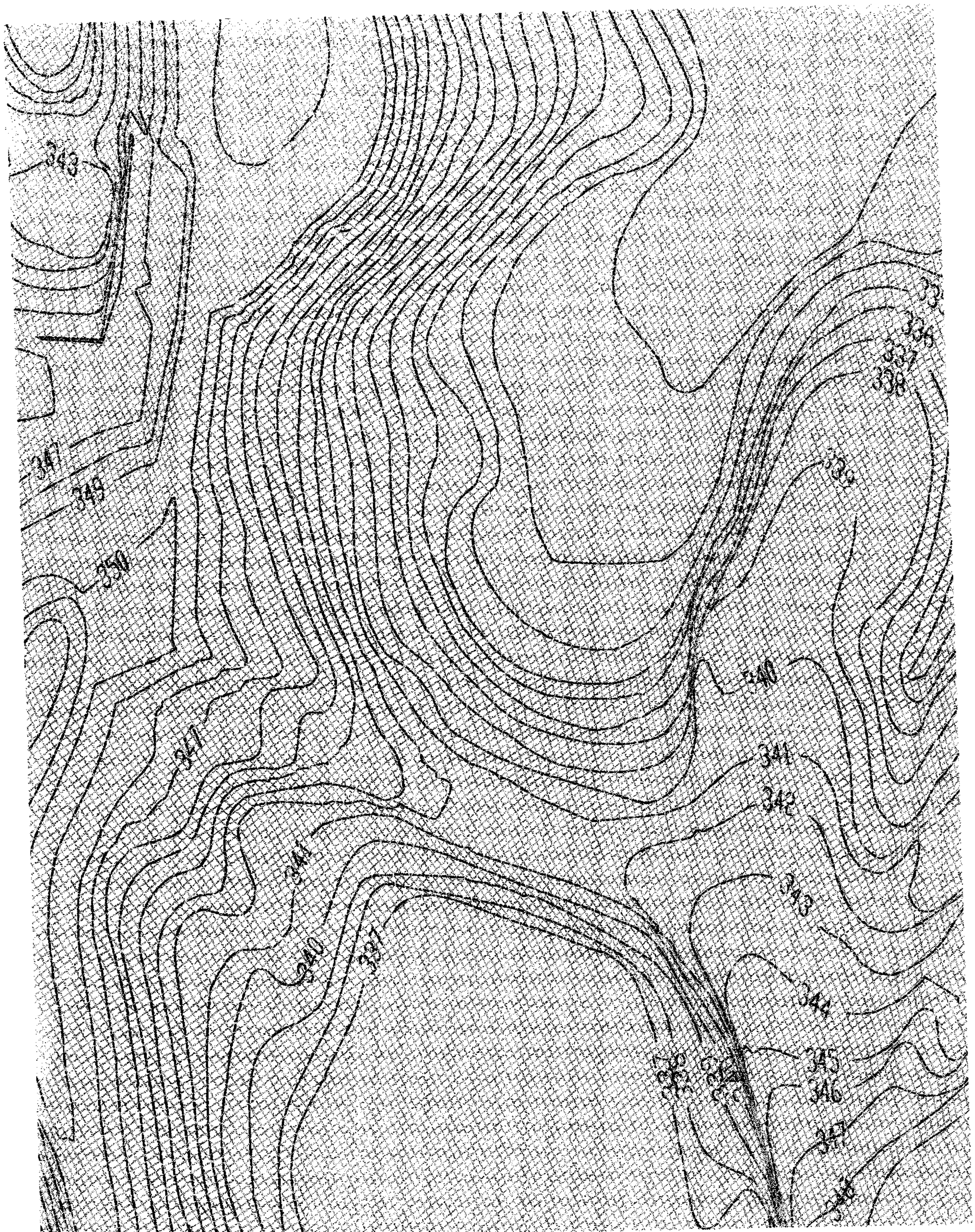
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Fig 2

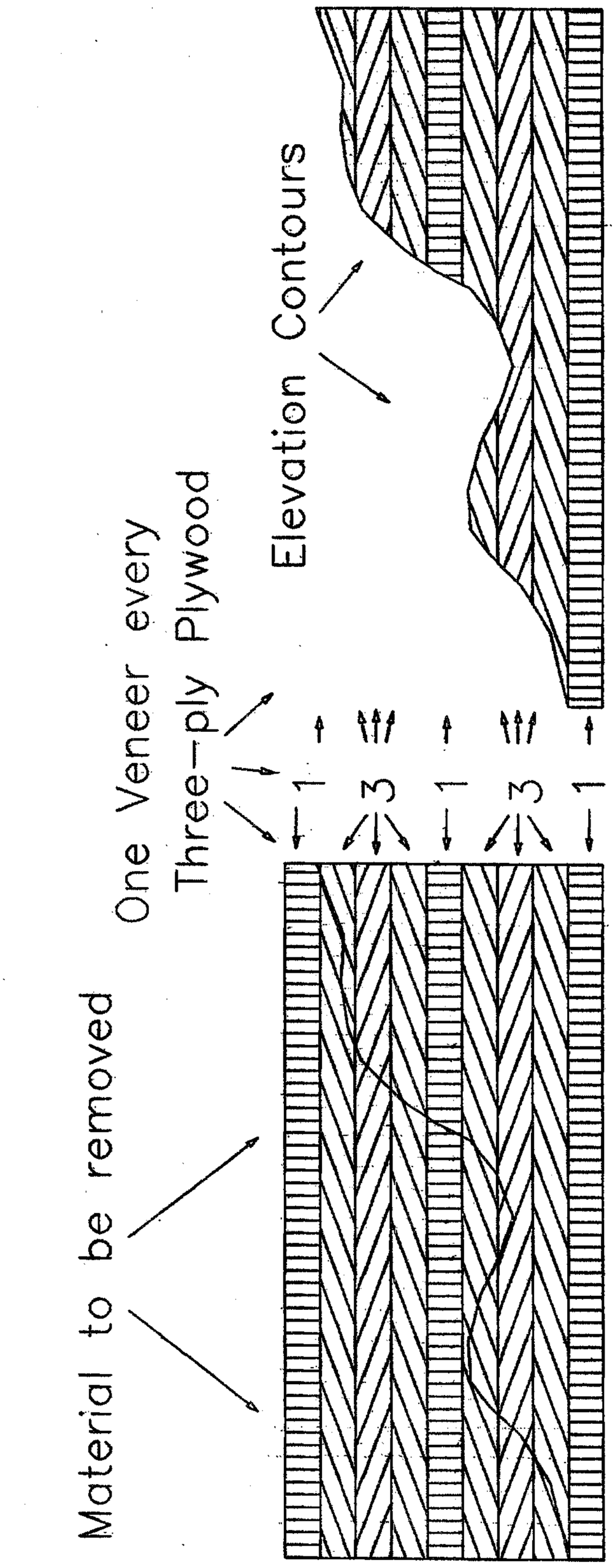

Material to be removed
One Veneer every
Three-ply Plywood
Contours
Elevation
1
3
1
3
1

Fig 4

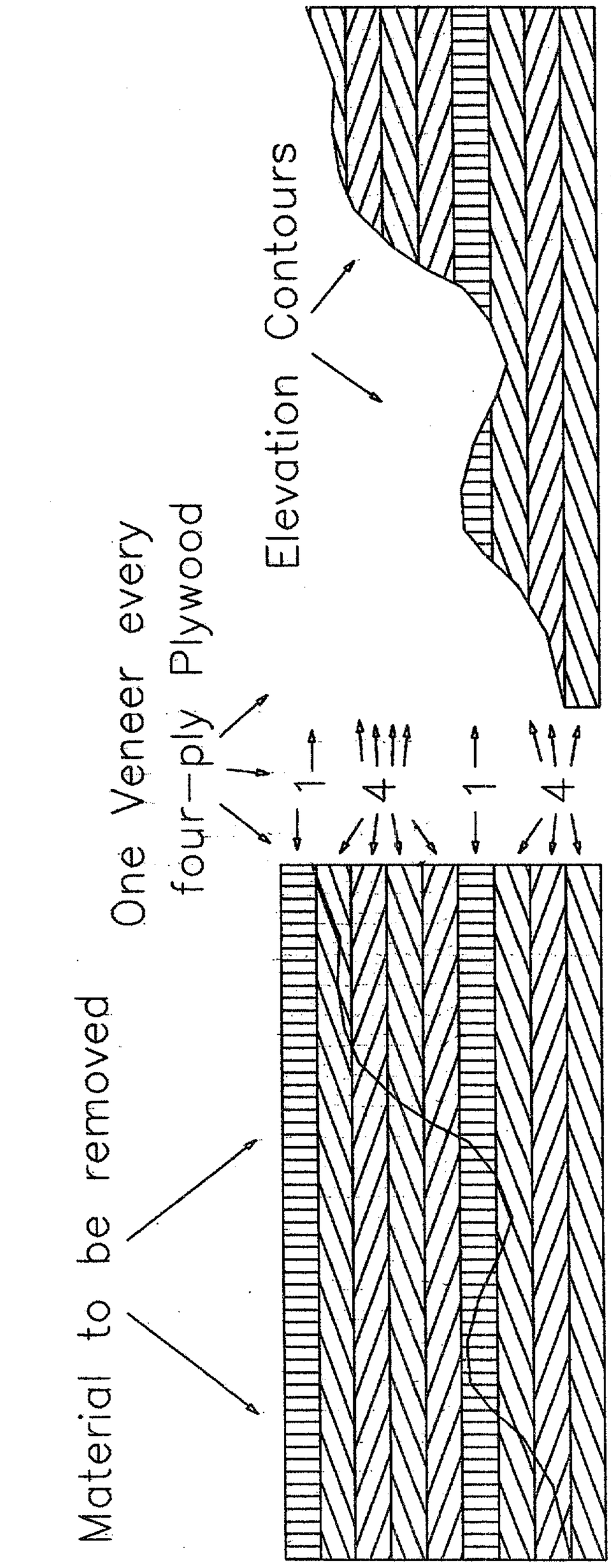

Material to be removed
One Veneer every four-ply Plywood
Contours
Elevation C

Fig 5

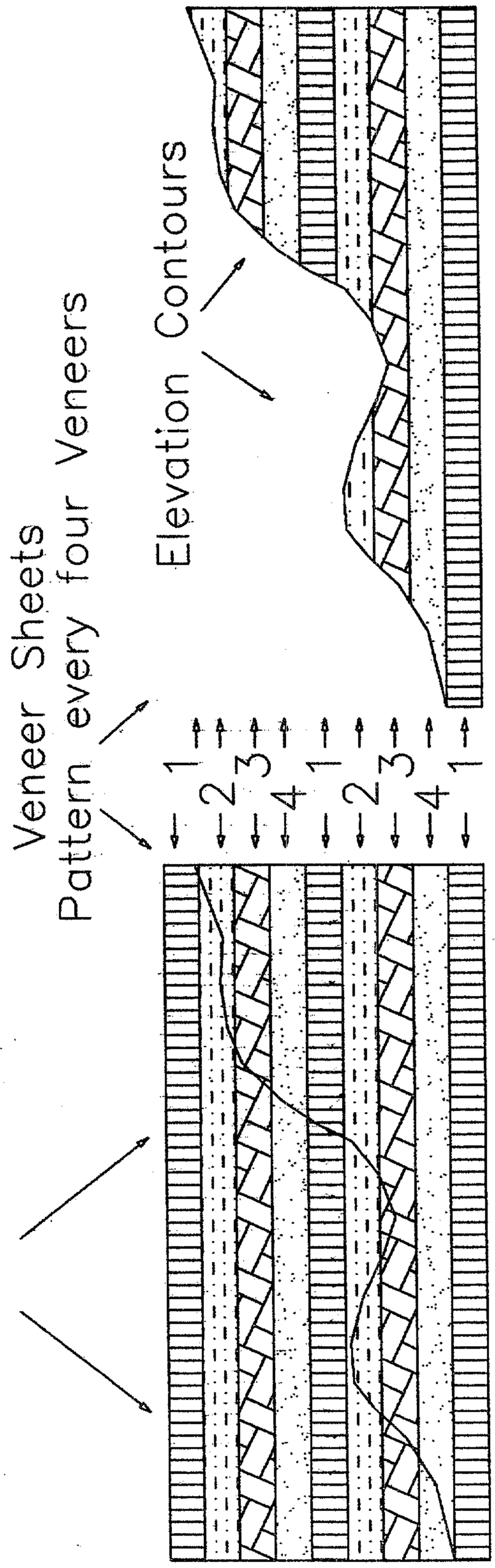

Material to be removed
Pattern every four Veneer Sheets
Elevation Contours
1
2
3
4
1
2
3
4
1

Fig 6

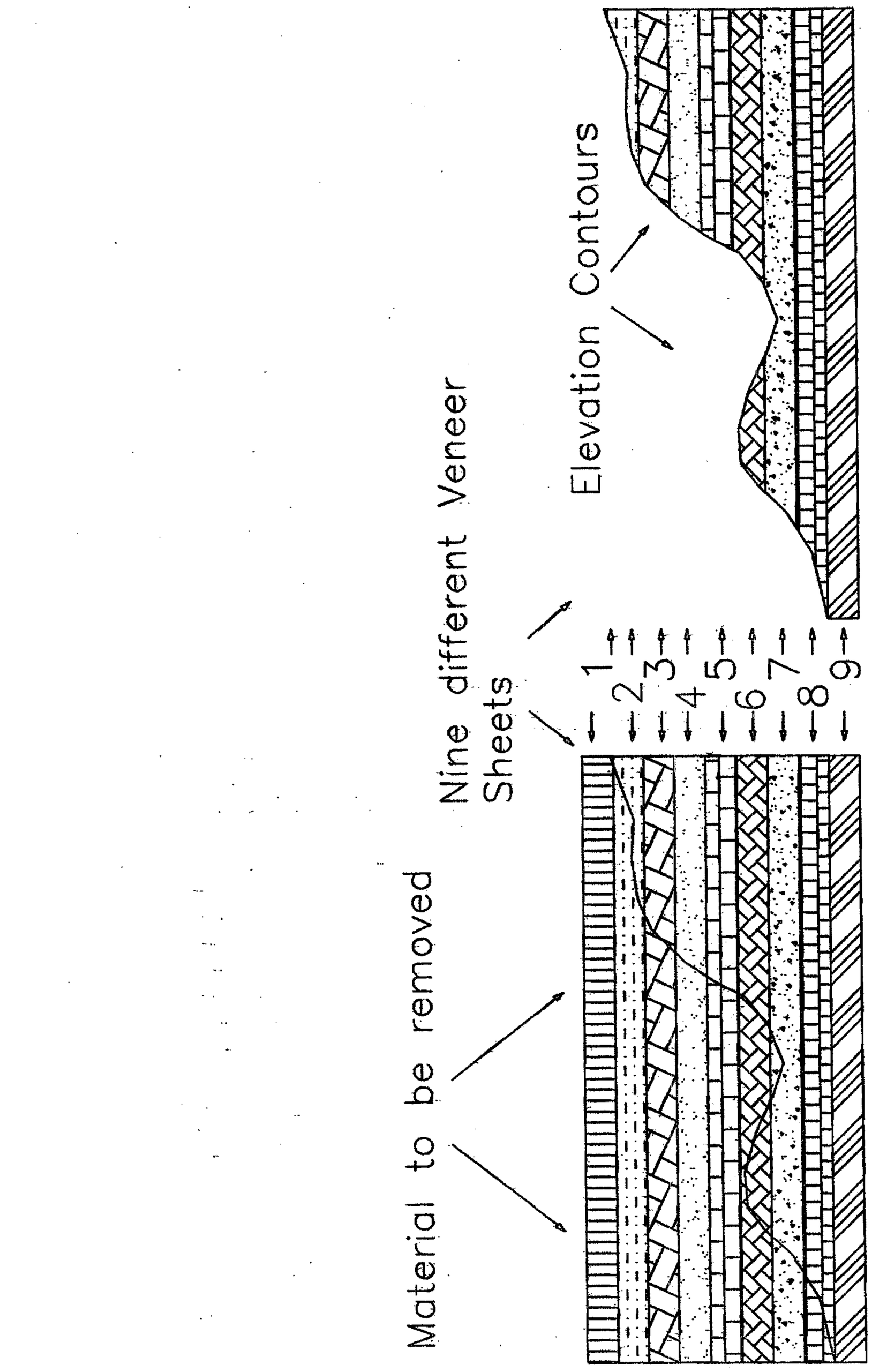
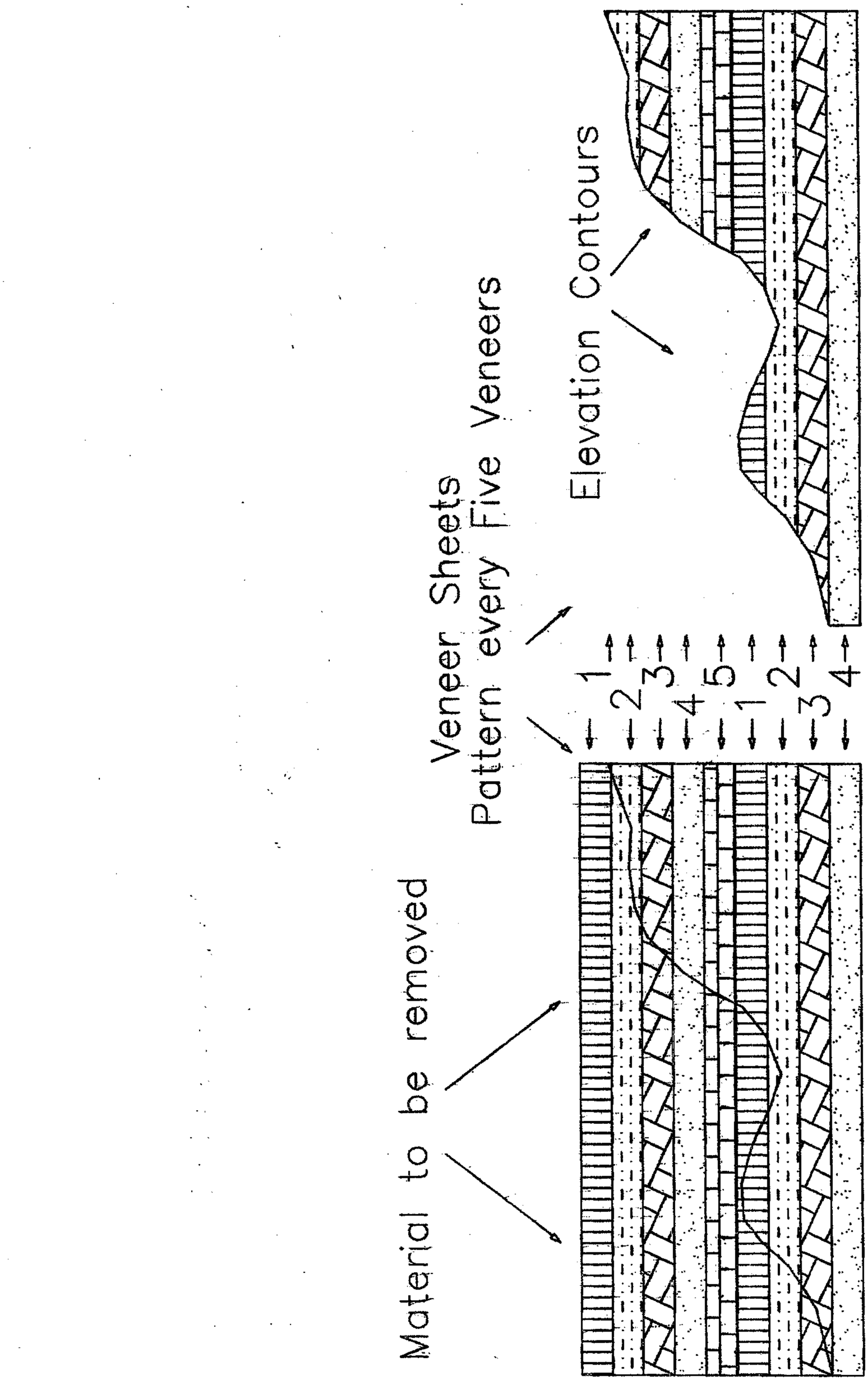

Contours
Elevation
Nine different Veneer Sheets
1
2
3
4
5
6
7
8
9
Material to be removed

Fig 7


Material to be removed
Veneer Sheets
Pattern every Five Veneers
Elevation Contours
1
2
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4
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3
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Fig 8

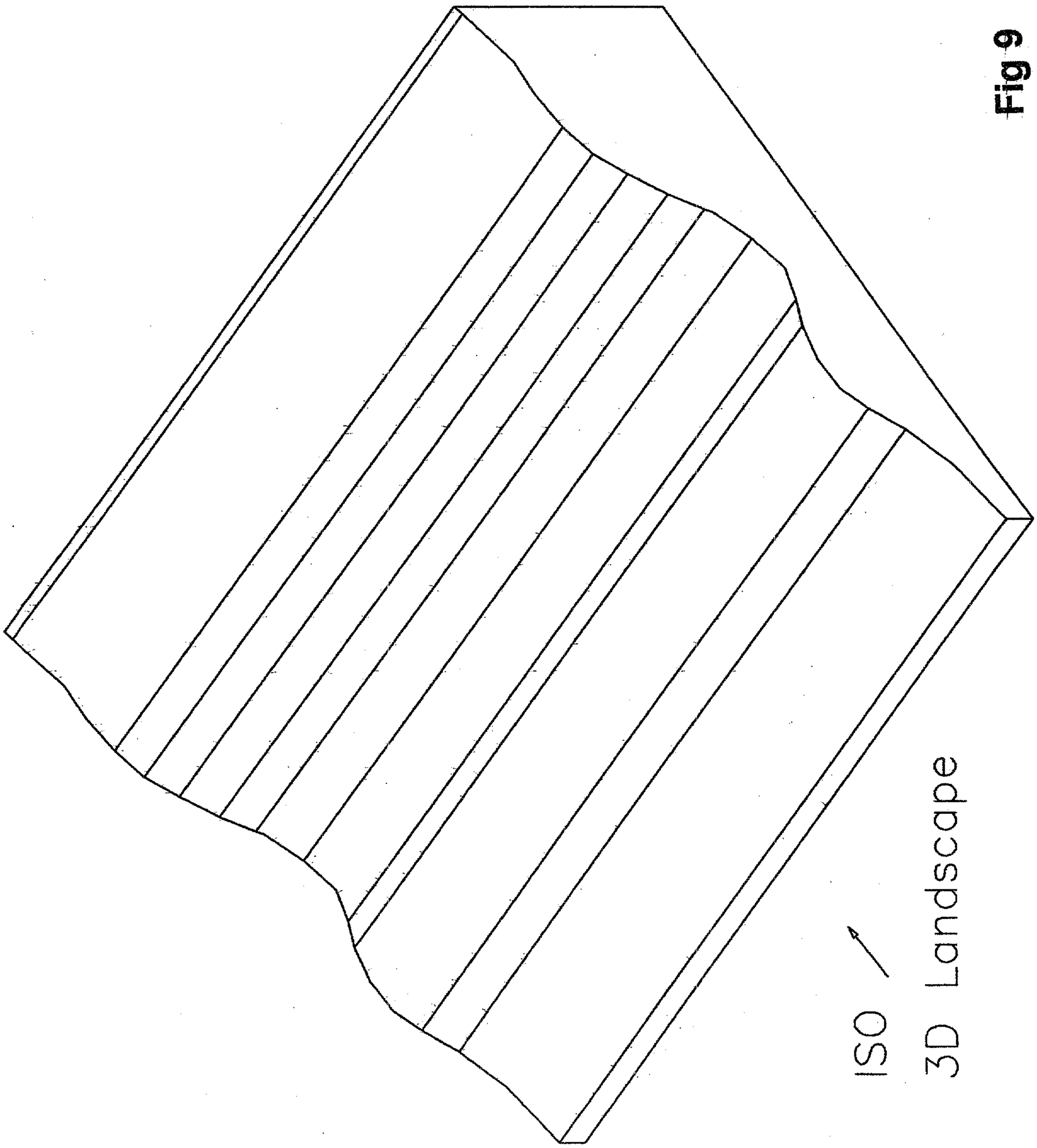
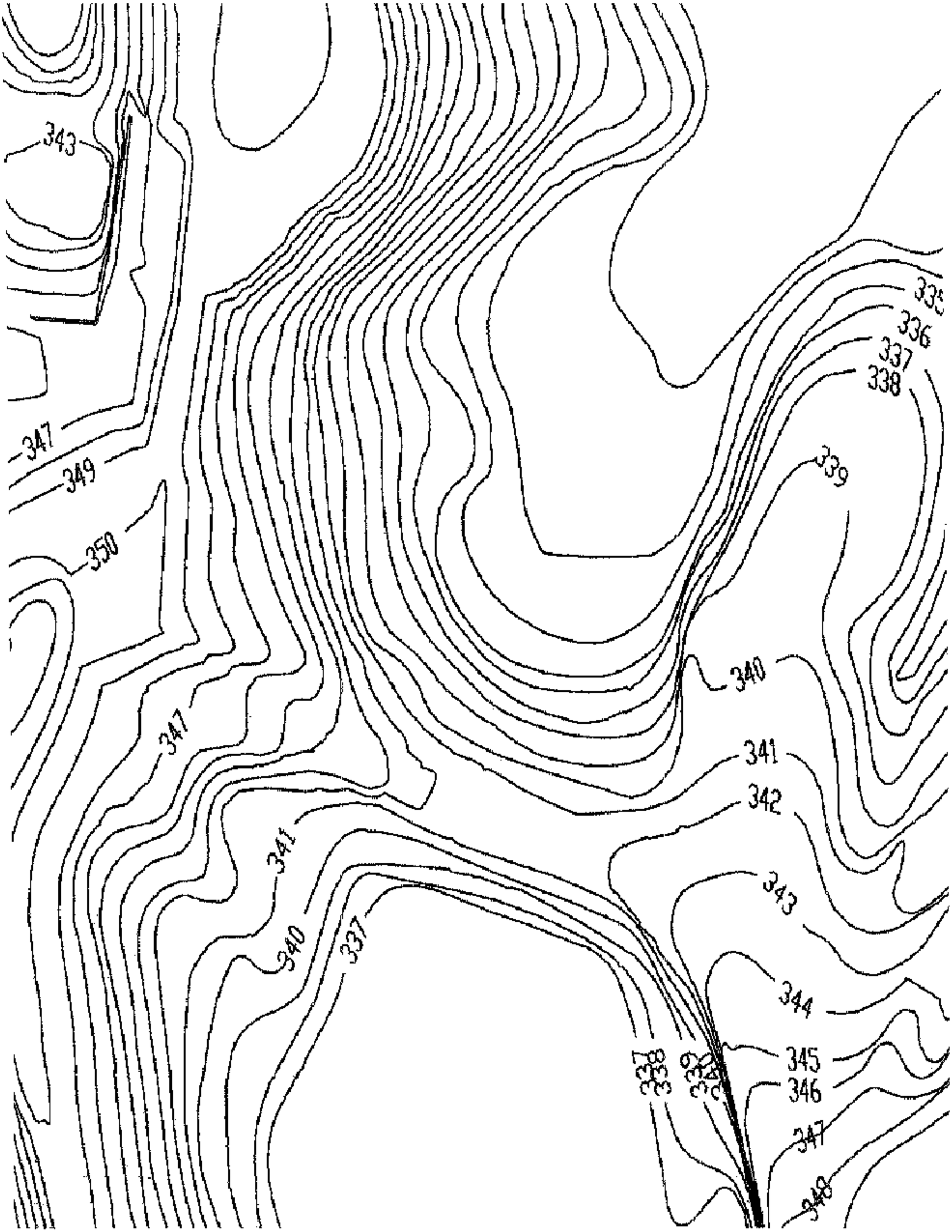


Fig 9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