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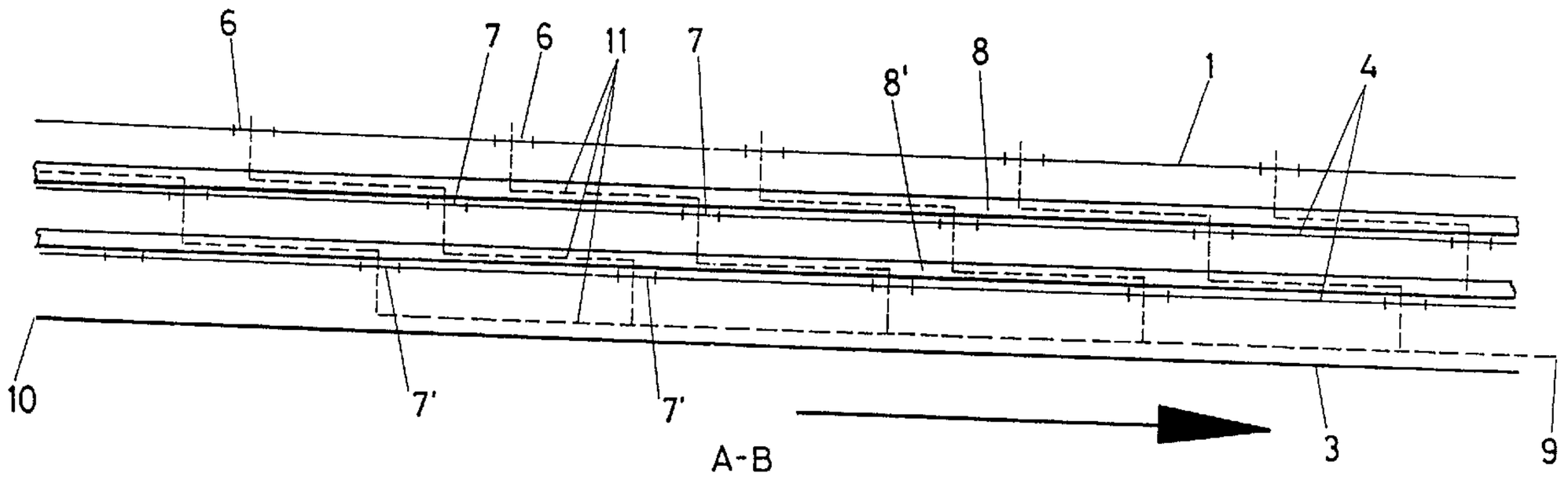
(54) Titre : PROCEDE DE CULTURE HYDROPONIQUE ET DISPOSITIF POUR SA MISE EN OEUVRE
(54) Title: HYDROPONIC CULTURE METHOD AND DEVICE FOR IMPLEMENTING SAME



(57) Abrégé/Abstract:
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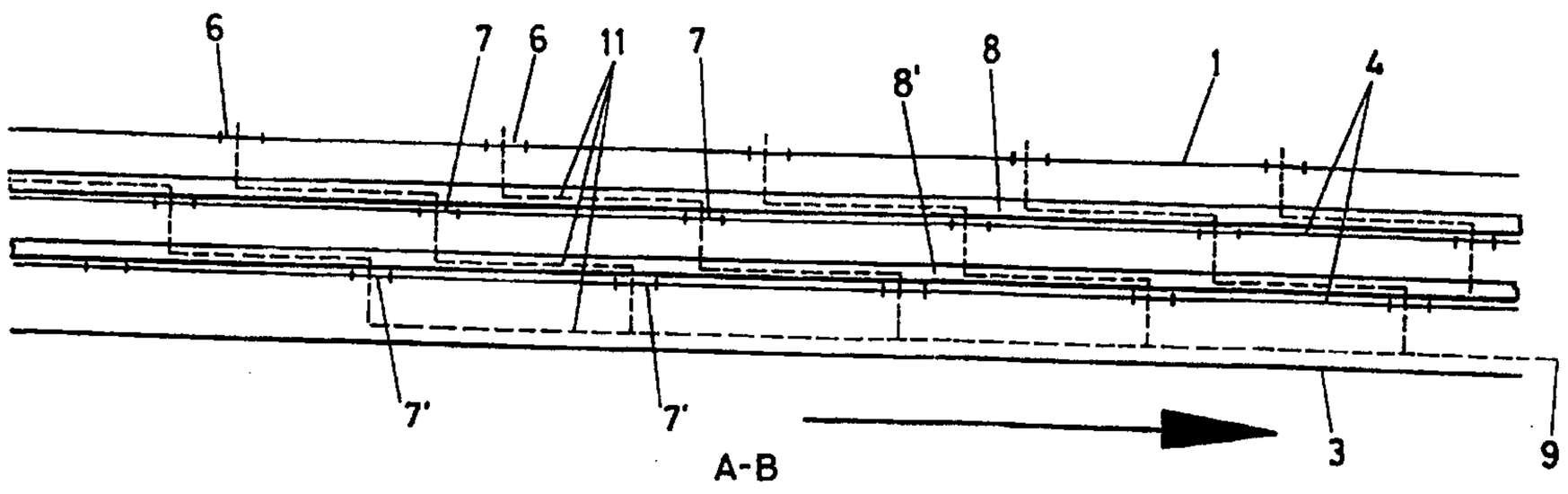
(54) Título: PROCEDIMIENTO DE CULTIVO HIDROPONICO Y DISPOSITIVO PARA SU PUESTA EN PRACTICA



(57) Abstract

A succession of suspended conduits are arranged on filiform and parallel supports (2). The upper sheet (1) has holes (6) for planting the respectives plants, the lower sheet (3) without holes acts as a collector, and the intermediary sheets (4) have the same number of holes which are offset longitudinarily with respect to the upper sheet (1). The conduits are assisted by the tube (8) forthe supply of water and nutrients and temperature control. From said tube a microtube or similar comes out above the upper sheet, one for each watering unit, for its individual supply. The liquid comes down in cascade through the conduits and through the holes (7, 7') down to the lower conduit (3), and guides the roots of the plants through the same path as the nutrient.

(57) Resumen

Sobre soportes filiformes y paralelos (2), se establece una sucesión de canalizaciones suspendidas. La lámina superior (1) con orificios (6) para implantación de respectivas plantas, lámina inferior (3) sin orificios actúa como colector, láminas intermedias (4) cuentan con el mismo número de orificios desfasados longitudinalmente respecto de la lámina superior (1). Las canalizaciones, están asistidas, por el tubo (8) de alimentación de agua con nutrientes y control de temperatura. De este tubo, sale por encima de la lámina superior, un micro tubo o similar, por cada unidad de riego, para alimentarla individualmente. El líquido desciende en cascada por las canalizaciones a través de sus orificos (7, 7') hasta la canalización inferior (3) dirigiendo a su vez las raices de las plantas por el mismo recorrido del nutriente.

HYDROPONIC CULTURE METHOD AND DEVICE FOR IMPLEMENTING SAME

DESCRIPTION

OBJECT OF THE INVENTION

The present invention lies within the scope of hydroponic cultures, namely cultures without earth, the object being to achieve a substantial simplification of the facilities and an equally substantial increase in yield.

The invention is furthermore related to the device for implementing said procedure.

BACKGROUND OF THE INVENTION

It is known that a hydroponic culture consists in an artificial culture process normally performed in shallow buckets to which a fertilizer liquid is added with a formulation that meets the nutrient requirements of a specific type of plant being grown, so that with adequate lighting, which may also be artificial, and adequate concentrations and proportions of nutrients dissolved in water, the plant growing conditions are optimal, providing far greater crops than those obtained by traditional methods.

A series of other advantages are furthermore achieved, such as greater plantation density, perfect overall root and plant protection against pathogenic agents, etc.

However, hydroponic cultures present a vitally important problem in regard to the plant's physical support means. The root of a plant plays a double role, namely that of absorbing the nutrients required by the plant and that of providing a physical support for the plant by taking root in the ground.

Hydroponic cultures do not require earth and therefore the plant's traditional physical support means disappears, thus requiring said traditional support to be replaced by

some other means having no detrimental effect on the crop in any of the above aspects. In this regard, inert matter such as high granulometric sand is used as a rooting physical support means, although this sand is occasionally difficult to obtain, is quite expensive and also poses several limitations to the farming facility as a result of its nature and weight.

Furthermore, although sand is in fact an inert matter, it may carry harmful germs to the plants, as initial thorough washing step therefore being essential, which furthermore has a negative economical effect.

US-A-3,823,508 discloses a method for hydroponic culture using a unit for hydroponic culture forming multiple channels based on superimposed strata perforated allowing multiple cascading paths for the liquid fertilizer as well as a staggered path for the plant roots through the different strata which constitute also a physical support for the plants. However, the units used in said method do not include slanting parallel filiform supports.

EP-A-0 406 458 discloses a device for hydroponically growing plants comprising a laminar body of an indefinite length formed by a pair of superposed layers of water-impervious material, interconnected along a longitudinal edge thereof and sealed along sealing lines extending transverse to and spaced along the longitudinal direction of the laminar body. However, said device does not contain holes along the median line of the dihedron or additional intermediate bodies with additional holes.

DESCRIPTION OF THE INVENTION

The procedure proposed by the invention solves the above problems in a fully satisfactory manner by eliminating the traditional need to provide a rooting substrate for the plants based on coarse sand or some similar inert matter.

Toward this end, and stated more specifically, said procedure consists in establishing a stratified laminar support, i.e. a support based on several superimposed sheets which, in addition to providing channel units for the fertilizer liquid, constitutes a means of attachment for the plant roots as it is fitted with offset holes through which labyrinthine conducts are formed for the roots, and thus, as the plant grows and consequently requires a greater stability, the roots become progressively lodged in the holes in the various strata, thereby providing an optimum mechanical attachment.

The implementation of this procedure involves the use of a device structured on the basis of a plurality of sheets having different widths designed to form a plurality of superimposed channel units of an indefinite length fitted with folded edges for supporting a pair of parallel

cables or rods, the ends of which are attached to supports of an adequate height conveniently designed to raise the multiple channels and to optimize the operators' working conditions.

More specifically, the various sheets form dihedrons having different angles which form superimposed channels with a common mouth, the lower sheet being totally closed whereas the remaining sheets are provided with holes which in the upper sheet are spaced from each other according to the spacing foreseen for the plants, the holes being offset in the lower sheets in order to achieve a "cascading" effect based on a certain lengthwise slant of the overall multiple channel units.

The upper sheet acts exclusively as a physical support for attaching the plants, while the intermediate sheets, in addition to taking part in the above-mentioned rooting effect, constitute cascading channels for the fertilizer liquid which is supplied through a tube with multiple outlets positioned within the recess of each channel unit and which flows on all of the channel units, cascading from one to the other and thus providing irrigation and oxygenation to the roots of the plants.

The lower sheet or channel unit acts as a sump for the residual fertilizer liquid, which is recycled and is therefore used in its entirety.

DESCRIPTION OF THE DRAWINGS

In order to complement this description and help to provide a better understanding of the characteristics of the invention, a set of drawings is attached to this specification, being an integral part thereof, wherein the following is represented with an illustrative, non-limiting character:

Fig. 1 shows a schematic, cross section view of a

hydroponic culture device fabricated according to the object of the present invention.

Fig. 2 shows a schematic, side elevation, longitudinal section view of the device shown in the previous figure, according to the A-B section line in said figure.

Finally, Fig. 3 shows a schematic, perspective view of the device in question.

PREFERRED EMBODIMENT OF THE INVENTION

In the example of a practical embodiment shown in the drawings, a hydroponic culture device is shown comprising an upper sheet (1), preferably made of plastic, in the form of a longitudinal band of an indefinite length which, with the assistance of a pair of lateral supports (2) composed of cables or rods, forms an obtuse dihedron, a second sheet (3), considerably wider than the previous sheet, also of a plastic nature, preferably opaque, in turn forms an acute dihedron and is supported by the same cables and rods (2), and between these end sheets (1) and (2), and a set of intermediate sheets (4), also having a dihedric shape and supported by the same marginal filiform elements (2). The number of intermediate sheets (4) may vary according to the specific requirements in each case, namely the type of plant being cultivated.

A cover (5) provides an initial protection for the small plants or seeds at the start of the culture process and protects the first roots from the light.

The upper sheet (1) is provided - along its median line, i.e. the dihedron edge formed by said line - with a plurality of evenly distributed holes (6) which correspond to the spacing foreseen for the plants to be grown, each of the intermediate sheets (4) being in turn provided with a number of holes (7) identical to that of the upper sheet (1), although longitudinally offset in a staggered manner, as can be seen particularly in Fig. 2. The last sheet (3)

is devoid of holes.

In the channel units established by the intermediate sheets (4), feeding tubes (8-8') are installed for the fertilizer liquid, which simultaneously acts as a liquid thermic transmitter for adequate temperature control in the culture facility.

According to this structure, the upper sheet (1) acts exclusively as a physical support for either the plant's bare root or for its root and substrate, the root becoming attached to the sheet by lodging inside the holes (6), the first roots being protected against the light, the intermediate sheets (4) also cooperating in said physical support function in view that, as the plant grows, the root in each plant first reaches holes (7), then holes (7') and so forth, in the event that a larger number of intermediate sheets (4) is provided, whereby rooting takes place at different levels and the mechanical attachment of the plant increases as its size increases, thereby remaining permanently stable.

The channel assembly is assisted by the water/nutrients and temperature control tube (8). From this tube emerges, toward the upper area above the upper sheet, a micro-tube or similar device for feeding each watering unit individually, so that the roots of the plants are fully immersed in said intermediate channel units, the fertilizer liquid descending in a cascade by virtue of the longitudinal offsetting between holes (7) and (7'), down to the lower channel unit (3) which, as previously stated, acts as a sump for the excess fertilizer liquid.

The longitudinal offsetting of the holes (6), (7) and (7') is oriented in the same direction as the slanting of the overall multiple channel unit, so that at the lower end (9) of said channel unit, i.e. its outlet, a general sump is established, not shown, wherein the liquid fertilizer is recycled toward the starting point (10) of the multiple

channel unit for the integral use thereof.

The roots follow the path of the liquid fertilizer, the rooting thus taking place according to the full lines (11) shown in Fig. 2.

This description need not be more extensive for an expert on the subject to understand the scope of the invention and the advantages deriving therefrom.

The materials, shape, size and arrangement of the elements are liable to variation provided no alteration to the essence of the invention is involved.

The terms of this specification should at all times be taken in their ample, non-limiting sense.

CLAIMS

1. Procedure for hydroponic culture, characterized by hanging, from a pair of slanting parallel filiform supports, a multiple channel unit based on superimposed laminar strata having different widths, which form dihedrons having different angles but with a common mouth, the upper sheet being provided, along its median line, with a plurality of evenly distributed holes, which correspond to the spacing foreseen for the plants to be grown, the intermediate sheet or sheets being provided with a number of holes identical to that of the upper sheet although longitudinally offset in a staggered manner, which are oriented in the same direction as the slanting of the overall multiple channel unit, and the lower sheet being devoid of holes, in order to establish, along said channel unit, multiple cascading paths for the fertilizer liquid as well as a staggered path for the plants roots through the different strata, in a manner that said strata furthermore constitute the physical rooting support for said plants.

2. Device for implementing the hydroponic culture procedure of Claim 1, characterized in that it is formed from a laminar body (1) of an indefinite length which forms a substantially obtuse dihedron attached through its marginal zones to filiform guides or supports (2), and which, along its median line, incorporates a plurality of evenly distributed holes (6) corresponding to the spacing foreseen for the plants, and hanging from said lateral guides (2) is a lower laminar body (3) devoid of holes which acts as a general sump for the device, while between the laminar bodies (1) and (3) several intermediate laminar bodies (4) are established which determine the equally intermediate channel units provided with holes (7-7') that coincide numerically weith those of the upper laminar body (1), although they are longitudinally offset to correspond with the general slanting of the overall multiple channel unit.

3. Device for hydroponic culture, according to Claim 2, characterized in that within the recess of the laminar bodies which determine the intermediate channel units (4), tubes (8-8') are established which simultanously act as suppliers of fertilizer liquid and as a means of heat conditioning the culture via the temperature of the fertilizer itself, emerging from said tubes (8-8') toward the upper area above the upper sheet (1) a device for feeding each watering unit individually through the holes (6) of the upper sheet (1), so that said tubes (8-8') feed fertilizer liquid to all the upper channel unit holes (6), said fertilizer liquid cascading from one intermediate channel unit (4) to the other, down to the lower channel unit (3) which acts as a sump.

4. Device for hydroponic culture, according to Claims 2 or 3, characterized in that at the lower end (9) of the multiple channel unit a sump is established wherefrom the excess fertilizer liquid is recycled toward the upper end (10) for its full reuse.

5. Device for hydroponic culture, according to any one of Claims 2 to 4, characterized in that on one of the lateral longitudinal guides (2) a cover is attached for protecting the roots from the light.

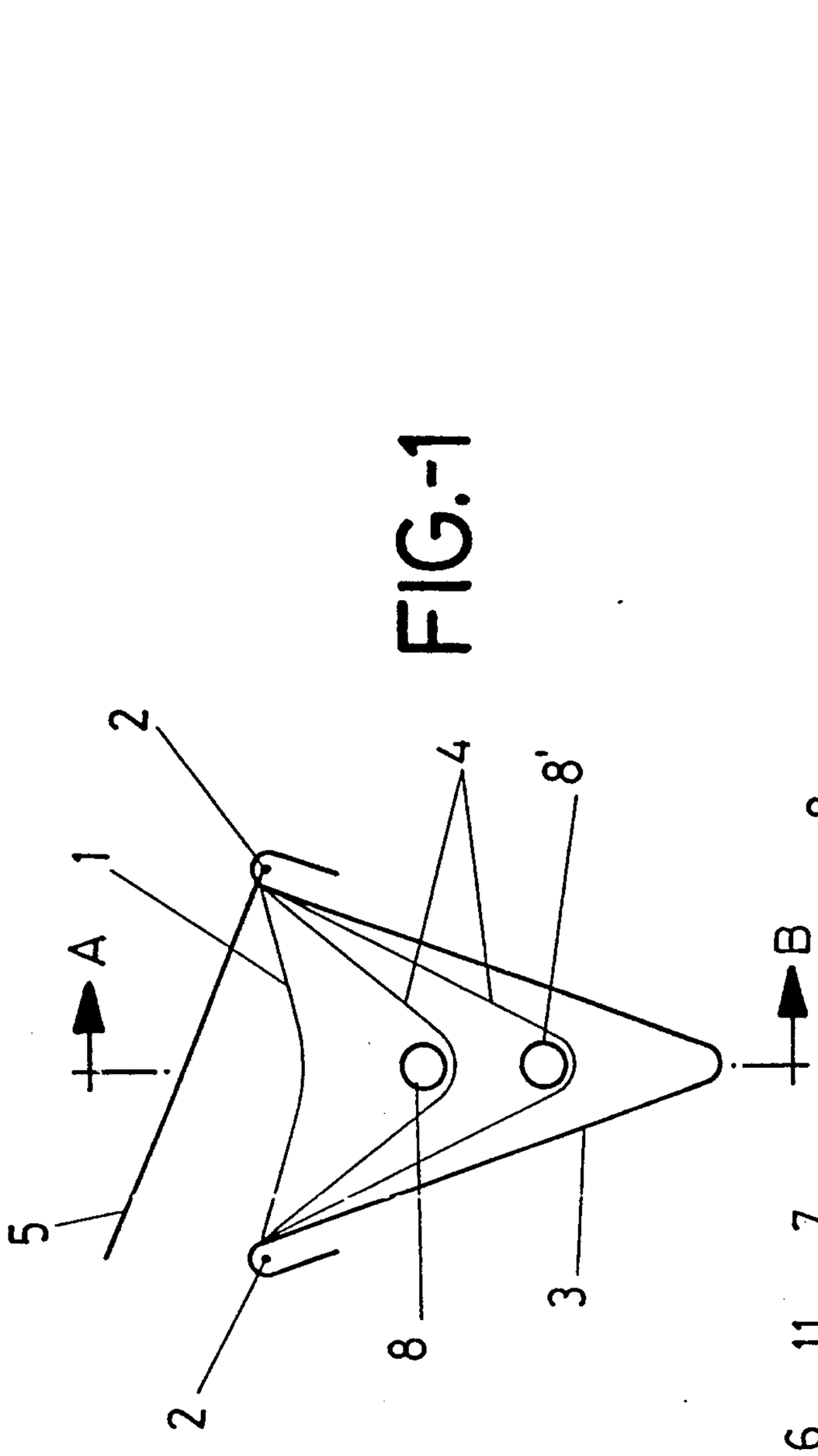


FIG.-1

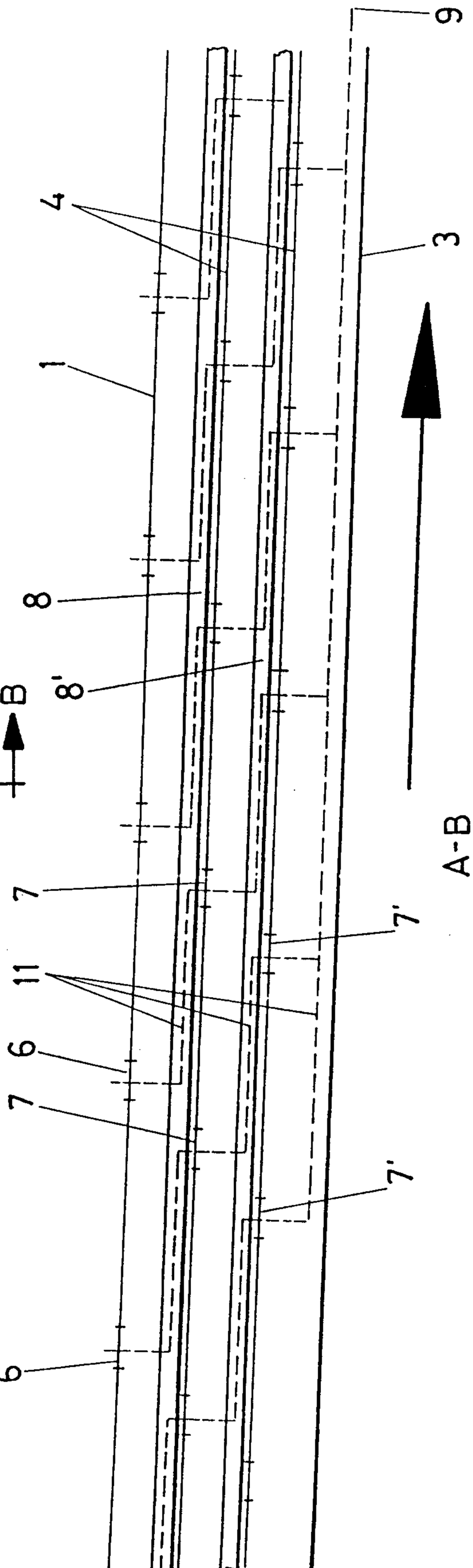


FIG.-2

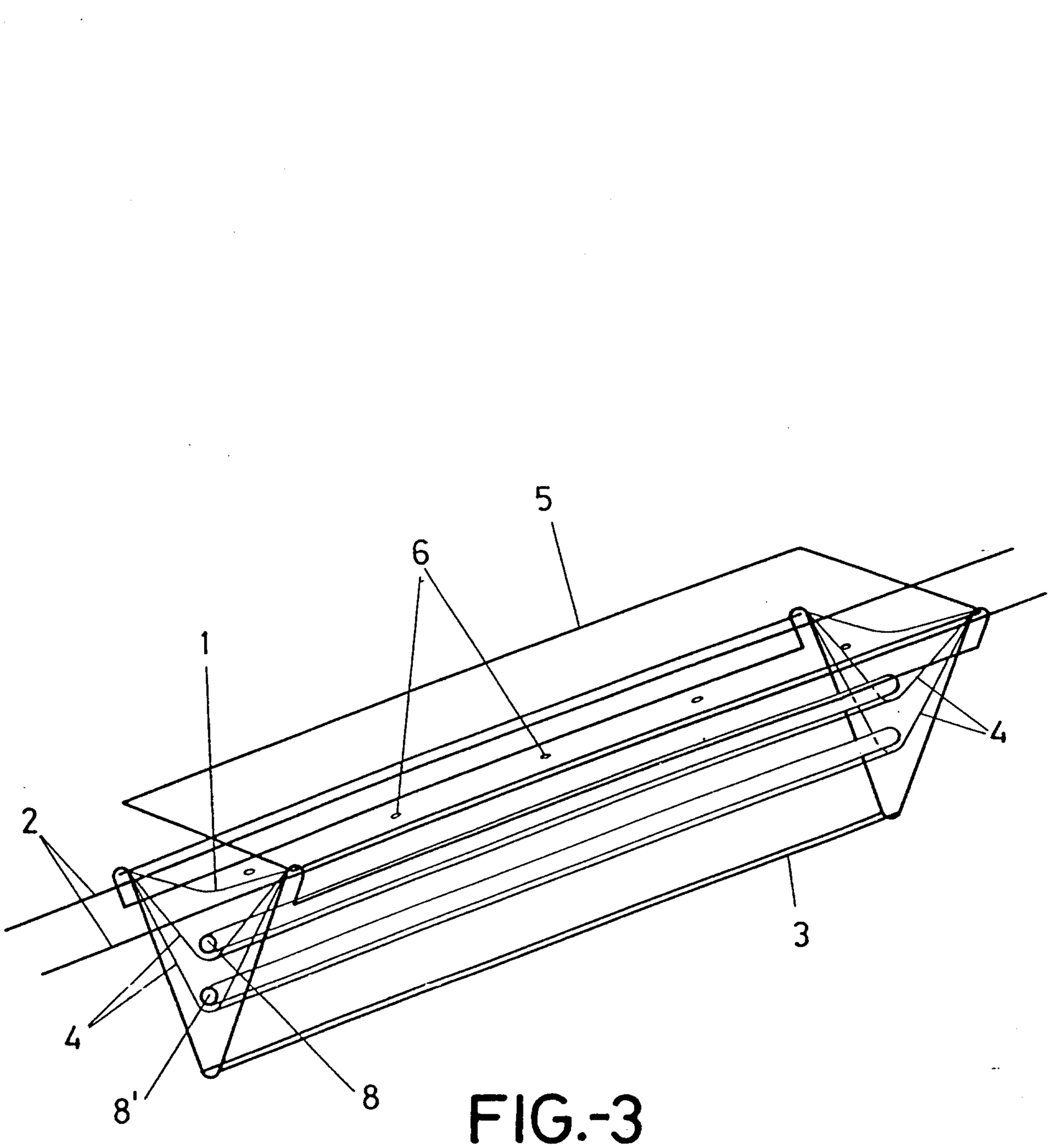
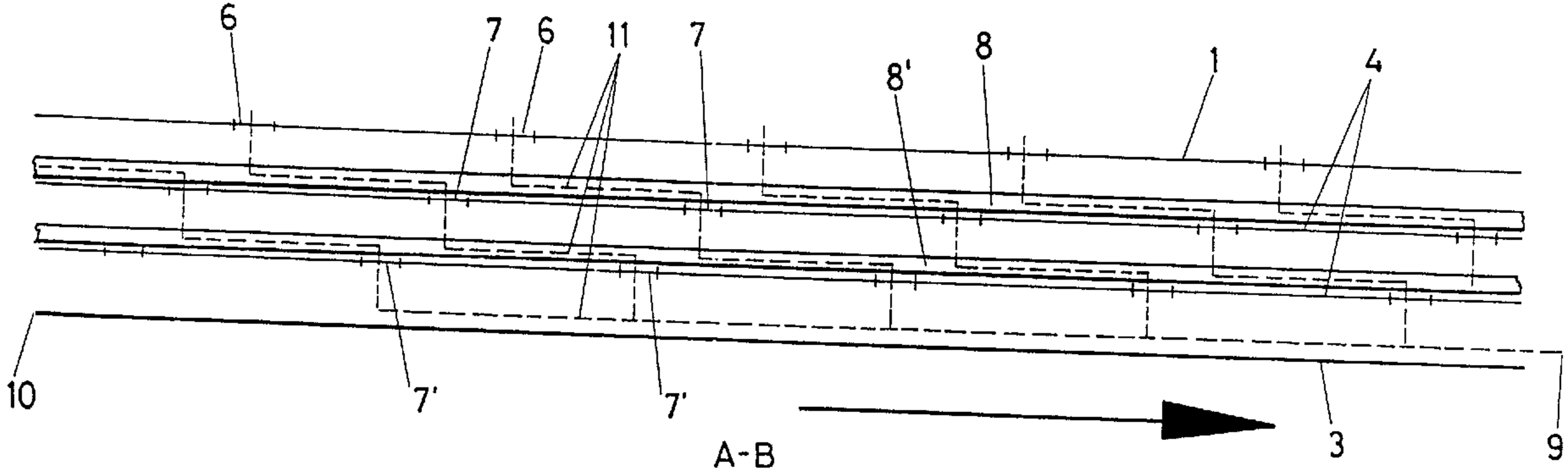


FIG.-3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