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(54) **Apparatus to produce large-size flat screens for televisions or suchlike**

(57) Apparatus to produce large-size flat screens, comprising a fixed base (11) on which working means (30, 40) are slidably mounted. The fixed base (11) is made of stone.

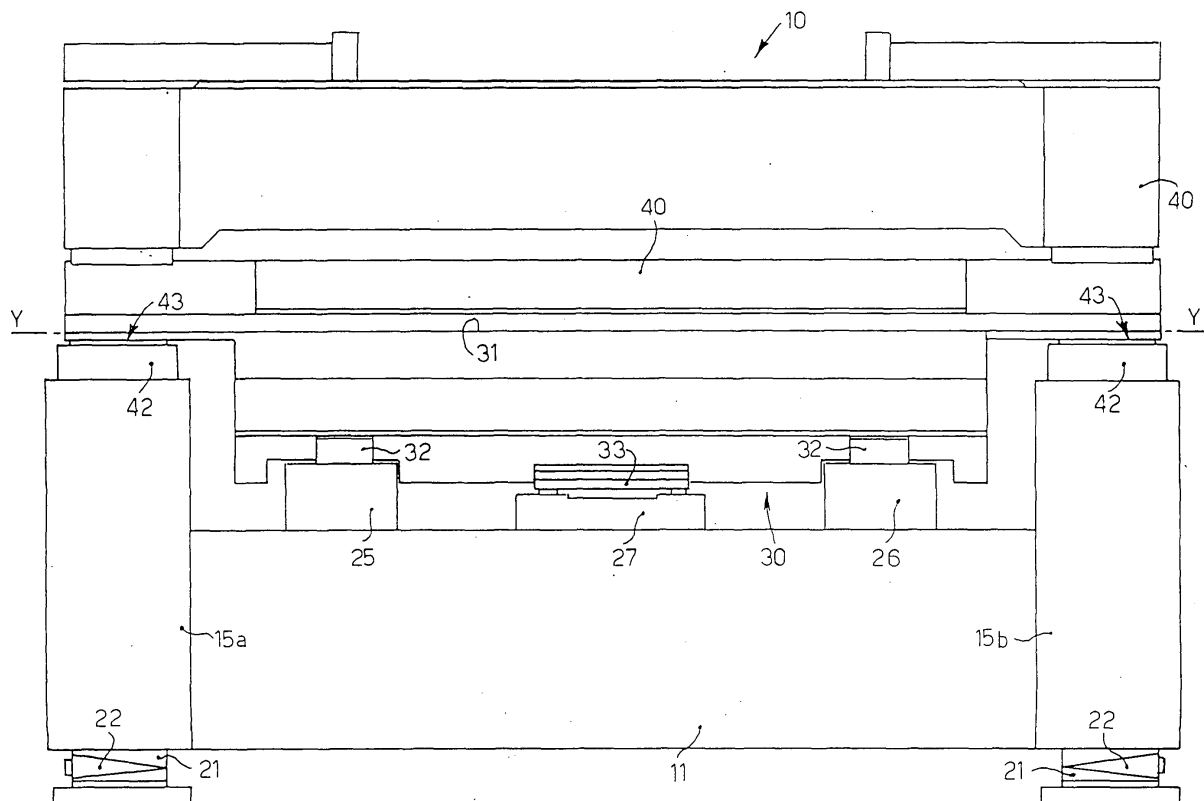


fig.1

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Description

FIELD OF THE INVENTION

[0001] The present invention concerns an apparatus to produce large-size flat screens, more than one square meter, for televisions or suchlike, and in particular flat screens made with liquid crystal devices by means of the Thin Film Transistor (TFT) technology, Plasma Display Panel (PDP) technology, or other similar technology. By production we mean both the construction proper, and also the control of the already constructed product.

[0002] The apparatus comprises a fixed base on which are mounted, able to slide independently, a working table to position the screen and a working turntable to make the matrix of lines and columns which define the pixels.

[0003] Both the fixed base and the working table are made of stone, advantageously black African granite, which has a very stable molecular structure and a very low coefficient of heat dilation.

[0004] In this way, using the serigraphy technique, it is possible to achieve matrixes with a high resolution, in the range of more than 1,500 pixels per square millimeter.

BACKGROUND OF THE INVENTION

[0005] It is known that apparatuses to produce large-size flat screens, for example with TFT or PDP technology, must be provided with a working table having a horizontal supporting plane with a greater surface than that of the screens to be produced. The working table has to be able to move along at least a first horizontal axis (X) with respect to a fixed base, which must necessarily be much bigger than the working table. On such fixed base a working turntable is also mounted, also able to slide along said first horizontal axis (X) and on which a serigraphy assembly is mounted, movable along a second horizontal axis (Y), orthogonal to the first axis (X).

[0006] It is also known that screens that adopt the TFT technology consist of a very thick reticule of lines and columns, at the junctions of which the pixels that form the image are determined. To have a high definition image, both the distance between the lines and the distance between the adjacent columns is in the range of about 25 μm so that, in the production of such screens, it is necessary to keep a high parallelism between the different lines and columns, each of which is longer than one meter.

[0007] Known apparatuses have both the base and also the working table consisting of metal structures, made by means of a plurality of metal elements welded together. This makes such structures not very stable and subject to deformations and stretching due mainly to variations in temperature, so that, in fact, in the state of the art it is very problematic and chancy to obtain

large-size flat screens that satisfy the design specifications. Indeed, the percentage of large-size flat screens that are accepted at quality control is today around 30%, with a consequent extremely high discard of production, so that the cost of the product is today very high, precisely because of the very high discard rate.

[0008] Applicant has devised and embodied the apparatus to produce large-size flat screens for televisions and suchlike, according to the invention, in order to overcome these shortcomings and to obtain other advantages.

SUMMARY OF THE INVENTION

[0009] The apparatus to produce large-size flat screens according to the present invention is set forth and characterized in the main claim, while the dependent claims describe other innovative features of the present invention.

[0010] One purpose of the present invention is to achieve an apparatus to produce large-size flat screens, even more than one square meter, which will allow to obtain, with repeatability and great reliability, workings with tolerances in the range of microns on distances of even more than one meter, so as to reduce to a minimum the rate of defectiveness of screens produced and consequently to considerably reduce the cost of the finished product. This is intended to apply both to apparatuses by means of which the large-size flat screens are properly made, and also for the apparatuses by means of which the already made screens are measured and/or controlled.

[0011] In accordance with this purpose, an apparatus according to the invention, which comprises a fixed base on which working means are slidably mounted, has as its characteristic feature the fact that at least the fixed base is made of stone, advantageously granite, for example that known as black African granite, which has a very stable molecular structure and a very low coefficient of heat dilation, in the range of 6-7 $\mu\text{m}/\text{m}^\circ\text{C}$.

[0012] Moreover, to reduce the weight of the fixed base, instead of being in a single block, it is made using a plurality of vertical and horizontal plates, attached together so as to form a relatively light box-like structure, that is, comparable in weight to the metal structures of known apparatuses. In fact, even if the individual stone plates that make up the box-like structure of the fixed base according to the present invention have a thickness 2-3 times greater than that of the metal sheets normally used in the state of the art, this is compensated by the specific weight of the stone, which is less than one third that of iron or steel.

[0013] This advantageously allows to obtain a very stable base, practically not affected by any possible temperature differences.

[0014] According to a preferential form of embodiment, the working means comprise at least a working table and a working turntable, movable independently

with respect to the fixed base.

[0015] Advantageously, the working table is also made of the same type of material that the fixed base is made of.

[0016] To allow the working table and the working turntable to slide precisely with respect to the fixed base, pneumostatic means, of a known type, are provided to selectively create an air cushion between the moving parts and the base itself. For example, the pneumostatic means can be of, the type described in the Italian patent IT-B-1.281.432 granted to the present Applicant on 18.02.1998.

[0017] Advantageously, moreover, both the movement of the working table and that of the working turntable with respect to the fixed base are obtained by means of linear electric motors, also of a known type, for example of the type described in the patent applications UD2001A000208 and UD2001A000209 filed by the present Applicant on 14.12.2001.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example, with reference to the attached drawings wherein:

- fig. 1 is a front view of an apparatus to produce large-size flat screens according to the invention;
- fig. 2 is an enlarged and partly sectioned front view of the fixed base of the apparatus in fig. 1;
- fig. 3 is a view along the line from III to III in fig. 2;
- fig. 4 is a side view in reduced scale of the apparatus in fig. 1.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

[0019] With reference to fig. 1, an apparatus 10 to produce large-size flat screens according to the invention comprises a fixed base 11 having a length of about 4 m, a width of about 2.5 m and a height of about 1 m.

[0020] The fixed base 11 (figs. 2 and 3) is made of a plurality of granite plates, for example black African granite, some arranged horizontally and others vertically and attached to each other by means of adhesives or mechanical attachment elements of a known type, such as screws or bolts, in order to form a box-like structure.

[0021] To be more exact, the fixed base 11 comprises a lower plate 12, about 5 cm thick, on which a plurality of vertical plates 13a, 13b, 13c, of a thickness varying between about 3 and 5 cm, are mounted and attached. To be more exact, the lateral vertical plates 13a and 13b are higher than the central vertical plates 13c and define two lateral uprights 15a and 15b. On the lateral vertical plates 13a and 13b two horizontal plates 16a and respectively 16b, about 5 cm thick, are mounted and at-

tached, while on the central vertical plates 13c a single horizontal plate 17, about 4 cm thick, is mounted and attached.

[0022] Two tubular metal elements 18 are arranged horizontally through mating holes made in the vertical plates 13a, 13b and 13c, and are attached to the latter to define elements used to lift, move and transport the whole fixed base 11 or the whole apparatus 10.

[0023] Through holes 19 are made in the vertical plates 13a and 13b in correspondence with the tubular elements 18.

[0024] Below the lower plate 12 six supporting feet 21 are arranged, each one provided with a device 22 for the micrometrical regulation of the height. Each device 22 can be of any known type and is therefore not described in detail here.

[0025] On the horizontal plate 17 and equidistant from the uprights 15a and 15b two blocks 25 and 26 of granite, shaped like a parallelepiped, are mounted and attached. At the center of the horizontal plate 17 a third block 27 of granite is mounted and attached, parallel to the two blocks 25 and 26.

[0026] The upper surfaces of the blocks 25 and 26 and of the horizontal plates 16a and 16b are lapped shiny and define the horizontal supporting planes for a working table 30 and respectively for a working turntable 40.

[0027] The working table 30 is also advantageously made of granite and can be made as a single worked and shaped block, or it can be of the box-like structure type and made by means of a plurality of horizontal and vertical plates attached together, as seen for the fixed base 11.

[0028] The working table 30 has a perfectly horizontal and smooth supporting plane 31, on which the screen to be produced is able to be located.

[0029] The movements of the working table 30, with respect to a horizontal axis X, are obtained by means of the combined action of pneumostatic devices 32, of a known type, which create an air cushion between the upper surfaces of the blocks 25 and 26 and the working table 30 itself, and of linear motors 33, also of a known type, arranged on the central block 27.

[0030] The working turntable 40 is also movable along the horizontal axis X thanks to the combined action of pneumostatic devices 42, of a known type, which create an air cushion between the upper surfaces of the uprights 15a and 15b and the working turntable 40 itself, and of linear motors 43, also of a known type.

[0031] On the working turntable 40 a serigraphy assembly 45 is mounted (fig. 4), of a known type, for example of the type described in the patent application UD99A000073 filed by the present Applicant on 02.04.1999. The serigraphy assembly 45 is movable both along the horizontal axis X and also along a horizontal axis Y perpendicular to the first.

[0032] It is clear that modifications and additions of parts may be made to the apparatus 10 to produce

large-size flat screens as described heretofore, without departing from the field and scope of the present invention. For example, the innovative concepts expressed herein are equally applicable, not only to a production apparatus proper, but also to an apparatus to measure or control the same large-size flat screens.

[0033] It is also clear that, although the present invention has been described with reference to a specific example, a person of skill in the art shall certainly be able to achieve many other equivalent forms of apparatuses to produce large-size flat screens, all of which shall come within the field and scope of the present invention.

Claims

1. Apparatus to produce large-size flat screens, comprising a fixed base (11) on which working means (30, 40) are slidably mounted, **characterized in that** at least said fixed base (11) is made of stone.
2. Apparatus as in claim 1, **characterized in that** at least said fixed base (11) is made of granite.
3. Apparatus as in claim 1 or 2, **characterized in that** said stone has a coefficient of heat dilation in the range of about 6-7 $\mu/m^{\circ}C$.
4. Apparatus as in any claim hereinbefore, **characterized in that** said fixed base (11) comprises a plurality of vertical plates (13a, 13b, 13c) and of horizontal plates (12, 16a, 16b, 17) attached to each other so as to form a box-like structure.
5. Apparatus as in claim 4, **characterized in that** said box-like structure, although made of stone, has a weight substantially comparable to that of a similar metal structure.
6. Apparatus as in claim 4, **characterized in that** said vertical plates (13a, 13b, 13c) and said horizontal plates (12, 16a, 16b, 17) have a thickness variable between about 3 and 5 cm.
7. Apparatus as in claim 4, **characterized in that** said vertical plates comprise lateral vertical plates (13a, 13b) higher than the central vertical plates (13c) and defining two lateral uprights (15a, 15b).
8. Apparatus as in claim 4, **characterized in that** at least a join element (18) is arranged horizontally through said vertical plates (13a, 13b and 13c) and is attached thereto.
9. Apparatus as in claim 7, **characterized in that** on one of said horizontal plates (17), between said uprights (15a, 15b), two blocks of granite (25, 26), shaped like a parallelepiped, are mounted and at-

tached, said uprights (15a, 15b) and said blocks of granite (25, 26) having the upper surfaces lapped and able to function as a support for said working means (30, 40).

10. Apparatus as in any claim hereinbefore, **characterized in that** pneumostatic means (32, 42) are provided to allow said working means (30, 40) to move with respect to said fixed base (11).
11. Apparatus as in any claim hereinbefore, **characterized in that** linear electric motors (33, 43) are provided to displace said working means (30, 40) with respect to said fixed base (11).
12. Apparatus as in any claim hereinbefore, **characterized in that** said working means comprise a working table (30) and working turntable (40), and that said working table (30) is made of the same type of material as the fixed base (11) is made of.
13. Apparatus as in claim 12, **characterized in that** said working table (30) has a lapped supporting plane (31), on which the screen to be produced is able to be placed.
14. Apparatus as in claim 12, **characterized in that** said working turntable (40) comprises a serigraphy assembly (45).

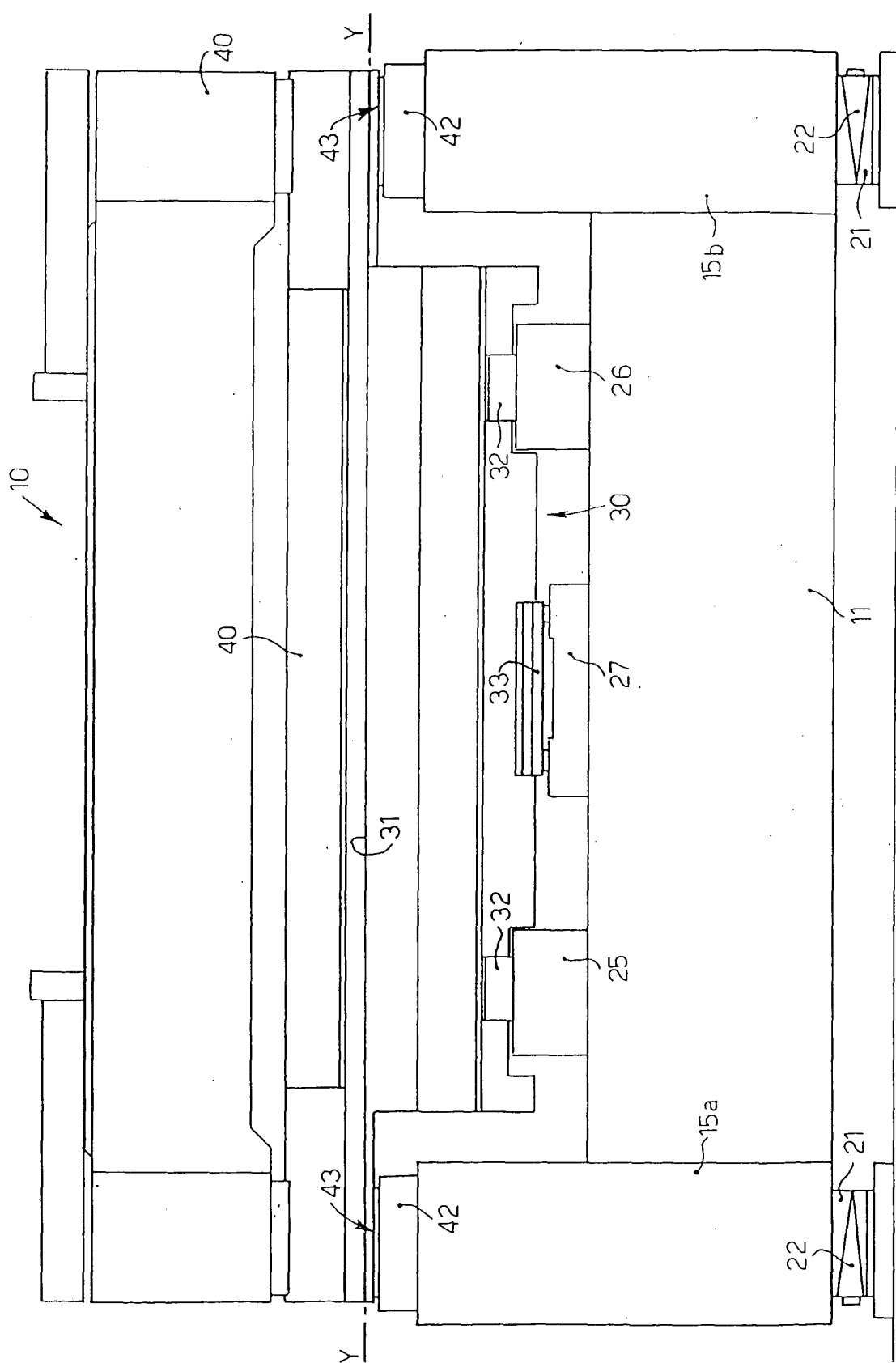


fig.1

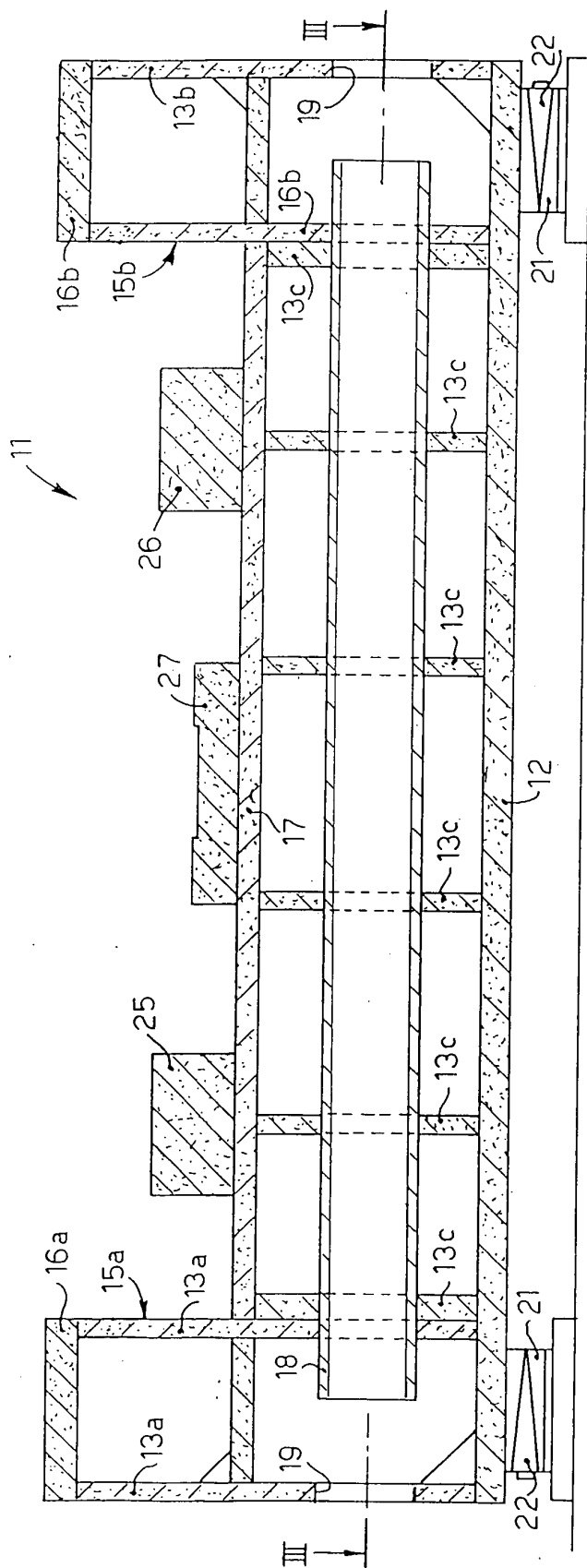


fig. 2

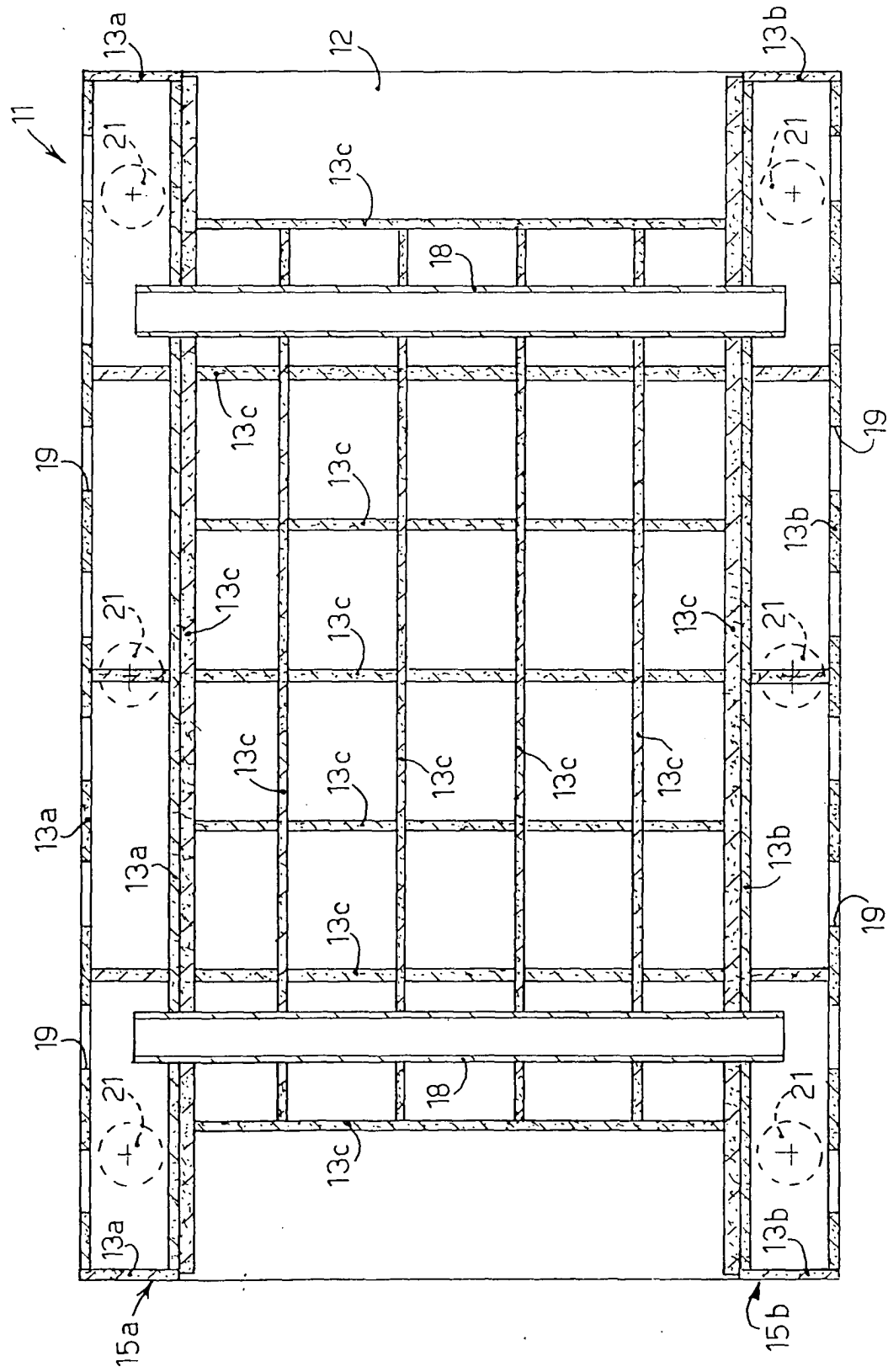


fig. 3

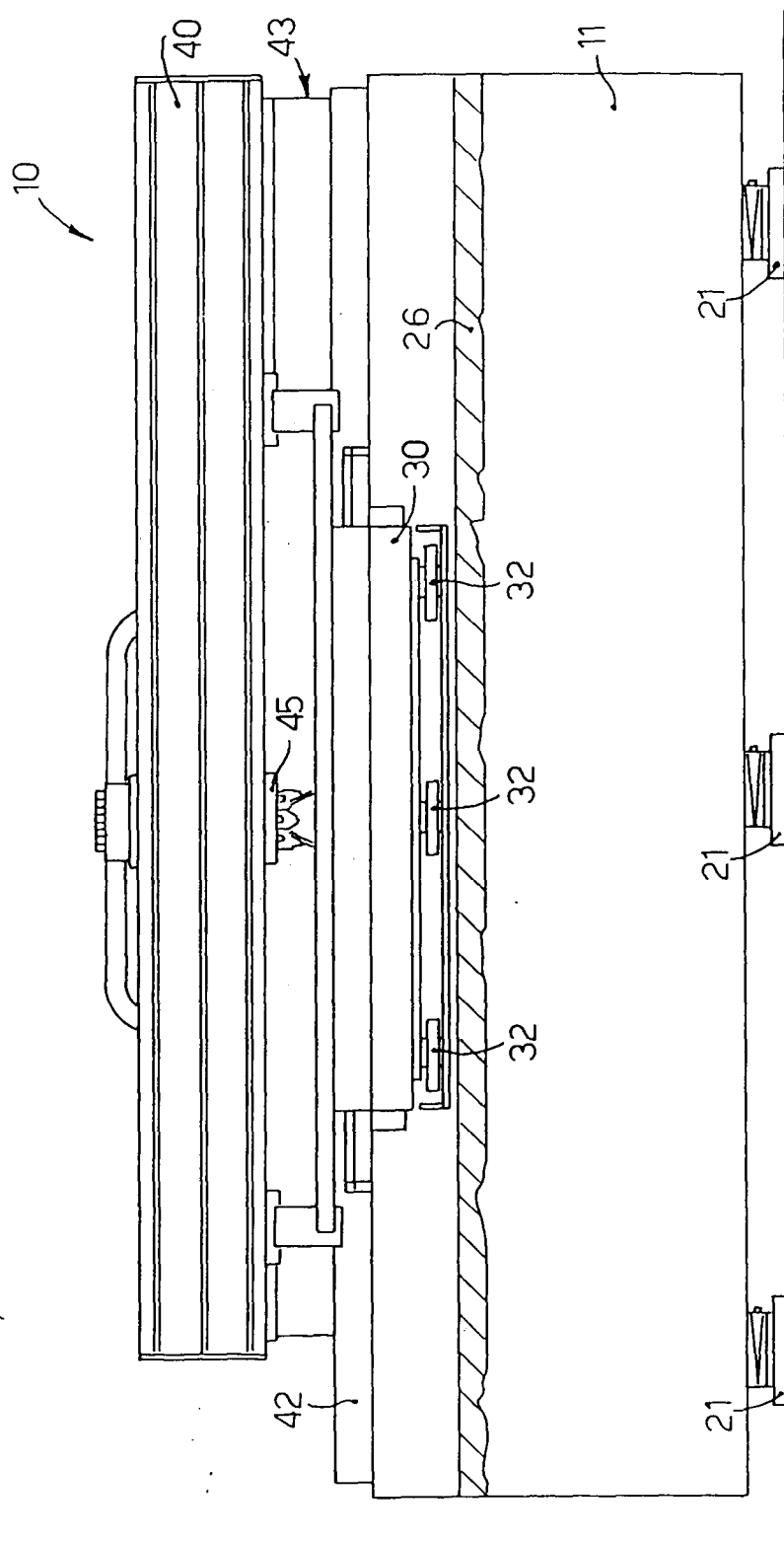


fig. 4