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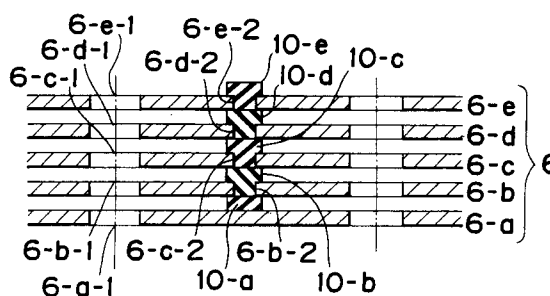
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D-28195 Bremen (DE)**(54) **Image display apparatus and manufacturing method therefor.**

(57) A method for manufacturing electrode unit (6) of an image display apparatus of flat plate type comprises steps of forming linear thin film spacers (10-a) on an electron beam control electrode (6-a) along lines passing anchor holes (6-b-2) thereof by spraying an insulating material thereonto, stacking another electron beam control electrode (6-b) on the electron beam control electrode, spraying the insulating material onto another electron beam control electrode to form linear thin film spacers while filling the same material in anchor holes of another electron beam control electrode, thereby the linear thin film spacers being bonded to the newly form linear thin film spacers and repeating these steps to form an electrode unit. There is also disclosed an electrode unit manufactured according to this method.

Fig. 1

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates particularly to a flat-plate type image display apparatus employing electron beams.

2. Description of the Prior Art

Hereinbelow, an example of the construction of the conventional image display apparatus will be described with reference to the accompanying drawings.

Fig. 10 is a sectional view showing an essential portion of a first example of the conventional electrode unit, Fig. 11 is a perspective view showing an essential portion of one example of the conventional electrode unit, and Fig. 12 is a sectional view of an essential portion of one example of the image display apparatus employing the conventional electrode unit. In these drawings, reference numeral 101 is a face-plate with a fluorescent screen 103 comprised of R, G and B being applied to the inner face thereof and serving also as a front casing, reference numeral 102 is a rear casing formed on the inner face with a rear electrode 104 made of a conductive film. Reference numeral 105 is a linear cathode, reference numeral 106 is an electrode unit formed by stacking electron beam control electrodes 106-a to 106-e, and the electron beams emitted from linear cathodes 105 are subjected to controls such as condensation, deflection and modulation while passing through electron beam through holes 106-a to 106-e-1 formed on control electrodes 106-a-1 to 106-e-1 and thereafter are collided with the fluorescent screen of R, G and B to make luminescent the same for display of images..

Here, as the method for stacking and fastening electron beam control electrodes 106-a to 106-e of the electrode unit 106 one upon another, as shown in Fig. 13, glass rods 110 (Fig. 13a) as core lines with frit glass 111 applied on the periphery thereof are arranged between control electrodes 106-a and 106-b and between adjacent electron beam pass-through holes (Fig. 13b) and control electrodes are bonded to each other by melting the frit glass 111 by applying pressure and heat (Fig. 13c). Here, the interval between adjacent electron beam control electrodes is maintained at the diameter of said glass rod 110.

The electrode unit 106 formed in the manner as described above is supported and fasten on the periphery thereof by the posts 108 bonded and fastened to said rear casing 102 by frit glass 107.

Furthermore, Fig. 14 is a sectional view showing an essential portion of a second example of the

conventional electrode unit. As the method for stacking and fastening electron beam control electrodes 106-a to 106-e one upon another, insulating spacers, for example, of ceramics 120-a to 120-e are arranged respectively between adjacent electron beam control electrodes to maintain an appropriate space therebetween, and in this state, the electrodes are connected and tightened by the tightening pins 120 bonded to the electron beam control electrode 106-e. Concretely, the tightening is effected by melting the end portion of each tightening pin 121, for example, with laser beams.

Here, the electron beam control electrodes 106-a to 106-e are planar, and therefore, the tightening pins 121 are also arranged at a proper interval two-dimensionally. The electron beam control electrodes 106-a to 106-e are discretely laminated and fastened at the portions of the tightening pins 121.

However, these conventional methods mentioned above have disadvantages as follows.

In the first place, in the first example, it is necessary to raise the temperature of the electron beam control electrodes up to the melting temperature of frit glass for the bonding thereof. Therefore, the electrodes are bonded to each other in the thermally expanded state and thereafter, cooled down to the normal temperature, but warping has been caused in many cases in that process, resulting in a large extent of warping in a finished electrode unit in many cases. Furthermore, in the process of melting frit, it is necessary to employ an electric furnace which is capable of strictly controlling the temperature profile, which has constituted the main cause of the cost increase and the decrease of through-put.

Furthermore in the second example, since the electron beam control electrodes are tightened by tightening pins, the warping due to the thermal expansion as in the first example does not take place. However, in this construction, since there are no member for regulating the stacking space of the electron beam control electrodes 106-a to 106-e except for on the tightening pin portions, there has been such a problem that undulations take place corresponding to the arrangement positions of the tightening pins. Furthermore, the rigidity as a construction of the electrode unit was comparatively low, and as a result, in the arrangement of fastening the electrode unit only on the periphery thereof, it is difficult to assemble the electrode unit while maintaining the exact planar configuration of each control electrode.

SUMMARY OF THE INVENTION

In view of the problems as described above, an essential object of the present invention is to pro-

vide a structure in which electron beam control electrodes are stacked and fastened without the problems of warping and undulation and in the state where the rigidity as a construction is secured, and a method for achieving such structure.

In order to solve the above-described problems, the following electronic apparatuses are provided according to the present invention.

According to a first aspect of the present invention as claimed in Claim 1, there is provided an image display apparatus of flat plate type which comprises a face plate formed with a fluorescent screen; an electrode unit in which a plurality of electron beam control electrodes having electron beam pass-through holes and anchor holes are spaced and fastened together by spacer means; electron sources; and a casing for maintaining its interior in a vacuum, each of said spacer means comprised of linear thin film spacers for spacing said plurality of electron beam control electrodes and connecting rods made of the same material as said linear thin film spacers for connecting said thin film spacers, each of said linear thin film spacers between adjacent electron beam control electrodes along a line connecting anchor holes of each electron beam control electrode in a direction parallel to each electron beam control electrode, and each of said connecting rods extending through anchor holes of said plurality of electron beam control electrodes in a direction vertical to each electron beam control electrode.

Furthermore, according to a second aspect of the present invention as claimed in Claim 6, there is provided a method for manufacturing electrode unit of an image display apparatus of flat plate type in which a plurality of electron beam control electrodes having electron beam pass-through holes and anchor holes are spaced and fastened together by spacer means, comprising steps of forming linear thin film spacers on an electron beam control electrode along lines passing anchor holes of said electron beam control electrode by spraying an insulating material onto said electron beam control electrode, stacking another electron beam control electrode on said electron beam control electrode with said linear thin film spacers in such a manner that anchor holes of said another electron beam locate on said linear thin film spacers, spraying said insulating material onto said another electron beam control electrode along each of said linear thin film spacers for plugging anchor holes of said another electron beam control electrode and forming linear thin film spacers on said another electron beam control electrode whereby said linear thin film spacers on said electron beam control electrode are bonded to those on said another electron beam control electrode by plug portions formed in said anchor holes, repeating these fore-

going steps by predetermined number of times to form said electrode unit.

The operation by this technical means is as follows.

The present invention as claimed in Claim 1 is so constituted that in a construction wherein a plurality of electron beams control electrodes are laminated and fastened as the electrode unit effecting the electron beam drive, etc. in the image display apparatus of flat-plate type, the Nth electron beam control electrode and the (N + 1)th electron beam control electrode are laminated and fastened by forming linear thin film spacers so as to plug and cover the anchor holes on the (N + 1)th electron beam control electrode and by fusion-bonding of said films to insulating spacers formed on the Nth electron beam control electrode through said anchor holes, and at the same time, the thin films formed on the (N + 1)th electron beam control electrode serve as the insulating spacers for lamination and fastening of the (N + 2)th electron beam control electrode. By the repetition of this construction, a plurality of electron beam control electrodes are laminated and fastened so as to constitute an electrode unit.

By this construction, since the thin film as the bonding means for electron beam control electrodes can be formed at a comparatively lower temperature as compared with frit glass, and so on, the problem of deformation due to thermal expansion will not take place in laminating and fastening electron beams control electrodes. At the same time, the thin film can be also utilized for the reference face in the lamination and fastening of the next electron beam control electrode, resulting in an advantage in cost.

Furthermore, by properly setting the size of the bonding area, that is, the size of the anchor hole, a proper rigidity as a construction can be secured.

The present invention as claimed in Claim 6 relates to a manufacturing method for a construction in which a plurality of electron beam control electrodes are laminated and fastened as the electrode unit effecting the drive of electron beams and so on in an image display apparatus of flat-plate type, the Nth electron beam control electrode and the (N + 1)th electron beam control electrode are laminated and fastened by bonding the linear thin films formed so as to plug and cover the anchor hole on the (N + 1)th electron beam control electrode to the insulating spacers formed on the Nth electron beam control electrode through said anchor hole, and at the same time, the linear thin films formed on the (N + 1)th electron beam control electrode serve as insulating spacers for laminating and fastening the (N + 1)th electron beam control electrode. By repeating this step, a plurality of electron beam control electrodes are

laminated and fastened so as to constitute an electrode unit.

According to this method, since the sprayed linear thin films as the means for bonding the electron beam control electrodes can be formed at a comparatively lower temperature as compared with frit glass, no problem such as the deformation accompanying the thermal expansion will take place in laminating and fastening electron beam control electrodes. Furthermore, since the sprayed linear films can form simultaneously the reference face for the lamination and fastening of the next electron beam control electrode, it is costwise advantageous.

Furthermore, by properly setting the size of the bonding area, that is, the size of the anchor hole, a proper rigidity as a construction can be secured.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view of an essential portion of an electrode unit in a first embodiment of the present invention;

Fig. 2 is a perspective view of an essential portion of an electrode unit in the process of manufacture in the first embodiment of the present invention;

Fig. 3 is a sectional view of an essential portion of an image display apparatus employing an electrode unit in the first embodiment of the present invention;

Fig. 4 is a sectional view of an essential portion of a first means for selectively effecting the formation of fusion-injected film only around the anchor hole;

Fig. 5 is a sectional view of an essential portion of a second means for selectively effecting the formation of fusion-injected film only around the anchor hole;

Fig. 6 is a sectional view of an essential portion of an electrode module in a second embodiment of the present invention;

Fig. 7 is a sectional view of an essential portion of an electrode unit in the second embodiment of the present invention;

Fig. 8 is a sectional view of an essential portion of an image display apparatus employing the electrode unit in the second embodiment of the present invention;

Fig. 9 is a sectional view of an essential portion of a spraying apparatus used for forming insulating spacers according to the present invention;

Fig. 10 is a sectional view of an essential portion of a first example of the conventional electrode unit;

Fig. 11 is a perspective view of an essential portion of one example of the conventional electrode unit;

Fig. 12 is a sectional view showing an essential portion of one example of the image display apparatus employing a conventional electrode unit;

Fig. 13a, 13b and 13c are sectional views for showing a conventional method for forming an electrode unit using glass rods, respectively;

Fig. 14 is a sectional view showing an essential portion of one example of the image display apparatus employing a conventional electrode unit.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiment:

Hereinbelow, an image display apparatus according to an embodiment of the present invention and a manufacturing method therefor will be described with reference to the accompanying drawings.

Fig. 1 is a sectional view of an essential portion of an electrode unit according to a first embodiment of the present invention, Fig. 2 is a perspective view of an electrode unit in the process of manufacture according to the first embodiment of the present invention, and Fig. 3 is a sectional view of an essential portion of an image display apparatus employing an electrode unit according to the first embodiment. In these figures, reference numeral 1 is a face plate applied with a fluorescent screen 3 comprised of R, G and B on the inner surface thereof and serving also as a front casing, and reference numeral 2 is a rear casing formed with a rear electrode 4 of a conductive film on the inner surface thereof. Reference numeral 5 is a linear cathode, reference numeral 6 is an electrode unit formed by laminating electron beam control electrodes 6-a to 6-e, and electron beams emitted from linear cathodes 5 are subjected to controls such as condensation, deflection and modulation while passing through electron beam pass-through holes 6-a-1 to 6-e-1 formed on electron beam control electrodes 6-a to 6-e and, thereafter, are caused to collide with the fluorescent screen 3 of R, G and B for effecting image display.

The electrode unit 6 is supported and fastened at its peripheral portion by posts 8 bonded and fastened to said rear casing 2 with frit glass 7.

Here, the lamination and fastening method for the electron beam control electrodes 6-a to 6-e will be described below.

In the first place, on linear insulating thin films 10-a formed by a certain method, for instance the spraying method, between electron beam pass-through holes 6-a-1 of the first electron beam control electrode 6-a, the second electron beam con-

trol electrode 6-b formed with anchor holes 6-b-2 at the positions corresponding to said linear insulating thin films 10-a are laminated, linear insulating thin films 10-b are formed by spraying an insulating material so as to plug and cover said anchor holes 6-b-2. By this spraying, the linear insulating thin films 10-a are melted partially at respective anchor holes 6-b-2 by heat of the sprayed material and, then, bonded to the above linear insulating thin films through respective anchor holes when the sprayed material solidified. Thus, the first electron beam control electrode 6-a and the second electron beam control electrode 6-b are fastened together through bonding of said sprayed films 10-b to said linear insulating thin films 10-a through the anchor holes 6-b-2. At the same time, the linear insulating thin films 10-b serve as the reference surface for the lamination and fastening of the third electron beam control electrode 6-c. The reason for using the film spraying method effecting such a bonding action as described above is that with respect to the formation of the insulating film 10-a, employment of the method with the sprayed film is better to avoid complication in the process but it is not particularly limited in the process.

As the construction and manufacture for the lamination and fastening of electron beam control electrodes 6-c to 6-e after the third one, the repetition of the above-described may be effected.

Fig. 9 is a schematic sectional view for showing an apparatus for forming insulating thin films as insulating spacers.

In the spraying apparatus shown in Fig. 9, an arc 33 is generated between positive and negative electrodes 31 and 32 and an operation gas 34 supplied from rear side of the arc 33 is heated up by the arc 33 to cause a plasma jet 22 spouting from a nozzle. Into this plasmajet 22, powdered solid material is thrown and melted to fine liquid particles 21b having diameters of several μms to one hundred and several tens μms . These liquid particles are collided with a substrate 23 such as an electron beam control electrode 6-a at a high speed of several tens to several hundreds m/sec and, thereby, deposited thereon as flattened particles 21c gradually to form a thin film.

However, the plasmajet 22 as a heat source for melting powdered solid material inevitably raises the temperature in the peripheral space 24 and, thereby, the substrate 23 is heated up. This causes thermal deformation such as warping of the substrate 23 if the substrate 23 is a thin plate such as an electron beam control electrode 6-a or the like.

In the spraying method, according to the present invention, there are provided two nozzles 25 for spouting cooling gas 26 toward side areas 23a of the thin film. This is quite effective to prevent the substrate from deforming thermally

after formation of thin films.

According to this construction, since the sprayed thin films as the bonding means of electron beam control electrodes can be formed at a temperature comparatively lower as compared with frit glass, no problem such as deformation accompanying thermal expansion will take place in laminating and fastening electron beam control electrodes. Furthermore, since the sprayed thin film can be also utilized for the reference surface for the lamination and fastening of the next electron beam control electrode, it is advantageous also in respect of process and cost. Furthermore, a proper rigidity as a construction can be secured by setting the bonding area, that is, the size of the anchor hole. The shape of the anchor hole is not limited to a circular hole as shown in Fig. 2 but may be selected to a suitable shape such as a slot. The size of the anchor hole should not be larger than the contact face with the insulating spacer constituting the reference of lamination. The reason is that, if the anchor hole is larger than the contact face with the insulating spacer constituting the reference of lamination it is difficult to form sprayed thin films so as to plug and cover the anchor holes and there is further a possibility that a problem such as the sprinkling of sprayed material between electrodes takes place and the performance of the electrode unit is impaired.

For the same reason as described above, as a method for selectively forming the sprayed film only around the anchor hole in forming the sprayed films so as to plug and cover the anchor holes, there is proposed a method which is so adapted that, by utilizing the possibility or non-possibility of forming the sprayed films due to the roughness of the ground surface, selectively surface-roughed areas 6-a-3, 6-b-3 and like are formed around anchor holes 6-b-2, 6-c-2 to be formed with sprayed films as shown in Fig. 4, and spraying is carried out in this state avoiding the electron beam pass-through holes 6-a-1, 6-b-1 and the like thus to prevent sprayed particles from sprinkling between electron beam control electrodes laminated and at the same time, to form sprayed films only on the surface-roughed areas around the anchor holes.

By this method, although the apparatus is simple, there is a possibility that the state of the accuracy, etc. with respect to the sprayed film is lowered to some extent.

Another method proposed therefor is a method using a mask 20 as shown in Fig. 5. By this method, the shapes of the fusion-injected films 10-b, 10-c formed around the anchor holes 6-b-2, 6-c-2 can be obtained at a better accuracy as compared with the method shown in Fig. 4, and as a result, the electron beam control electrodes can be laminated at a high accuracy.

The mask 20 can be preferably reused many times, and to this end, it is necessary for the mask not to be attached by the fusion-injected film. As such a mask, for example, a mask having a mirror-finished surface can be mentioned.

Meanwhile, with respect to the sprayed film 10-e formed on the outermost side of the electrode unit 6 among the sprayed films plugging the anchor holes 6-b-2, 6-c-2 and the like, when an insulating material is used as its material, charge-up may take place due to the effect of, for example, leakage electron of electron beams having passed through electron beam pass-through holes 6-a-1 to 6-e-1, which may affect the path of the electron beam. In such a case, a conductive material may be employed as the material of the fusion-injected film 10-e. Even when a conductive material is employed for the sprayed film 10-e, the insulation between electron beam control electrodes 10-d and 10e can be maintained because of the construction.

In order to further secure the effect of the present invention for solving the problem relating to the thermal expansion, the electron beam control electrodes 6-a to 6-e may be made of Invar (36 Ni alloy) of low thermal expansion coefficient and as fusion-injection film forming process, a process of effecting the spraying while cooling at least the electron beam control electrode having the anchor holes to be plugged may be employed.

According to this method, by the synergic effect of the employment of a low thermal expansion coefficient and the suppression of temperature rise by cooling, the thermal expansion of the electron beam control electrode can be suppressed to the minimum and the warping of the electrode due to the difference in the thermal expansion between during the bonding process by forming the fusion-injected film and after said process can be more positively prevented. Particularly, Invar material shows the low thermal expansion characteristic in the temperature range of room temperature to about 200 °C, and therefore, as the guide line of cooling, it is preferable to hold the base plate (the electron beam control electrode whose anchor hole is going to be plugged) below 200 °C.

Furthermore, the spraying method to around the anchor hole by a mask previously shown in Fig. 5 has, at the same time, an effect of shielding radiation heat from the spraying torch and has a further effect for solving the problems relating to heat.

Fig. 6 is a sectional view of an essential portion of an electrode module according to a second embodiment of the present invention, Fig. 7 is a sectional view of an essential portion of an electrode unit according to the second embodiment of the present invention and Fig. 8 is a perspective

view of an essential portion of an image display apparatus employing an electrode unit according to the second embodiment of the present invention, in which parts having the same operation as the construction in the first embodiment are affixed with the same reference numerals.

This construction is such that as an electrode unit 6 for effecting the drive of electron beams, etc., a plurality of electron modules 6' wherein a plurality of electron beam control electrodes 6-a to 6-e are laminated and fastened together are arranged at a predetermined interval P, and the clearances between respective modules constitute electron beam pass-through clearances and effect the same operation as the electron beam pass-through holes in the first embodiment.

By modularizing the electrode unit, it is intended to reduce the effect to the electrode accuracy (the initial processing accuracy and change with time such as thermal deformation) which becomes a problem particularly in the large screen.

The construction and manufacturing method of the electrode module in this construction and the concrete construction, shape and material regarding the insulating spacers and anchor holes are the same as those in the previous first embodiment.

As described so far, since the present invention employs sprayed films for bonding electron beam control electrodes and further for the formation of spacers for the lamination of the next electron beam control electrode, and the formation of fusion-injected films is possible at a comparatively lower temperature as compared with the case of frit glass, etc., no problem such as the deformation accompanying the thermal expansion will take place in the lamination and fastening of electron beam control electrodes.

Furthermore, the electrode unit bonded together in the manner as described above can secure a rigidity as a construction.

Although the present invention has been fully described in connection with the preferred embodiments thereof with reference to the accompanying drawings, it is to be noted that various changes and modifications are apparent to those skilled in the art. Such changes and modifications are to be understood as included within the scope of the present invention as defined by the appended claims unless they depart therefrom.

Claims

1. An image display apparatus of flat plate type which comprises
 - a face plate formed with a fluorescent screen;
 - an electrode unit in which a plurality of electron beam control electrodes having elec-

tron beam pass-through holes and anchor holes are spaced and fastened together by spacer means;

electron sources; and

a casing for maintaining its interior in a vacuum,

each of said spacer means comprised of linear thin film spacers for spacing said plurality of electron beam control electrodes and connecting rods made of the same material as said linear thin film spacers for connecting said thin film spacers, each of said linear thin film spacers between adjacent electron beam control electrodes along a line connecting anchor holes of each electron beam control electrode in a direction parallel to each electron beam control electrode, and each of said connecting rods extending through anchor holes of said plurality of electron beam control electrodes in a direction vertical to each electron beam control electrode.

2. The image display apparatus as claimed in claim 1 in which said electrode unit is comprised of a plurality of electrode modules arranged in a plane in parallel to each other at a predetermined pitch to define electron beam pass-through holes between adjacent electrode modules.
3. The image display apparatus as claimed in claim 1 in which the diameter of each anchor hole is smaller than the width of each linear thin film spacer.
4. The image display apparatus as claimed in claim 1 wherein a conductive material is used for forming the spacer means on the electron beam control electrode constituting the outermost side of the electrode unit.
5. The image display apparatus as claimed in claim 1 wherein each electron beam control electrode is made of Invar (36 Ni alloy).
6. A method for manufacturing electrode unit of an image display apparatus of flat plate type in which a plurality of electron beam control electrodes having electron beam pass-through holes and anchor holes are spaced and fastened together by spacer means, comprising steps of
 - forming linear thin film spacers on an electron beam control electrode along lines passing anchor holes of said electron beam control electrode by spraying an insulating material onto said electron beam control electrode,
 - stacking another electron beam control

electrode on said electron beam control electrode with said linear thin film spacers in such a manner that anchor holes of said another electron beam locate on said linear thin film spacers,

spraying said insulating material onto said another electron beam control electrode along each of said linear thin film spacers for plugging anchor holes of said another electron beam control electrode and forming linear thin film spacers on said another electron beam control electrode whereby said linear thin film spacers on said electron beam control electrode are bonded to those on said another electron beam control electrode by plug portions formed in said anchor holes, repeating these foregoing steps by predetermined number of times to form said electrode unit.

7. The method for manufacturing electrode unit as claimed in claim 4 in which said electrode unit is comprised of a plurality of electrode modules arranged in a plane in parallel to each other at a predetermined pitch to define electron beam pass-through holes between adjacent electrode modules.
8. The method for manufacturing electrode unit of an image display apparatus as claimed in claim 6 in which the spraying step for the outermost electron beam control electrode of the electrode unit is made using a conductive material.
9. The method for manufacturing electrode unit as claimed in claim 6 in which said another electron beam control electrode is cooled upon spraying.
10. The manufacturing method of electrode unit as claimed in claim 6 in which, upon spraying, said another electron beam control electrode is covered by a mask except for regions on which said linear thin film spacers are formed.

Fig. 1

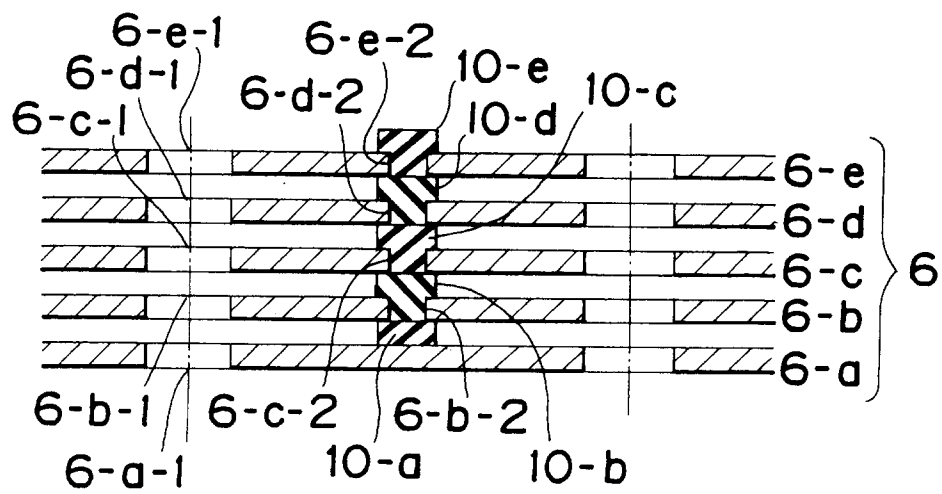


Fig. 2

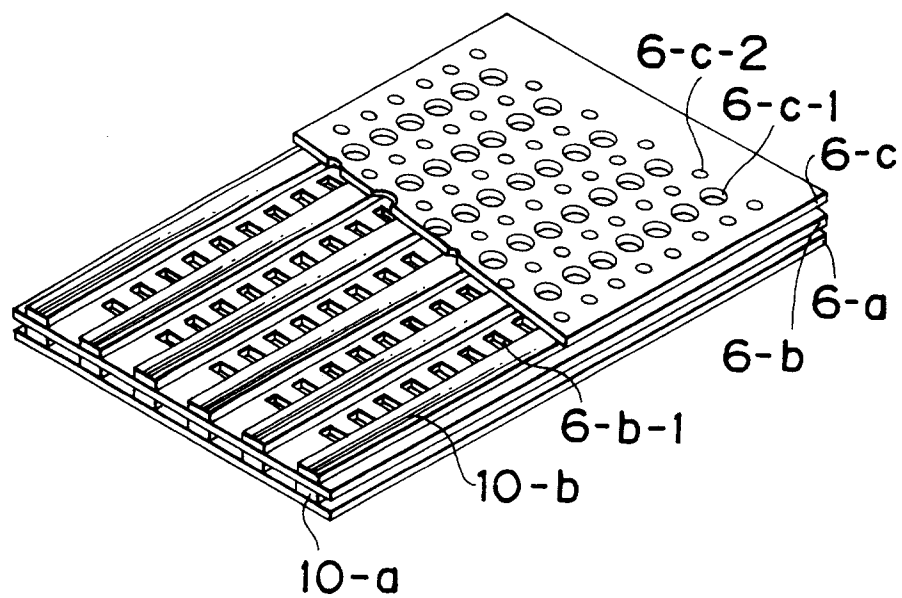


Fig. 3

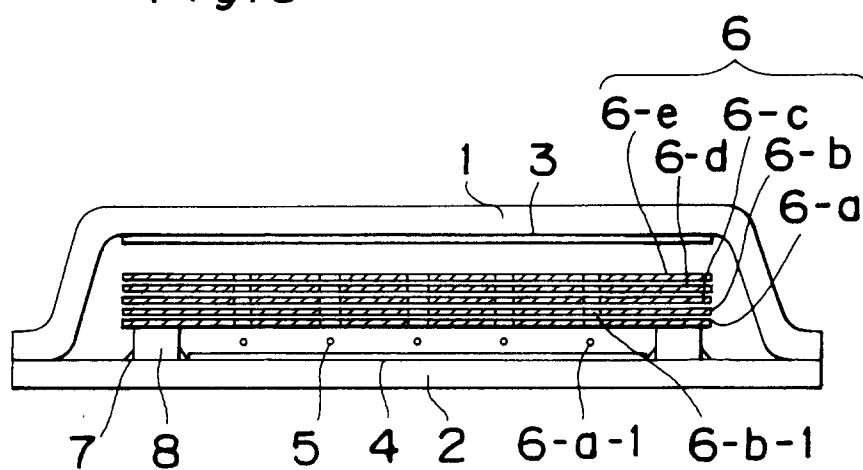


Fig. 4

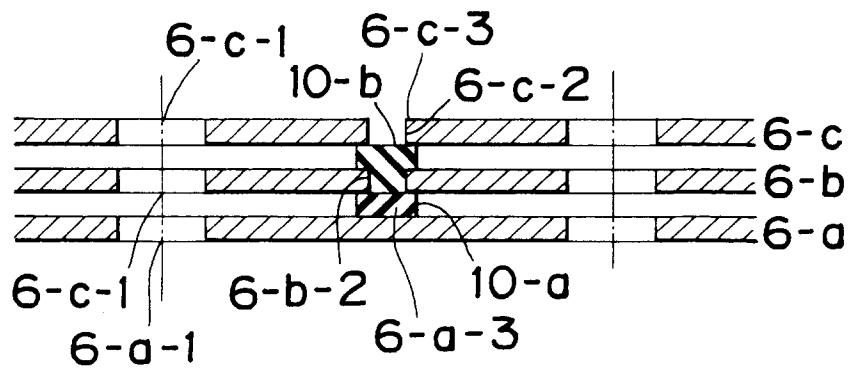


Fig. 5

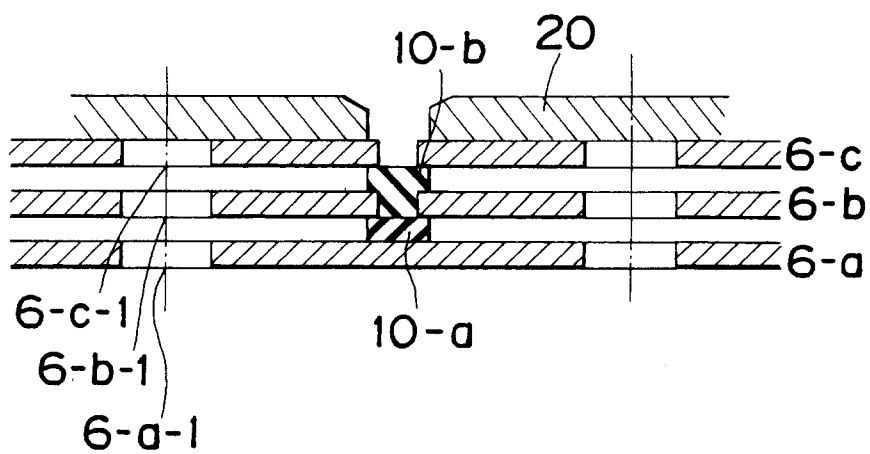


Fig. 6

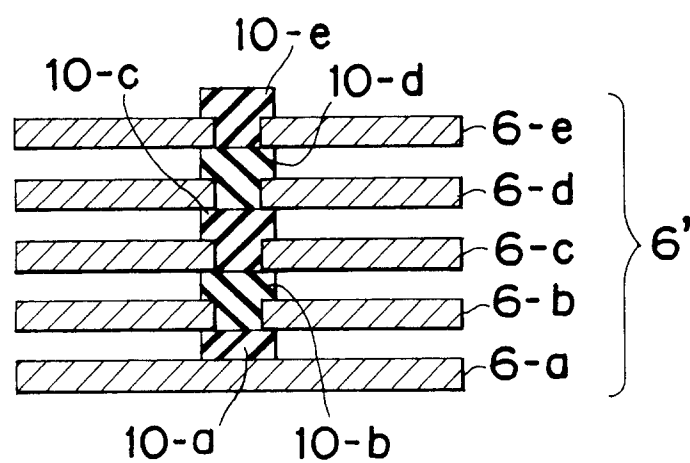


Fig. 7

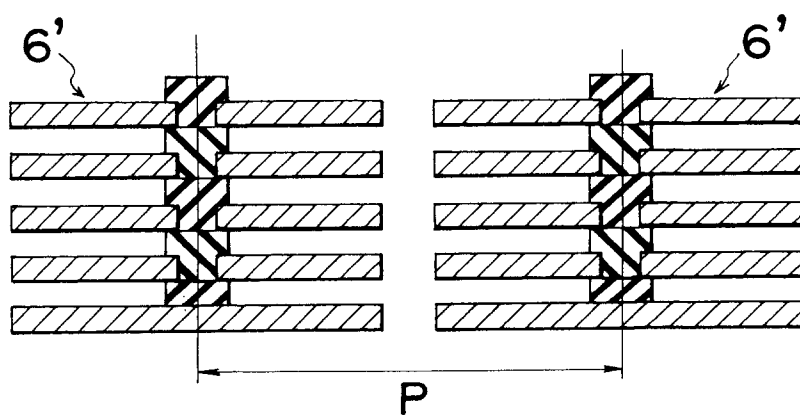


Fig. 8

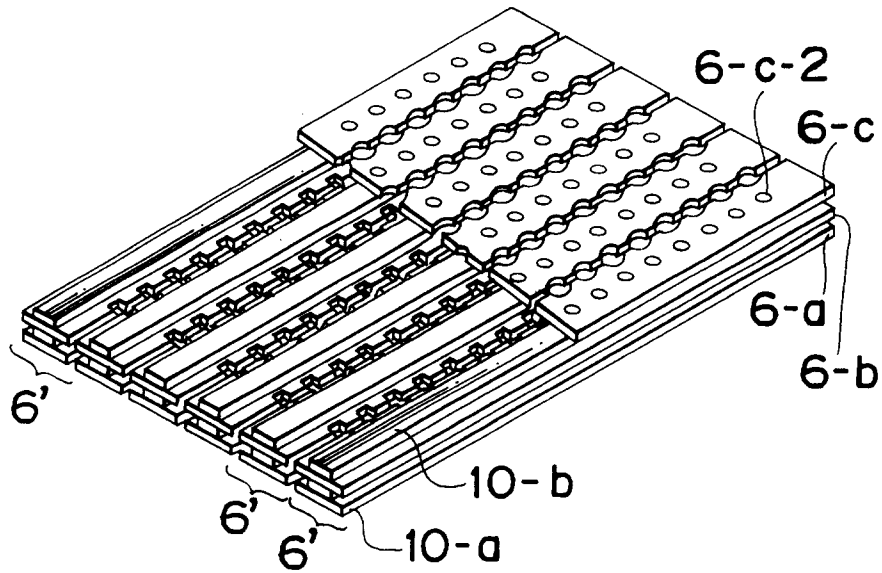


Fig. 10 PRIOR ART

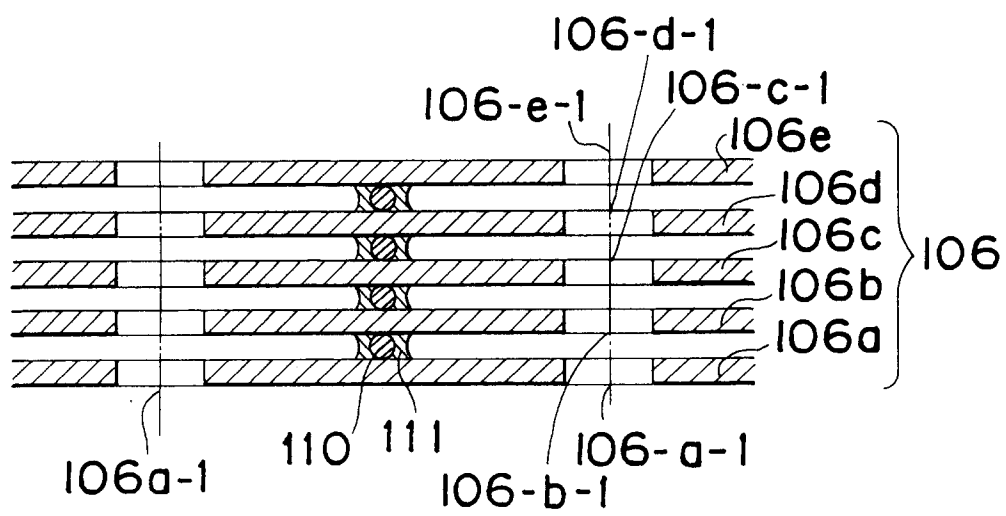


Fig. 9

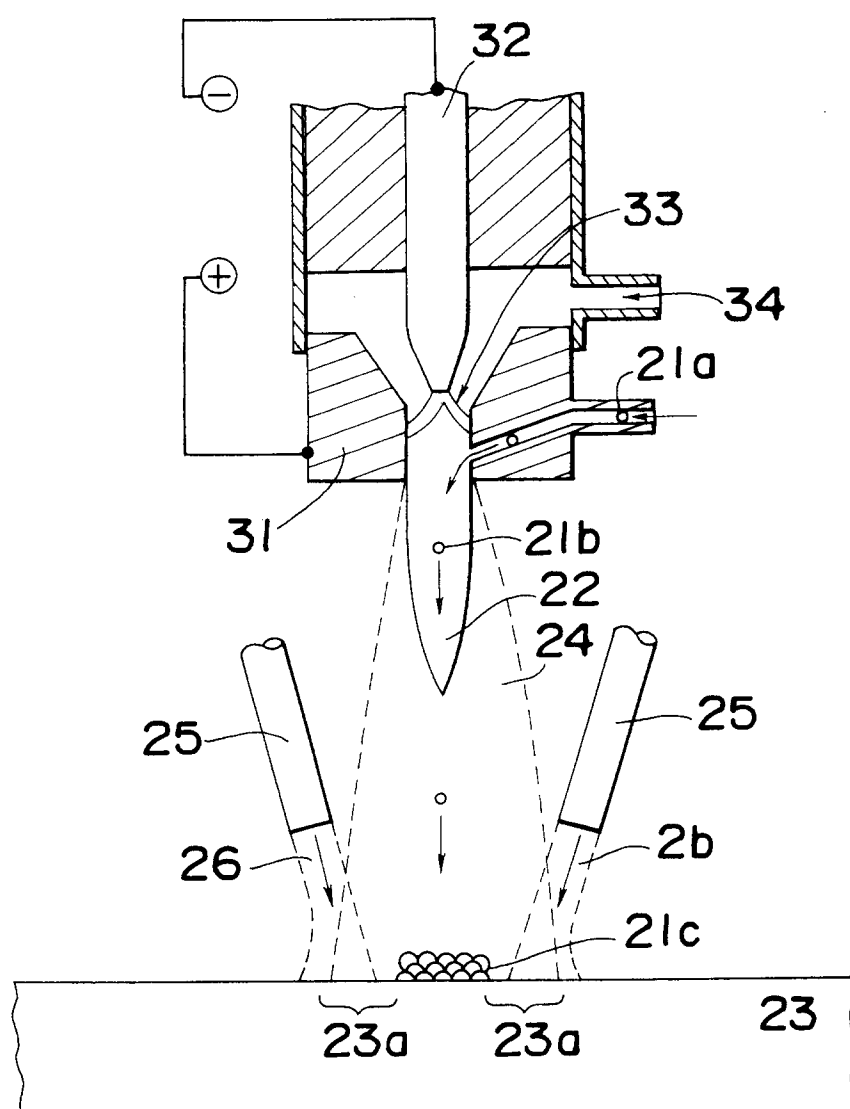


Fig.11 PRIOR ART

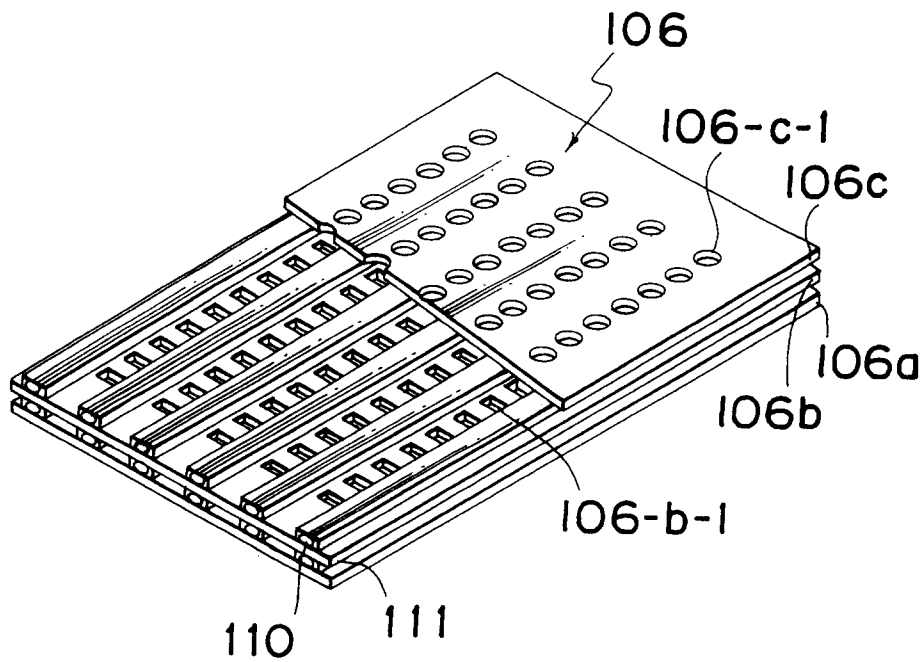


Fig.12 PRIOR ART

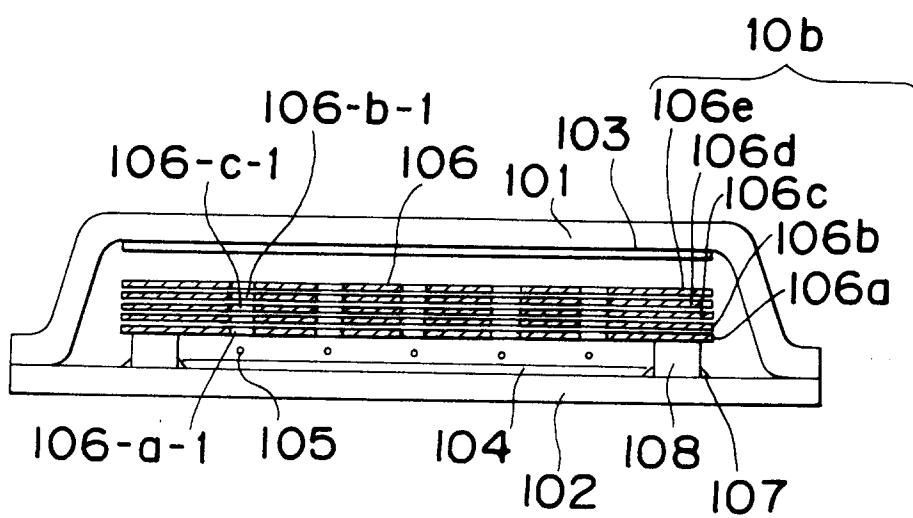


Fig. 13(a) PRIOR ART

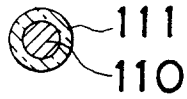


Fig. 13(b) PRIOR ART

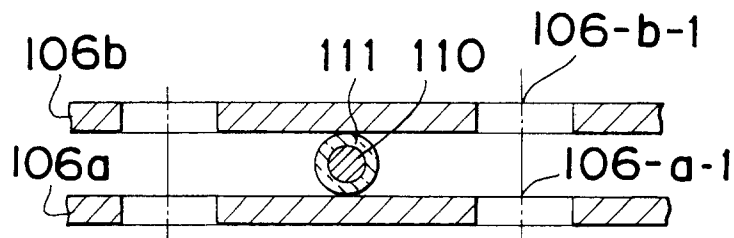


Fig. 13(c) PRIOR ART

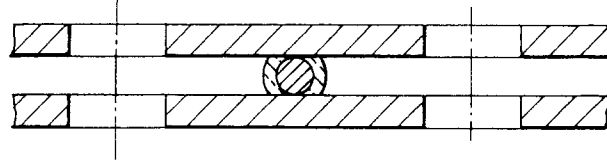
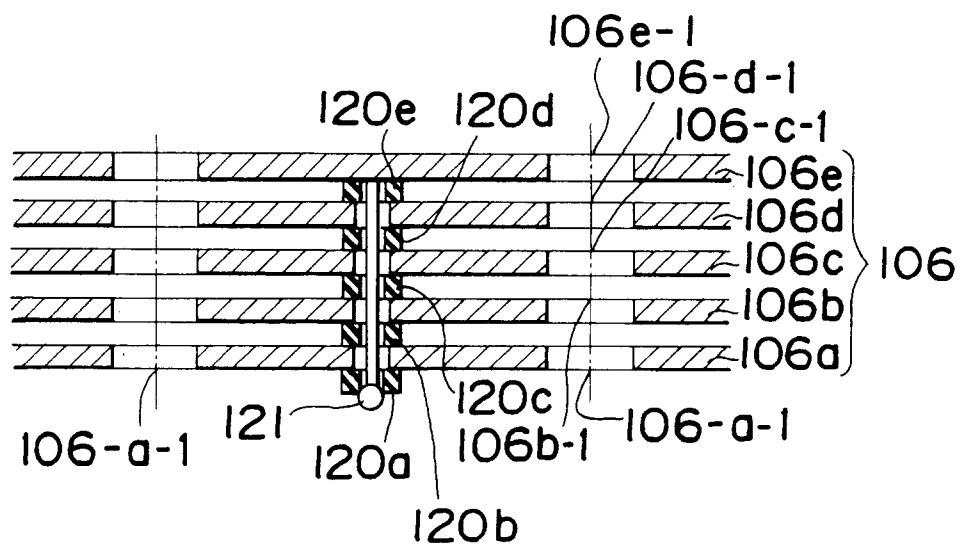


Fig. 14 PRIOR ART





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 10 8900

DOCUMENTS CONSIDERED TO BE RELEVANT

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	PATENT ABSTRACTS OF JAPAN vol. 10, no. 65 (E-388)(2122) 14 March 1986 & JP-A-60 216 426 (MATSUSHITA DENKI SANGYO K.K.) 29 October 1985 * abstract * ---	1,6	H01J9/18 H01J31/12
A	EP-A-0 487 936 (MATSUSHITA ELECTRIC INDUSTRIAL CO.LTD.) * column 2, line 58 - column 3, line 14 * * column 5, line 30 - column 6, line 22 * ---	1,6	TECHNICAL FIELDS SEARCHED (Int. Cl.5) H01J
A	EP-A-0 050 294 (MATSUSHITA ELECTRIC INDUSTRIAL CO.LTD.) * abstract * * page 5, last paragraph -paragraph 1 * ---	1,6	
A	US-A-5 003 219 (MURAGISHI ET AL.) * abstract * * column 1, line 35 - line 44 * -----	1,6	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 08 SEPTEMBER 1993	Examiner COLVIN G.G.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			