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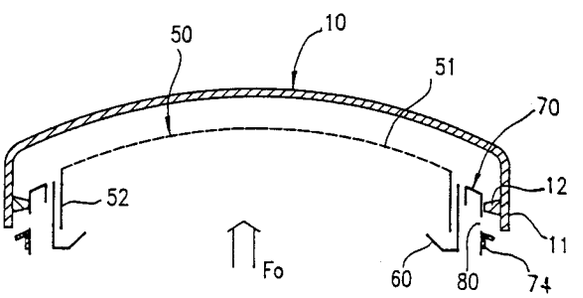
(54) Apparatus for mounting shadow mask in color picture tube.

(57) Apparatus for mounting a shadow mask 50 in a shadow mask type color picture tube. The mounting frame 60 is integrally formed with the shadow mask 50 and adapted for supporting the shadow mask 50. The mounting pieces 70 mount the shadow mask 50 with respect to an inner surface of a screen panel 10 of the color picture tube with provision of a predetermined space between the inner surface of the screen panel and the space between the inner surface of the screen panel and the shadow mask, each mounting piece 70 being attached to the mounting frame 60 and having a fixing hole 80. The panel pins 12 each engages with each fixing hole 80 of the mounting piece 70, the panel pins 12 being provided on an inner surface of a panel skirt 52 of the screen panel 10. The positioning pins 74 are attached to a mounting part of the mounting piece 70 at a position closely under the fixing hole 80 in order to contact with the panel pin 10 as the mounting part advances toward the screen panel, thereby causing the fixing hole 80 to be aligned with the panel pin 12 and inserted thereinto without advancing over a position of the panel pin 12.

FIG.5



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BACKGROUND OF THE INVENTION

Field of the Invention

The present invention generally relates to an apparatus for mounting a shadow mask in a shadow mask type color picture tube, and more particularly to such apparatus for mounting the shadow mask in which, when the shadow mask is mounted with respect to a screen panel of the shadow mask type color picture tube, the apparatus makes the shadow mask be parallel to an inner surface of the screen panel, thereby preventing the shadow mask from damaging a fluorescent coating on the screen panel and also facilitating the mounting work of the shadow mask.

Description of the Prior Art

Conventionally, known shadow mask type color picture tubes include a screen panel 10, a funnel 20 and a neck part 30, as shown in FIG. 1 which shows a construction of a representative embodiment of the known shadow mask type color picture tubes. An electron gun 40 is installed in the neck part 30 in order to scan an electron beam onto a shadow mask 50 which is mounted with respect to an inner surface of the panel 10 so as to provide a predetermined space therebetween. Generally upon receiving the red(R), green (G) and blue(B) color lights scanned by the electron gun 40, the shadow mask 50 allows the color lights to be selectively passed therethrough.

Here, the shadow mask 50 generally includes a shadow mask effective part 51 and a shadow mask skirt 52 as shown in FIG. 2. The effective part 51 is provided with a great number of minute holes (generally, about 330,000 holes are formed) for allowing the electron beams to be selectively passed therethrough, while the skirt 52 is formed as backwardly and nearly perpendicularly bending the peripheral part of the shadow mask 50 except for the effective part 51.

On the other hand, the color picture tubes are provided with apparatus for mounting the shadow mask therein at the predetermined position. The shadow mask mounting apparatus generally includes a mounting frame 60 to which the shadow mask skirt 52 is tightly attached, thereby causing the shadow mask 50 to be supported and thus stably mounted on its position in the color picture tube. A plurality of mounting pieces 70 are provided on corners of the mounting frame 60, respectively, in order to allow the shadow mask 50 to be mounted with respect to the screen panel 10 such that it faces the inner surface of the panel 10 with a predetermined space therebetween. In addition, the mounting apparatus includes a plurality of panel pins 12 which are formed as inwardly protruding from the corners of a panel skirt 11 of the screen panel 10. the panel pins 12 are inserted into fixing holes 80 formed on the mounting pieces 70, respectively, thereby causing the shadow mask 50 to be mounted on the predetermined position with respect to the screen panel 10.

Hereinafter, a process for mounting the shadow mask in the color picture tube by using the above-mentioned shadow mask mounting apparatus will be described in conjunction with FIG. 2.

First, the mounting pieces 70 of the mounting frame 60 provided with the shadow mask 50 are forcedly deformed by the inward force F as described in the drawing, then the mounting frame 60 is forced so as to advance toward the inner surface of the screen panel 10 until the fixing holes 80 of the mounting pieces 70 are aligned with the panel pins 12 protruding from the four corners of the panel skirt 11, respectively. Upon being aligned with the fixing holes 80 of the mounting pieces 70 as the mounting frame 60 advances toward the inner surface of the screen panel 10, the panel pins 12 of the panel skirts 11 are naturally inserted into the fixing holes 80 of the mounting pieces 70 owing to an elastic restoring force resulting from removing the inward force F so that the shadow mask 50 is mounted on the screen panel 10 with the predetermined space provided between the shadow mask 50 and the inner surface of the screen panel 10.

However, there have occurred several problems when the shadow mask 50 is mounted in the shadow mask type color picture tube by using the known shadow mask mounting apparatus. As described above, the fixing holes 80 formed on the mounting pieces 70 and the panel pins 12 formed as protruding from the panel skirt 11 are formed at four corners of the mounting frame 60 and the panel skirt 11, respectively. Therefore, the mounting frame 60 will be accurately mounted with respect to the screen panel 10 when the inward force F is removed under the condition that each fixing hole 80 of the mounting pieces 70 is accurately aligned with each corresponding panel pin 12 of the panel skirt 11. Thus, the mounting frame 60 of the mounting apparatus should be inserted toward the inner surface of the screen panel 10 such that an assumed plane, represented at the line A-A in FIG. 2, including the fixing holes 80 of the mounting pieces 70 are parallel to another assumed plane, represented at the line B-B in FIG. 2, including the panel pins 12 of the panel skirt 11. However, if the mounting frame 60 provided with the shadow mask 50 is inserted as slightly inclined with respect to the screen panel 10, the fixing holes 80 of the mounting pieces 70 will not be accurately aligned with the panel pins 12 of the

panel skirt 11, thereby inducing a misalignment of the shadow mask 50 with respect to the screen panel 10. Additionally, as shown in FIG. 3, a front surface of the shadow mask 50 occasionally contacts with the inner surface of the screen panel 10 so that the shadow mask 50 easily damages the fluorescent coating on the inner surface of the screen panel 10. Furthermore, when the mounting frame 60 is inserted toward the screen panel 10 in order to mount the shadow mask 50 on the predetermined position in the color picture tube, the mounting frame 60 should be inserted toward the screen panel 10 under the condition that the mounting pieces 70 are manually forced in order to provide the inward force F, respectively, thereby causing the conventional mounting process of the shadow mask to require a substantial time and also reducing the productivity.

SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide an apparatus for mounting a shadow mask of a shadow mask type color picture tube which, when the shadow mask is mounted in the color picture tube, efficiently prevents the shadow mask from damaging the fluorescent coating on an inner surface of a screen panel, facilitates the mounting work such that the working time can be reduced and thus improves the productivity.

The above-mentioned object of this invention can be accomplished by providing an apparatus for mounting a shadow mask in a color picture tube including a mounting frame for supporting the shadow mask, the frame being integrally connected to a skirt of the shadow mask, a plurality of mounting pieces for mounting the shadow mask with respect to an inner surface of a screen panel of the color picture tube with provision of a predetermined space between the inner surface of the screen panel and the shadow mask, each of the pieces being attached to the mounting frame and having a fixing hole, a plurality of panel pins each for engaging with each fixing hole of the mounting piece, the panel pins being provided on an inner surface of a panel skirt of the screen panel, and positioning member for guiding the panel pins to be accruately aligned with the fixing holes so as to be inserted thereinto, the positioning member being integrally provided to the mounting pieces.

The positioning member includes a plurality of positioning pins each of which is attached to a mounting part of the mounting piece at a position closely under the fixing hole in order to contact with the panel pin as the mounting part advances toward the screen panel, thereby causing the fixing hole to be aligned with the panel pin and inserted thereinto without advancing over a position of the panel pin.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a longitudinal sectional view of a color picture tube according to the prior art;

FIG. 2 is a sectional view for showing a mounting process of a conventional shadow mask by using a known shadow mask mounting apparatus;

FIG. 3 is a sectional view for showing an embodiment of a misalignment of the shadow mask when the knwon shadow mask mounting apparatus is used;

FIG. 4 is a partially sectional view of an apparatus for mounting a shadow mask of a color picture tube according to the present invention; and

FIG. 5 is a sectional view for showing a mounting process of the shadow mask by using the shadow mask mounting apparatus according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to FIG. 4 showing an apparatus for mounting a shadow mask of a color picture tube according to the present invention, the apparatus includes a mounting frame 60 which is attached to a shadow mask skirt 52 of a shadow mask 50 in order to support the shadow mask 50. A plurality of mounting pieces, preferably four mounting pieces 70, are provided on four corners of the mounting frame 60, respectively, in order to allow the shadow mask 50 to be mounted with respect to a screen panel 10 such that the shadow mask 50 is disposed with respect to the inner surface of the panel 10 with provision of a predetermined space therebetween. In addition, the mounting apparatus includes a plurality of panel pins, preferably four panel pins 12, each of which is formed as protruding from each corner of panel skirt 11 of the screen panel 10. The panel pins 12 are to be inserted into fixing holes 80 formed on the mounting pieces 70, respectively, thereby causing the shadow mask 50 to be mounted on the screen panel 10. A plurality of positioning pins 74 are secured to the mounting pieces 70 by welding or riveting, respectively, and are adapted to guide the panel pins 12 of the panel skirt 11 to be accurately aligned with the fixing holes 80 of the mounting pieces 70, thereby causing the panel pins 12 to be accurately inserted into

the fixing holes 80.

Each mounting piece 70 integrally includes an attaching part 71 for being attached to the mounting frame 60, an inclined part 72 for providing a resilient force acting from the shadow mask 50 toward the panel skirt 11 and a mounting part 73 having the fixing hole 80 into which the panel pin 12 of the panel skirt 11 is inserted. In addition, the mounting piece 70 includes the positioning pin 74 which is fixed to the mounting part 73 by welding or riveting so as to be disposed closely under the fixing hole 80. The positioning pins 74 each is adapted to prevent the mounting part 73 of the mounting piece 70 from advancing over the panel pin 12 as the mounting piece 70 moves toward the screen panel 10, thereby causing the panel pin 12 to be accurately inserted into the fixing hole 80 of the mounting part 73.

Hereinafter, the process for mounting the shadow mask in the color picture tube by using the above-mentioned shadow mask mounting apparatus of this invention, will be described.

The mounting frame 60 is first attached to the skirt 52 of the shadow mask 50, then four positioning pins 74 are fixed to the mounting pieces 70 so as to be closely disposed under the fixing holes 80 of the mounting pieces 70, respectively. Thereafter, each mounting piece 70 is secured to the mounting frame 60 so as to be disposed at each corner of the shadow mask 50, thereby producing a shadow mask structure. Sequentially, the shadow mask structure is forced so as to be inserted inside the screen panel 10, thereby accomplishing the mounting of the shadow mask with respect to the color picture tube.

Described in detail with reference to FIG. 5, the shadow mask structure is gradually forced by an outside force Fo so as to be inserted toward the inner surface of the screen panel 10 under the condition that an effective plane 51 of the shadow mask 50 is approximately parallel to the inner surface of the screen panel 10. As the shadow mask structure advances toward the inner surface of the screen panel 10, each inclined part 72 of the mounting piece 70 is elastically inwardly deformed. When the structure is continuously forced in order to advance toward the screen panel 10 under the above-mentioned condition, each fixing hole 80 of the mounting piece 70 is last aligned with each corresponding panel pin 12 of the panel skirt 11. Thus, the panel pins 12 are elastically inserted into the fixing holes 80, respectively. Upon accomplishing the insertion of the panel pins 12 into the fixing holes 80, the pressure having acted on the mounting pieces 70 by the panel pins 12 is removed so that the mounting pieces 70 are restored to the original shape by the elastic restoring force. In result, it is accomplished to mount the shadow mask structure in a predetermined position with respect to the screen panel 10.

Here, as the shadow mask structure is forced by the outside force Fo in order to advance toward the inner surface of the screen panel 10, each panel pin 12 contacts with the corresponding positioning pin 74 which is provided to the mounting part 73 of the mounting piece 70 at a position closely under the fixing hole 80, respectively, so as to be prevented from advancing over the fixing hole 80. Hence, even though the shadow mask structure is approximately forced by the force Fo without considering the parallelism between the inner surface of the screen panel 10 and the effective plane 51 of the shadow mask 50, the panel pins 12 are obliged to contact with the positioning pins 74 of the mounting pieces 70, respectively, so that they are accurately inserted into the fixing holes 80 without passing by the fixing holes 80.

Briefly described, during forcing the shadow mask structure including the mounting apparatus according to the prior art in order to cause the structure to advance toward the inner surface of the screen panel 10 under the condition that the mounting pieces 70 of the structure are forcedly deformed, it is required to precisely control the shadow mask structure so as to make each panel pin 12 be accurately aligned with the corresponding fixing hole 80 of the mounting piece 70. However, as the shadow mask mounting apparatus of this invention includes the positioning pins 74 each of which is in contact with the panel pin 12 during the shadow mask structure advances toward the inner surface of the screen panel 10 by being forced by the outside force Fo, the mounting apparatus of this invention assures that the panel pin 12 is accurately aligned with the fixing hole 80 so as to be inserted thereinto. In result, when the shadow mask structure including the mounting apparatus of this invention is forced by the outside force in order to advance toward the inner surface of the screen panel 10 under the condition that the shadow mask structure is disposed with respect to the screen panel 10 such that the corners thereof are coresponding to the corners of the screen panel 10 without forced deforming of the mounting pieces 70 differently from the prior art, the fixing holes 80 of the mounting pieces 70 are accurately and naturally aligned with the panel pins 12 due to the contact of the panel pins 12 with the positioning pins 74. Upon being aligned with the fixing holes 80, the panel pins 12 are inserted into the fixing holes 80 by the elastic restoring force, respectively, thereby accomplishing the stable mounting of the shadow mask on the predetermined position in the color picture tube.

As described above, the shadow mask mounting apparatus according to the present invention is

characteristically provided with the positioning pins each of which is secured to the mounting part of the mounting piece closely under the fixing hole and adapted to contact with the corresponding panel pin of the panel skirt of the screen panel when the shadow mask structure including the shadow mask and the mounting apparatus advances toward the inner surface of the screen panel of the color picture tube. Thus, the mounting apparatus of this invention prevents the shadow mask from advancing over the predetermined mounting position when the shadow mask is mounted in the color picture tube so that it provides an advantage in that it efficiently prevents the shadow mask from damaging the fluorescent coating on the screen panel. The apparatus of this invention provides another advantage in that it is not required to forcedly deform the mounting pieces of the mounting frame, thereby facilitating the mounting work of the shadow mask, thus reducing the working time. In addition, the apparatus of this invention provides still another advantage in that the mounting pieces are not required to be forcedly deformed, as described above, thereby causing the mounting pieces to be easily restored without any deformation, thus improving the reliability.

Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, theose skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

Claims

1. An apparatus for mounting a shadow mask in a color picture tube comprising:
a mounting frame (60) for supporting said shadow mask (50), said frame being integrally connected to a skirt (52) of said shadow mask;
a plurality of mounting pieces (70) for mounting said shadow mask with respect to an inner surface of a screen panel (10) of said color picture tube with provision of a predetermined space between said inner surface of the screen panel (10) and said shadow mask (50), each of said pieces (70) being attached to said mounting frame (60) and having a fixing hole (80);
a plurality of panel pins (12) for engaging with said fixing holes (80) of the mounting pieces (70), respectively, said panel pins (12) being provided on an inner surface of a panel skirt (52) of said screen panel;
and
positioning means (74) for guiding said panel pins (12) to be accurately aligned with said fixing holes (80) so as to be inserted thereinto, said means (74) being integrally provided to said mounting pieces (70).

2. The apparatus according to claim 1,
wherein each of said mounting pieces (70) includes: an attaching part (71) for attaching said mounting piece (70) to said mounting frame;
an inclined part (72) for providing a resilient force acting toward said panel skirt (11), said inclined part integrally formed with said attaching part (71); and
a mounting part (73) provided with said fixing hole (80) for receiving said panel pin (12) in order to cause said shadow mask to be mounted in said color picture tube, said mounting part (73) being integrally formed with said inclined part (72) and provided with said positioning means (74).

3. The apparatus according to claim 2, wherein said positioning means (74) is attached to said mounting part (73) of the mounting piece (70) at a position closely under said fixing hole (80) in order to contact with said panel pin (12) as said mounting part (73) advances toward said screen panel (10), thereby causing said fixing hole (80) to be aligned with said panel pin (12) and inserted thereinto without advancing over a position of said panel pin (12).

FIG. 1
PRIOR ART

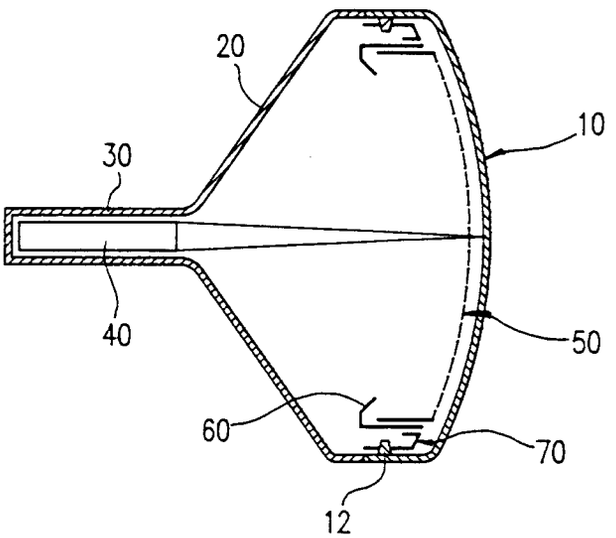


FIG. 2
PRIOR ART

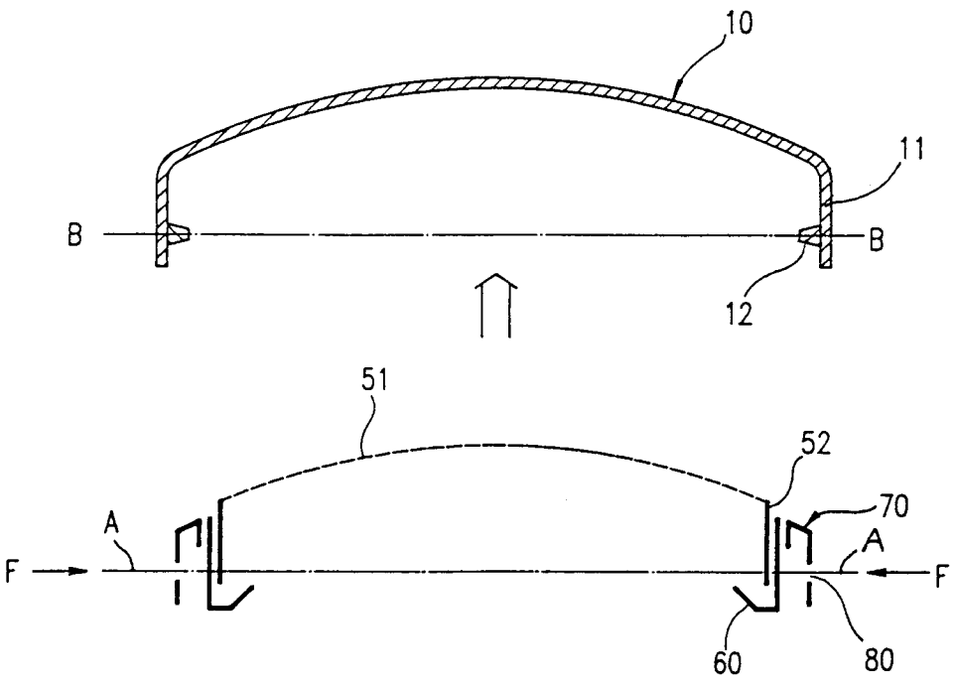


FIG.3
PRIOR ART

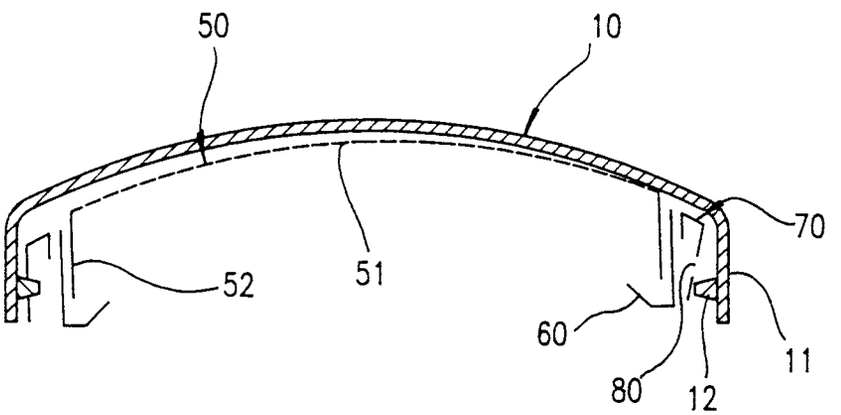


FIG.4

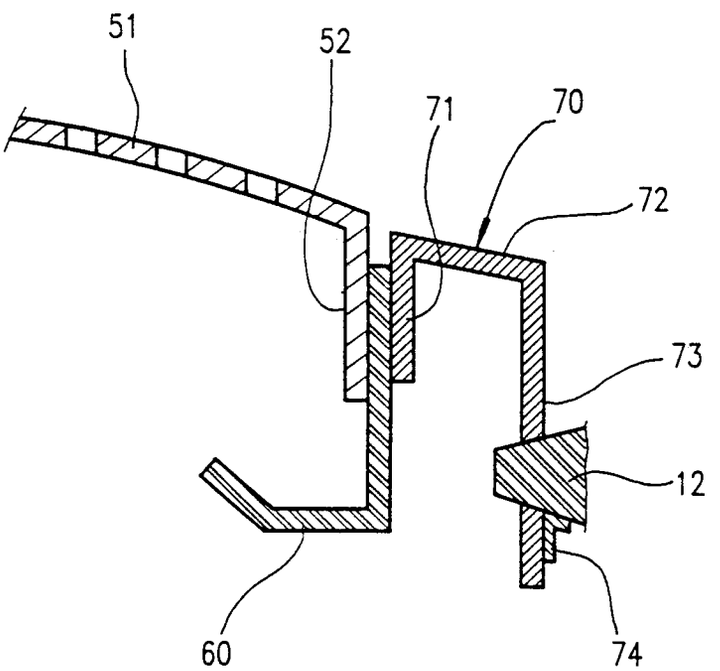
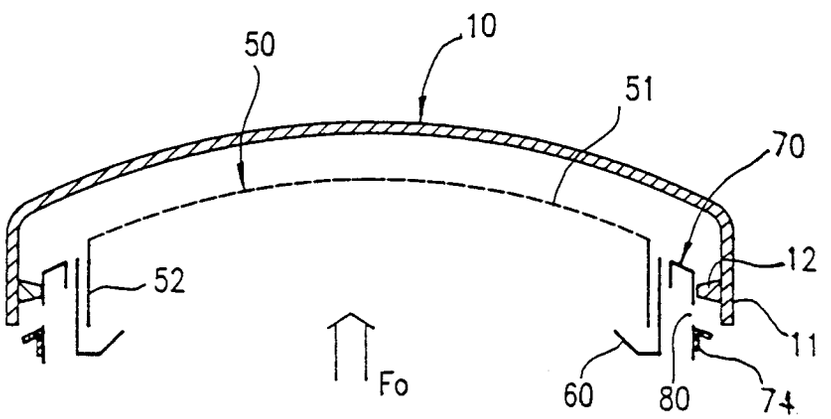


FIG.5



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EUROPEAN SEARCH REPORT

Application Number

EP 92 10 3922

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	EP-A-0 355 893 (NV. PHILIPS' GLOEILAMPENFABRIEKEN) * column 8, line 25 - line 45 * * figure 9 *	1	H01J29/07 H01J9/14
A		2,3	

Y	PATENT ABSTRACTS OF JAPAN vol. 4, no. 162 (E-33)(644) 12 November 1980 & JP-A-55 109 344 (TOKYO SHIBAURA DENKI K.K.) 22 August 1980	1	
A	* abstract *	2,3	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

H01J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23 JUNE 1992	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
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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

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