Description

This invention relates to television assembly techniques which allow automatic centering of the kinescope screen with respect to the screen opening in the television cabinet.

A kinescope is typically provided with 4 mounting lugs at the respective corners. During assembly, the kinescope is mated with the television (TV) cabinet and screws are driven through the holes in the mounting lugs to fixedly secure the kinescope to the cabinet.

After assembly of the kinescope to the cabinet, the electron gun assembly of the kinescope is activated to see if there is any misalignment between the raster produced on the TV screen and the cabinet opening. The screen misalignment is manifested as black edges between the lighted raster and the bezel or rim defining the cabinet opening. If there is any misalignment, the screws holding the kinescope are loosened, the position of the kinescope is readjusted, and the screws are then retightened. The holes in the mounting lugs are purposely made larger than the kinescope mounting screws, so that the position of the kinescope can be readjusted after loosening the screws. This technique is time-consuming and costly.

The problem of correct positioning of the kinescope screen is further compounded by the minimal overlap (e.g., 0.015 inch (0.038 cm)) between the screen (i.e., phosphor area) and the bezel surrounding the cabinet opening. Other factors - such as manufacturing variations involved in the positioning of the kinescope mounting lugs, etc., also contribute to the difficulty of correctly positioning the kinescope screen relative to the cabinet opening.

In Patent Abstracts of Japan, Vol. 5 No. 176, (E-81)(848), in the abstract of JP-A-56 102 174, there is disclosed a method of automatically and precisely positioning a kinescope within a TV receiver by detecting light images of the CRT screen and moving the CRT screen accordingly. However, there is no means disclosed of affixing the screen within the receiver to assure that the accurate positioning is preserved.

The present invention provides in one aspect a method for positioning a kinescope having a display screen within a cabinet, characterized by the steps of providing the kinescope with mechanical locating means for securing the kinescope in a cabinet, the locating means being adjustable for adjusting the position of the kinescope; optically detecting edge alignment features of the display screen to generate a position indicative control signal representative of the position of the display screen with respect to a reference pair of mutually perpendicular axes; and adjusting the mechanical locating means in dependence upon said position indicative control signal for subsequent accurate location of the display screen within a cabinet.

By "edge alignment features" is meant edge features of the display screen such as yoke alignment slots (YAS) or YAS means, simple edges of the screen where appropriate detecting means is provided, or any other distinctive feature associated with the edge.

In a further aspect the invention provides a kinescope having a display with edge alignment features, and characterized by mechanical locating means for registering with and engaging with further locating means within a cabinet; the locating means including position adjustment means which are adjusted with respect to said edge alignment features to precisely locate the display within the cabinet.

In accordance with a preferred embodiment of the present invention, two of the kinescope mounting lugs are equipped prior to the assembly of the kinescope to the cabinet with accurately-positioned washers. The cabinet is provided with a pair of tapered guiding posts on the inner front surface thereof, which are designed to closely fit the apertures in the washers during kinescope assembly to the cabinet. The kinescope is automatically located upon reception of the guiding posts in the washers, thereby eliminating the need for subsequent realignment. Screws are then driven through the holes in the mounting lugs, while the cabinet guiding posts are firmly seated in the kinescope-mounted washers, to fixedly secure the kinescope to the cabinet.

IN THE DRAWINGS:

FIGURES 1 (a) - (f) represent a manufacturing procedure depicting the automatic assembly of the kinescope to the cabinet, where both the kinescope and the cabinet are provided with the screen locating features in accordance with the present invention;

FIGURES 2 (b) and (a) respectively show cross-sectional views of a cabinet guiding post positioned for entry into an associated kinescope-mounted locating washer pursuant to this invention;

FIGURE 3 shows a perspective view of a corner portion of a kinescope having a mounting lug secured thereto by means of a tension band;

FIGURES 4 (a) and (b) respectively illustrate a front view and a cross-sectional side view of the mounting lug of FIGURE 3;

FIGURE 5 is the front view of the locating washer of FIGURES 2 (a), 3, 4 (a) and 3 (b);

FIGURE 6 illustrates the front view of another locating washer disposed on the opposed bottom mounting lug of the kinescope;

FIGURE 7 schematically shows the equipment used for positioning a pair of locating washers - one against the mounting lug on each of the two lower corners of the kinescope; and

FIGURES 8 (a) through (c) diagrammatically depict the equipment for attaching the locating washers to the respective lugs on the kinescope.

FIGURES 1 (a) through (f) show automated assembly of a kinescope 20 to an enclosure such as a TV cabinet 22 in accordance with the principles of the subject invention. A set of four mounting lugs 24, 26, 28 and 30 (see FIGURE 7) are secured to the kinescope 20 at each of the four corners by means of a tension band 32. A pair of locating washers 34 and 36 are accurately positioned against the two lower lugs 24 and 26 of the kinescope 20. The washers 34 and 36 may be affixed to the respective lugs 24 and 26 by any suitable means -e.g., spot welding, adhesive backing, heat-activated adhesive, etc.

Although the washers 34 and 36 in this particular embodiment are affixed to the bottom kinescope mounting lugs 24 and 26, they may be applied to any other suitable combination of the mounting lugs - for example, the top two lugs. Note that Figures 1(a) and (d)-(f) are bottom views.

The kinescope 20, having the accurately-positioned locating washers 34 and 36, is transported to the instrument assembly station on a conveyor 50, where it is placed, face down, on a pallet 52. The pallet 52 is equipped with a pair of locating studs 54 and 56, which are subject to reception in the apertures 44 and 46 (FIGURES 4 and 5) in the respective washers 34 and 36 in order to precisely position and orient the kinescope 20 on the pallet.

A pick-and-place device 60 (e.g., robot) lifts the kinescope 20 from the pallet 52, and turns it over to make it upright in the manner indicated in FIGURE 1 (e). The pick-and-place device 60 consistently picks up the kinescope 20 at the same location relative to the mounting lugs 24 and 26, because of the engagement between the pallet-mounted studs 54 and 56 and the kinescope-mounted washers 34 and 36.

The front inner walls 70 and 72 of the TV cabinet 22 are equipped with a pair of tapered guiding posts 74 and 76 as shown in FIGURE 1 (e). The position of the guiding posts 74 and 76 with respect to a cabinet opening 78 is arranged to be the same as the position of the locating washers 34 and 36 relative to the kinescope display screen 38. When the kinescope 20 is mated with the cabinet 22, the tapered guiding posts 74 and 76 are respectively received in the apertures 44 and 46 in the locating washers 34 and 36, in the manner indicated in FIGURES 2 (a) and (b), to center the screen 38 with respect to the cabinet opening 78.

It will be noted that the guiding posts 74 and 76 on the respective front inner surfaces 70 and 72 can be integrally molded with the plastic TV cabinet 22. In the case of non-plastic console cabinets (e.g., made from wood), the guiding posts 74 and 76 may be integrally molded on a plastic support frame used for securing the kinescope to the non-plastic cabinet.

After the kinescope 20 is positioned with respect to the cabinet 22, a suction gripper disposed at the end of a mechanical arm 80 enters the cabinet through the opening 78 to hold the kinescope in place. The pick-and-place device 60 is then withdrawn to make room for a screw-driving mechanism 82. The screw-driving mechanism 82 inserts the fasteners, such as screws, indicated by numeral 64, through the respective holes 84, 86, 88 and 90 in the mounting lugs 24-30 (FIGURE 7) to fixedly secure the kinescope 20 to the cabinet 22.

FIGURES 3, 4 (a) and 4 (b) show the details of one of the bottom mounting lugs - namely 24, and the associated locating washer 34. Each of the mounting lugs 24-30 has two holes, one for a screw 64 used to fixedly secure the kinescope 20 to the TV cabinet 22. The holes in the kinescope mounting lugs are purposely made larger than the kinescope mounting screws in order to ensure that mounting lug holes always match up with the screw holes in the cabinet - indicated by numeral 92 in FIGURE 2 (b). In this particular embodiment, the diameter of the mounting lug holes is approximately 0.512 inch (13.0 mm), and the diameter of the kinescope mounting screws is about 0.219 inch (5.56 mm).

The locating washers 34 and 36 are fabricated from a thin sheet of metal (e.g., cold rolled steel), -about 0.010 to 0.015 inch (0.25 to 0.38 mm) thick. The locating washers 34 and 36 have an octagonal cross-section as depicted in FIGURES 5 and 6. The flat-to-flat dimension of the locating washers 34 and 36 is about 0.625 inch (15.9 mm).

The aperture 44 in the locating washer 34 has a circular cross-section, with a diameter of about 0.250 to 0.252 inch (6.35 to 6.40 mm). In contrast, the aperture 46 in the locating washer 36 is elongated as shown in FIGURE 6. The short dimension of the elongated aperture 46 is the same as the diameter of the circular aperture 44 in the washer 34 - about 0.250 to 0.252 inch (6.35 to 6.40 mm), and the long dimension is about 0.450 inch (11.4 mm).

The washer 34 with a circular hole serves to locate the kinescope 20 in both the horizontal (x) and vertical (Y) directions with respect to the TV cabinet 22. On the other hand, the washer 36 has a slotted hole to provide angular positioning of the kinescope 20 relative to the cabinet 22 without the need for having tight tolerances on the spacing

between the cabinet guiding posts 74 and 76 in the manner explained later.

As indicated in FIGURE 7, the kinescope 20 includes an evacuated glass envelope 94. On the inside surface of the front portion of the envelope 94 is the previously-mentioned display screen 38. A plurality of red, green and blue phosphor elements are deposited on the inside surface of the kinescope faceplate. Disposed within the envelope 94 is a slotted mask (not shown) having apertures registered with the respective phosphor elements. At the other end of the envelope 94 is an electron gun assembly 96, which, when activated, produces three electron beams directed toward the phosphor elements of the display screen 38.

A deflection yoke 98 is disposed around the neck portion of the glass envelope 94. Upon energization, the yoke 98 generates a magnetic field for deflecting the electron beams to form a lighted raster on the display 38.

The design of the electron gun assembly 96 and yoke 98 is such that the three electron beams substantially converge at all points on the aperture mask. The three beams pass through the apertures in the mask and impinge upon the respective one of the red, green and blue phosphor elements. The phosphor elements, when excited by electron beams, emit light to produce images on the screen 38.

Typically, the deflection yoke 98 is secured to the kinescope 20 before the assembly of the kinescope to the TV cabinet 22. Prior to the attachment of the yoke 98 to the kinescope 20, its axial position, angular orientation and tilt, etc., are manipulated on a yoke alignment machine (or YAM) to make centering, convergence and purity adjustments on the kinescope. To facilitate adjustment of the horizontal deflection axis with respect to the display screen 38, the phosphor elements on the inside of the faceplate are arranged to define a pair of oppositely-disposed screen locating marks or indicia 104 and 106 - commonly known as yoke alignment slots or YAS marks.

The yoke alignment slots 104 and 106 on the display screen 38 are normally not easily noticeable to the naked eye. When the electron gun assembly 96 and the deflection yoke 98 are activated to scan a raster on the display screen 38, the deflection yoke is rotated so as to align a single scan line with the YAS marks 104 and 106. To generate a raster, the kinescope 20 is connected to a raster generator 108. The raster generator 108 provides appropriate grid and anode voltages to the electron gun assembly 96. Additionally, it applies appropriate deflection currents to the horizontal and vertical windings of the deflection yoke 98.

In accordance with an aspect of the invention, a pair of optical sensors 114 and 116 have their viewing fields focussed in the regions surrounding the YAS marks 104 and 106. The optical sensors 114 and 116 may be in the form of TV cameras or CCD imaging devices. The outputs of the optical sensors 114 and 116 are fed to a control signal generator 112. The control signal generator 112 produces a control signal representative of the position of the display screen 38 with respect to a pair of mutually perpendicular, x and y axes 118 and 120. These x and y axes 118 and 120 are respectively parallel and perpendicular to a line joining the oppositely-disposed YAS marks 104 and 106. In response to the control signal, x and y linear actuators 124 position the locating washers 34 and 36 against the respective mounting lugs 24 and 26.

In the case of kinescopes without the YAS marks, it is possible to locate the screen position by finding the edges of the lit-up area or raster on display screen 38. This might be done simply and inexpensively by using three linear arrays of photo detectors - such as the Fairchild I-SCAN unit. The information from these sensors can be used to drive the linear actuators 124, that are used to position the two locating washers 34 and 36 over the respective mounting lugs 24 and 26.

Although the kinescope 20 is energized in this particular embodiment to make the edges of the display screen and the YAS marks 104 and 106 visible to the optical sensors 114 and 116, it is not necessary to do so. Alternately, it is possible to sense the screen position without illuminating the display screen 38, for example, in the manner shown in U. S. Patent US-A- 4,261,013 (VanRenseen et al.). The VanRenseen et al. apparatus includes a pair of screen sensors mounted on a vertically movable member at a separation equal to the vertical dimension of the display screen. Each sensor directs a light beam at the kinescope screen and detects the reflected beam. The sensors are moved until the detector outputs are equal, indicating that the two sensors are located at similar positions with respect to the top and bottom screen edges. The midpoint between the two sensors is then the location of the horizontal centerline of the display screen. Another pair of screen edge sensors may be used to locate the vertical centerline of the screen in a similar fashion.

FIGURE 8 illustrates an embodiment of equipment which may be used for applying the locating washers 34 and 36 over the respective one of the holes 84 and 86 in the associated kinescope mounting lugs 24 and 26. As previously indicated, these washers 34 and 36 have smaller apertures 44 and 46 (i.e., 0.250 inch (6.35 mm) in diameter) compared to the mounting lug holes 84 and 86 (i.e., 0.512 inch (13.0 mm)), and are precisely positioned with respect to the display screen 38.

The washer application equipment includes a stationary frame 126. A base plate 128 is translatably mounted on the stationary frame 126 for motion along the horizontal or x-direction 118. A linear actuator 130 adjusts the position of the base plate 128 in the x-direction 118 in response to the control signal indicative of the position of the screen 38.

To allow adjustment of the locating washers in the vertical or y-direction 120, a pair of plates 134 and 136 are pivotally mounted on the base plate 128. The plate 136 is pivoted about an axis 138 defined by a pair of bearing blocks 140 and 142 mounted on the base plate 128. The other plate 134 is pivoted about a parallel axis 144 formed by another pair of bearing blocks 146 and 148 also secured to the base plate 128. Both of the pivot axes 138 and 144 are disposed parallel to each other, and perpendicular to the x-y plane.

The rotational radii of the pivotally-mounted plates 134 and 136 are so large that the angular motion of these plates causes essentially vertical or y displacement of the respective free ends 150 and 152. A pair of linear actuators, indicated by numeral 132 in FIGURE 8, adjust the vertical positions of the free ends 150 and 152 of the respective plates 134 and 136 in response to the control signal indicative of the position of the screen 38.

A pair of tubes 154 and 156 are reciprocably mounted on the respective plates 134 and 136 for motion along a z-direction 122. A pair of bearing blocks 158 and 160 disposed on the pivotally-mounted plate 134 slidably support the tube 154. The other tube 156 is similarly mounted by means of another pair of bearing blocks 162 and 164, secured to the pivotally-mounted plate 136.

Disposed at the free ends of the tubes 154 and 156 are respective suction holders 174 (FIGURE 8-(b)), e.g. of a capillary type, for capturing the respective washers 34 and 36. Swivel motion of the suction holders permits the locating washers 34 and 36 to automatically align with the planes of the respective kinescope mounting lugs 24 and 26 when they are brought into contact therewith. The vacuum within the tubes 154 and 156 serves to firmly hold the washers 34 and 36 in place until they are permanently secured to the respective lugs 24 and 26.

It will be noted that the spacing between the washers 34 and 36 in the x-direction is not adjustable because the respective bearing blocks 140, 142 and 146, 148 for both of the pivotally-mounted plates 134 and 136 are fixedly disposed on the base plate 128. Therefore, the tubes 154 and 156, carrying the respective locating washers 34 and 36, move together in the x-direction 118. However, the oblong aperture 46 in the locating washer 36 makes it unnecessary to precisely adjust the spacing between the washers 34 and 36 in the horizontal or x direction.

The locating washers 34 and 36 are fed to the washer application equipment in a strip form from respective reels - indicated by numeral 178. The washers are supplied on a plastic backing film 180 having an adhesive layer arranged between the film and the washer strip 182 in the manner depicted in FIGURE 8 (c). When the washers are peeled from the backing film 180, the adhesive stays on the washers and is released from the film. As the washer strips are fed by respective feed mechanisms 184 and 186, the backing films are peeled away and wound on associated reels - indicated by numeral 188.

Instead of supplying the washers 34 and 36 in a strip form, they may be supplied individually from a cartridge dispenser. Furthermore, other techniques may be used for attaching the washers 34 and 36 to the respective kinescope mounting lugs 24 and 26 - for example, spot welding, hot-melt adhesive, etc.

The tubes 154 and 156 are fully retracted to allow the washer feeding mechanisms 184 and 186 to raise the washers 34 and 36 to the respective positions where they can be captured by the associated swivel holders. As the tubes 154 and 156 are moved forward, the washers 34 and 36 are sheared from the respective strips, and picked up by the swivel holders 174.

The motion of the tubes 154 and 156 is provided by a pair of drive motors 194 and 196 via respective rack-and-pinion mechanisms - indicated by numeral 198. As the tubes 154 and 156 are moved forward, the locating washers 34 and 36, with adhesive sides facing the respective kinescope mounting lugs 24 and 26, come into contact with the lugs. The drive motors 194 and 196 continue to press the locating washers 34 and 36 against the lugs 24 and 26 until a preset force is achieved. At this point, the drive motors 194 and 196 stop. Once the vacuum is released, the washers 34 and 36 are firmly pressed against the mounting lugs 24 and 26. The drive motors 194 and 196 are then reversed to withdraw the tubes 154 and 156 away from the kinescope 20. The kinescope 20 is then transported to the instrument assembly station on the conveyor 50 as indicated in FIGURE 1 (b).

As previously mentioned, the positions of the locating washers 34 and 36 are set before their application to the lugs 24 and 26 by adjusting the position of the translatably-mounted base plate 128 in the horizontal direction and by adjusting the positions of the pivotally-mounted plates 134 and 136 in the vertical directions in response to the control signal. The locating washer 34 with a circular aperture is precisely located in both horizon-

tal and vertical directions. The locating washer 36 with an oblong aperture is, however, positioned only in the vertical direction.

The locating washer 34, with a close-fitting or circular aperture, positions the kinescope 20 with respect to the TV cabinet 22 in both horizontal and vertical directions. The second locating washer 36, with a slotted aperture, controls only the angular orientation of the kinescope 20 with respect to the cabinet 22. The two washers 34 and 36, in combination, accurately position the kinescope 20 in the x-y plane without the need for tight tolerances on the spacing between the cabinet guiding posts 74 and 76 and without the need for adjusting the spacing between the washers.

One application of the kinescope locating features pursuant to this invention is to assure accurate registration between the kinescope screen 38 and the cabinet opening 78. Another application of the subject kinescope locating features is to accurately position the kinescope on the assembly line for robotic wiring, instrument alignment and test, etc. The kinescope locating features are also useful for precisely positioning the kinescope on the pallet so that it can be picked up by an automatic pick-and-place device or a robot.

It is noted that it may be desirable to apply the locating washers to the kinescope mounting lugs at the YAMMING station. As previously indicated, the YAS marks are sensed at the YAMMING station for the purpose of rotationally adjusting the vertical and horizontal magnetic fields of the deflection yoke. The YAS mark information can be temporarily stored and later used for positioning the locating washers over the respective mounting lug holes before the kinescopes leave the YAMMING station, or it may be later used for positioning the kinescope in the cabinet. This technique eliminates the need for sensing the YAS marks a second time, and may eliminate the need for the locating washers.

Claims

1. A method for positioning a kinescope having a display screen within a cabinet, characterized by the steps of:

providing the kinescope with mechanical locating means (24,26,34,36) for securing the kinescope in a cabinet, the locating means being adjustable (34,36) for adjusting the position of the kinescope;

optically detecting (114,116) edge alignment features (104,106) of the display screen to generate a position indicative control signal (112) representative of the position of the display screen with respect to a reference pair of mutually perpendicular axes (118,120); and

adjusting the mechanical locating means in dependence upon said position indicative control signal for subsequent accurate location of the display screen within a cabinet (22).

2. The method defined in claim 1 characterized in that said step of optically detecting comprises locating yoke alignment indicia (104,106) by means of a pair of optical sensors (114,116) having their viewing fields respectively focused on the regions surrounding the nominal positions of said indicia.

3. The method defined in claim 1, wherein the kinescope is positioned within a television cabinet (22) for housing said kinescope (20), said cabinet having an opening (78) for exposing said display screen; and said cabinet (22) is equipped with a mechanical locating feature (74,76) bearing the same positional relationship with respect to said cabinet opening (78) as the positional relationship of said mechanical locating means (34,36) with respect to said display screen (38).

4. The method defined in claim 3 wherein during assembly of the kinescope within the cabinet, said kinescope (20) is located with said cabinet (22) in a manner causing engagement between said mechanical locating means (34,36) and said mechanical locating feature (74,76) to assure registration between said display screen (38) and said cabinet opening (78); the method comprising the further step of

fixedly attaching said kinescope (20) to said cabinet (22) while said locating means and locating feature remain in engagement with each other.

5. The method defined in claim 4 wherein said cabinet locating feature is in the form of a pair of guiding posts (74,76) disposed on the front inner walls (70,72) of said cabinet (22) and having said positional relationship with respect to said cabinet opening (78); characterized in that said step of providing said kinescope (20) with said mechanical locating means (36,34) comprises the steps of:

positioning a pair of apertured washers (36,38) with respect to said kinescope (20) in response to said control signal such that the apertures (44,46) in said washers (36,34), dimensioned to snugly receive said guiding posts (74,76) in said cabinet (22), bear said positional relationship relative to said kinescope screen (38); and

affixing said apertures washers (36,38) to said kinescope (20) at the respective positions

tal and vertical directions. The locating washer 36 with an oblong aperture is, however, positioned only in the vertical direction.

The locating washer 34, with a close-fitting or circular aperture, positions the kinescope 20 with respect to the TV cabinet 22 in both horizontal and vertical directions. The second locating washer 36, with a slotted aperture, controls only the angular orientation of the kinescope 20 with respect to the cabinet 22. The two washers 34 and 36, in combination, accurately position the kinescope 20 in the x-y plane without the need for tight tolerances on the spacing between the cabinet guiding posts 74 and 76 and without the need for adjusting the spacing between the washers.

One application of the kinescope locating features pursuant to this invention is to assure accurate registration between the kinescope screen 38 and the cabinet opening 78. Another application of the subject kinescope locating features is to accurately position the kinescope on the assembly line for robotic wiring, instrument alignment and test, etc. The kinescope locating features are also useful for precisely positioning the kinescope on the pallet so that it can be picked up by an automatic pick-and-place device or a robot.

It is noted that it may be desirable to apply the locating washers to the kinescope mounting lugs at the YAMMING station. As previously indicated, the YAS marks are sensed at the YAMMING station for the purpose of rotationally adjusting the vertical and horizontal magnetic fields of the deflection yoke. The YAS mark information can be temporarily stored and later used for positioning the locating washers over the respective mounting lug holes before the kinescopes leave the YAMMING station, or it may be later used for positioning the kinescope in the cabinet. This technique eliminates the need for sensing the YAS marks a second time, and may eliminate the need for the locating washers.

Claims

1. A method for positioning a kinescope having a display screen within a cabinet, characterized by the steps of:

providing the kinescope with mechanical locating means (24,26,34,36) for securing the kinescope in a cabinet, the locating means being adjustable (34,36) for adjusting the position of the kinescope;

optically detecting (114,116) edge alignment features (104,106) of the display screen to generate a position indicative control signal (112) representative of the position of the display screen with respect to a reference pair of mutually perpendicular axes (118,120); and

adjusting the mechanical locating means in dependence upon said position indicative control signal for subsequent accurate location of the display screen within a cabinet (22).

2. The method defined in claim 1 characterized in that said step of optically detecting comprises locating yoke alignment indicia (104,106) by means of a pair of optical sensors (114,116) having their viewing fields respectively focused on the regions surrounding the nominal positions of said indicia.

3. The method defined in claim 1, wherein the kinescope is positioned within a television cabinet (22) for housing said kinescope (20), said cabinet having an opening (78) for exposing said display screen; and said cabinet (22) is equipped with a mechanical locating feature (74,76) bearing the same positional relationship with respect to said cabinet opening (78) as the positional relationship of said mechanical locating means (34,36) with respect to said display screen (38).

4. The method defined in claim 3 wherein during assembly of the kinescope within the cabinet, said kinescope (20) is located with said cabinet (22) in a manner causing engagement between said mechanical locating means (34,36) and said mechanical locating feature (74,76) to assure registration between said display screen (38) and said cabinet opening (78); the method comprising the further step of

fixedly attaching said kinescope (20) to said cabinet (22) while said locating means and locating feature remain in engagement with each other.

5. The method defined in claim 4 wherein said cabinet locating feature is in the form of a pair of guiding posts (74,76) disposed on the front inner walls (70,72) of said cabinet (22) and having said positional relationship with respect to said cabinet opening (78); characterized in that said step of providing said kinescope (20) with said mechanical locating means (36,34) comprises the steps of:

positioning a pair of apertured washers (36,38) with respect to said kinescope (20) in response to said control signal such that the apertures (44,46) in said washers (36,34), dimensioned to snugly receive said guiding posts (74,76) in said cabinet (22), bear said positional relationship relative to said kinescope screen (38); and

affixing said apertures washers (36,38) to said kinescope (20) at the respective positions

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determined by said control signal so that when said kinescope (20) is mated with said cabinet (22), said guiding posts (74,76) in said cabinet (22) closely fit into said apertures (44,46) in said kinescope-mounted washers (34,36) to center said display screen (38) with respect to said cabinet opening (78).

6. The method defined in claim 5 wherein said cabinet guiding posts (74,76) define a circular cross-section; wherein one (34) of said washers is provided with a circular aperture (44) dimensioned to snugly receive one (74) of said guiding posts; wherein the other (36) of said washers is provided with an oblong aperture (46) having respective short and long dimensions that are respectively slightly and substantially greater than the diameter of the other of said guiding posts; characterized in that said step of positioning said washers (34,36) consists of;

positioning said one washer (34), having said circular aperture (44), with respect to said kinescope (20) along both of said mutually perpendicular directions (X,Y) in response to said control signal;

positioning said other washer (36), having said oblong aperture (46), with respect to said kinescope (20) such that the long dimension of said oblong aperture is substantially parallel to one (X) of said mutually perpendicular directions; and

further positioning said other washer (36) with respect to said kinescope (20) only along the other (Y) of said mutually-perpendicular directions in response to said control signal.

7. The method defined in claim 5 characterized in that said step of affixing said apertured washers (34,36) to said kinescope (20) comprises gluing said washers (34,36) to mounting lugs (24,26) disposed on said kinescope (20).

8. The method defined in claim 5 characterized in that said step of affixing said apertured washers (34,36) to said kinescope (20) comprises welding said washers (34,36) to said mounting lugs (24,26) disposed on said kinescope (20).

9. The method defined in claim 5 characterized in that said step of affixing said washers (34,36) to said kinescope (20) comprises the steps of;

feeding washers in a strip form (182) from a pair of reels (178);

severing the leading washers from the respective strips (182);

transporting said severed washers to said respective positions relative to said kinescope (20); and

attaching said washers to said kinescope (20) at said respective positions.

10. A kinescope (20) having a display (38) with edge alignment features (104,106), and characterized by

mechanical locating means (24,26) for registering with and engaging with further locating means (74,76) within a cabinet (22);

the locating means including position adjustment means (34,36) which are adjusted with respect to said edge alignment features to precisely locate the display within the cabinet.

11. The kinescope defined in claim 10 having a mounting lug (24,26) disposed at each corner of the display screen; said mounting lugs having holes for mounting said kinescope in a cabinet; characterized in that said adjustment means comprises a pair of washers (34,36) disposed over said mounting holes (84,86) such that the apertures (44,46) in said washers are precisely positioned with respect to said kinescope display screen (38).

12. The kinescope defined in claim 11 characterized by an adhesive or welding material disposed between said locating washers (34,36) and the respective ones of said mounting lugs (24,26).

Patentansprüche

1. Verfahren zum Positionieren einer Bildröhre mit einem Anzeigeschirm innerhalb eines Gehäuses,
gekennzeichnet durch:
   - Anbringen von mechanischen Positioniermitteln (24, 26, 34, 36) an der Bildröhre zum Haltern der Bildröhre in einem Gehäuse, wobei die Positioniermittel einstellbar (34, 36) sind zum Einstellen der Position/Lage der Bildröhre;
   - optisches Erfassen (114, 116) von Rand-Ausrichtungseinrichtungen (104, 106) des Anzeigeschirmes zum Erzeugen eines positionsanzeigenden Steuersignales (112), das repräsentativ für die Position/Lage des Anzeigeschirmes bezüglich eines Referenzpaares von gegenseitig (aufeinander) senkrechten Achsen (118, 120) ist;
   - Einstellen der mechanischen Positioniermittel in Abhängigkeit von dem positionsanzeigenden Steuersignal zum darauffolgenden genauen Positionieren des Anzeigeschirms innerhalb des Gehäuses

(22).

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß das optische Erfassen aufweist: Erfassen von Joch-Ausrichtungsmarkierungen (104, 106) mittels eines Paares von optischen Sensoren (114, 116), deren Beobachtungsbereiche (viewing fields) jeweils auf die Bereiche gerichtet sind, welche die Nominalpositionen der Markierungen umgeben.

3. Verfahren nach Anspruch 1, bei dem die Bildröhre in einem Fernsehgehäuse (22) zum Aufnehmen der Bildröhre (20) positioniert wird, wobei das Gehäuse eine Öffnung (78) zum Exponieren des Anzeigeschirmes hat; und wobei das Gehäuse (22) mit einer mechanischen Positioniervorrichtung (74, 76) ausgerüstet ist, welches dieselbe Lagebeziehung bezüglich der Gehäuseöffnung (78) hat, wie die Lagebeziehung der mechanischen Positioniermittel (34, 36) bezüglich des Anzeigeschirmes (38).

4. Verfahren nach Anspruch 3, bei dem während des Einbaus der Bildröhre in das Gehäuse die Bildröhre (20) in dem Gehäuse (22) in einer Weise positioniert wird, die einen Eingriff bewirkt zwischen den mechanischen Positioniermitteln (34, 36) und der mechanischen Positioniervorrichtung (74, 76), um eine Paß- oder Lagegenauigkeit zwischen dem Anzeigeschirm (38) und der Gehäuseöffnung (78) zu erreichen; welches Verfahren weiter das ortsfeste Befestigen der Bildröhre (20) an dem Gehäuse (22) umfaßt, während die Positioniermittel und Positioniervorrichtung miteinander im Eingriff sind.

5. Verfahren nach Anspruch 4, bei dem die Gehäuse-Positioniervorrichtung in der Form eines Paares von Führungspfosten (74, 76) ausgestaltet ist, die an den vorderen Innenwänden (70, 72) des Gehäuses (22) angebracht sind und die Lagebeziehung bezüglich der Gehäuseöffnung (78) haben;
dadurch gekennzeichnet,
daß das Vorsehen von mechanischen Positioniermitteln (34, 36) an der Bildröhre (20) aufweist:
   - Positionieren eines Paares von - eine Öffnung aufweisenden - Unterlegscheiben (36, 38) bezüglich der Bildröhre (20) abhängig von dem Steuersignal so, daß die Öffnungen (44, 46) in den Unterlegscheiben (34, 36) - die so dimensioniert sind, daß sie eng anliegend die Führungspfosten (74, 76) in dem Gehäuse (22) aufnehmen - die Lagebeziehung relativ zu dem Bildröhren-Schirm (38) herstellen;
   - Befestigen der - eine Öffnung aufweisenden - Unterlegscheiben (36, 38) an der Bildröhre (20) in den jeweiligen Positionen/Lagen, die von dem Steuersignal bestimmt werden, so daß die Führungspfosten (74, 76) in dem Gehäuse (22) spielfrei (closely) in die Öffnungen (44, 46) in den bildröhren-befestigten Unterlegscheiben (34, 36) eingreifen, wenn die Bildröhre (20) mit dem Gehäuse (22) vereinigt wird, um den Anzeigeschirm (38) bezüglich der Gehäuseöffnung (78) zu zentrieren.

6. Verfahren nach Anspruch 5, bei dem die Führungsstangen (74, 76) einen runden Querschnitt haben, wobei eine (34) der Unterlegscheiben eine runde Öffnung (44) hat, die eine Größe aufweist, um eng anliegend (snugly) eine (74) der Führungspfosten aufzunehmen, wobei die andere (36) der Unterlegscheiben eine längliche (oblong) Öffnung (46) hat, mit Kurz- bzw. Lang-Abmessungen, die gering bzw. wesentlich größer als der Durchmesser des anderen der Führungspfosten ist;
dadurch gekennzeichnet,
daß das Positionieren der Unterlegscheiben (34, 36) besteht aus:
   - Positionieren der einen Unterlegscheibe (34) mit kreisförmiger Öffnung (44) bezüglich der Bildröhre (20) längs beider aufeinander senkrechter Richtungen (X, Y), abhängig von dem Steuersignal;
   - Positionieren der anderen Unterlegscheibe (36) mit länglicher Öffnung (46) bezüglich der Bildröhre (20) so, daß die Längsabmessung der länglichen Öffnung im wesentlichen parallel zu einer (X) der aufeinander senkrechten Richtungen ist;
   - weiter Positionieren der anderen Unterlegscheibe (36) bezüglich der Bildröhre (20) nur längs der anderen (Y) der aufeinander senkrechten Richtungen, abhängig von dem Steuersignal.

7. Verfahren nach Anspruch 5, dadurch gekennzeichnet, daß das Befestigen der eine Öffnung aufweisenden Unterlegscheiben (34, 36) an der Bildröhre (20) das Kleben der Unterlegscheiben (34, 36) an Montageansätze (24, 26) umfaßt, die an der Bildröhre (20) angeordnet sind.

8. Verfahren nach Anspruch 5, dadurch gekennzeichnet,

daß das Befestigen der eine Öffnung aufweisenden Unterlegscheiben (34, 36) an der Bildröhre (20) das Schweißen der Unterlegscheiben an Montageansätze (24, 26) umfaßt, die an der Bildröhre (20) angebracht sind.

9. Verfahren nach Anspruch 5, dadurch gekennzeichnet, daß das Befestigen der Unterlegscheiben (34, 36) an der Bildröhre (20) umfaßt:
   - Zuführen von Unterlegscheiben in Streifen-Form (strip form; 182) von einem Paar von Rollen (178);
   - Lösen der vorderen Unterlegscheiben von den jeweiligen Streifen (182);
   - Überführen der gelösten Unterlegscheiben zu den jeweiligen Lagen relativ zu der Bildröhre (20);
   - Anbringen der Unterlegscheiben an der Bildröhre (20) an den jeweiligen Positionen.

10. Bildröhre (20) mit einer Anzeige (38), welche Randausrichtungs-Einrichtungen (104, 106) aufweist und gekennzeichnet ist durch
   - mechanische Positioniermittel (24, 26) zum Ausrichten auf und zum in Eingriff bringen mit weiteren Positioniervorrichtungen (74, 76) innerhalb eines Gehäuses (22);
   - wobei die Positioniermittel Positionier-Einstellmittel (34, 36) haben, die bezüglich der Randausrichtungs-Einrichtungen einstellbar sind, um die Anzeige genau innerhalb des Gehäuses zu positionieren.

11. Bildröhre nach Anspruch 10 mit einem Montageansatz (24, 26), der an jeder Ecke des Anzeigeschirmes angeordnet ist, wobei die Montageansätze Öffnungen zum Anbringen der Bildröhre in einem Gehäuse haben; dadurch gekennzeichnet, daß die Einstellmittel ein Paar von Unterlegscheiben (34, 36) haben, die über die Montageöffnungen (84, 86) so gelegt sind, daß die Öffnungen (44, 46) in den Unterlegscheiben genau bezüglich dem Bildröhren-Anzeigeschirm (38) positioniert/ausgerichtet sind.

12. Bildröhre nach Anspruch 11, gekennzeichnet durch Klebe- oder Schweißmaterial, das zwischen den Positionier-Unterlegscheiben (34, 36) und den jeweiligen der Montageansätze (24, 26) angebracht ist.

Revendications

1. Procédé de positionnement d'un tube-image ayant un écran d'affichage à l'intérieur d'une enveloppe, caractérisé par les étapes consistant à :
   munir le tube-image d'un moyen de localisation mécanique (24,26,34,36) pour fixer le tube-image dans une enveloppe, le moyen de localisation étant ajustable (34, 36) pour régler la position du tube-image ;
   détecter optiquement (114, 116) les caractéristiques d'alignement des bords (104, 106) de l'écran d'affichage pour générer un signal de contrôle indicateur de position (112) représentatif de la position de l'écran d'affichage par rapport à une paire de référence d'axes mutuellement perpendiculaires (118, 120) ; et
   ajuster le moyen de localisation mécanique en fonction dudit signal de contrôle indicateur de position pour ensuite préciser la position de l'écran d'affichage à l'intérieur de l'enveloppe (22).

2. Procédé selon la revendication 1 , caractérisé en ce que ladite étape de détection optique comprend des index d'alignement des colliers de positionnement (104, 106) à l'aide d'une paire de capteurs optiques (114, 116) ayant leurs domaines d'observation focalisés respectivement sur les régions entourant les positions nominales desdits index.

3. Procédé selon la revendication 1 dans lequel le tube-image est positionné à l'intérieur d'une enveloppe de télévision (22) pour loger ledit tube-image (20), ladite enveloppe comportant une ouverture (78) pour présenter ledit écran d'affichage ; et ladite enveloppe (22) est équipée d'une particularité de localisation mécanique (74, 76) supportant la même relation de position par rapport à ladite ouverture d'enveloppe (78) que la relation de position dudit moyen de localisation mécanique (34, 36) par rapport audit écran d'affichage (38).

4. Procédé selon la revendication 3 dans lequel pendant le montage du tube-image à l'intérieur de l'enveloppe, ledit tube-image (20) est situé par rapport à ladite enveloppe (22) d'une manière entrainant l'engagement entre ledit moyen de localisation mécanique (34, 36) et ladite particularité de localisation mécanique (74, 76) pour assurer la concordance entre ledit écran d'affichage (38) et ladite ouverture de l'enveloppe (78) ; le procédé comprenant l'étape supplémentaire consistant à
   fixer solidement ledit tube-image (20) à

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ladite enveloppe (22) tandis que ledit moyen de localisation et ladite particularité de localisation restent en engagement l'un avec l'autre.

Procédé selon la revendication 4 dans lequel ladite particularité de localisation de l'enveloppe se présente sous la forme de montants de guidage (74, 76) disposés sur les parois internes de l'avant (70, 72) de ladite enveloppe (22) et possédant ladite relation de position par rapport à ladite ouverture d'enveloppe (78) ; caractérisé en ce que ladite étape consistant à munir ledit tube-image (20) de moyen de localisation mécanique (36, 34) comprend les étapes consistant a :

placer une paire de rondelles à ouvertures (36, 38) par rapport audit tube-image (20) en réponse audit signal de contrôle de telle sorte que les ouvertures (44, 46) desdites rondelles (36, 34), dimensionnées pour recevoir avec un ajustement doux lesdits montants de guidage (74, 76) de ladite enveloppe (22) supportant ladite relation de position par rapport audit écran du tube-image (38) ; et

fixer lesdites rondelles à ouverture (36, 34) audit tube-image (20) aux positions respectives déterminées par ledit signal de contrôle de sorte que lorsque ledit tube-image (20) est adapté à ladite enveloppe (22), lesdits montants de guidage (74, 76) dans ladite enveloppe (22) s'ajustent serrés dans lesdites ouvertures (44, 46) desdites rondelles montées sur le tube-image (34,36) pour centrer ledit écran d'affichage (38) par rapport à ladite ouverture de l'enveloppe (78).

6. Procédé selon la revendication 5 dans lequel lesdits montants de guidage de l'enveloppe (74, 76) définissent une section transversale circulaire ; dans lequel l'une (34) desdites rondelles est munie d'une ouverture circulaire (44) dimensionnée pour recevoir avec un ajustement doux l'un (74) desdits montants de guidage; dans lequel l'autre (36) desdites rondelles est munie d'une ouverture oblongue (46) ayant des dimensions respectivement courte et longue qui sont respectivement légèrement et sensiblement plus grandes que le diamètre de l'autre desdits montants de guidage ;

caractérisé en ce que ladite étape de positionnement desdites rondelles (34, 36) consiste à:

positionner ladite rondelle (34) ayant ladite ouverture circulaire (44) par rapport audit tube-image (20) le long des deux dites directions mutuellement perpendiculaires (X, Y) en réponse audit signal de contrôle ;

positionner l'autre dite rondelle (36) , ayant ladite ouverture oblongue (46) par rapport audit tube-image (20) de telle sorte que la dimension longue de ladite ouverture oblongue est sensiblement parallèle à l'une (X) desdites directions mutuellement perpendiculaires ; et

positionner, de plus, ladite autre rondelle (36) par rapport audit tube-image (20) seulement le long de l'autre (Y) desdites directions, mutuellement perpendiculaires en réponse audit signal de contrôle.

7. Procédé selon la revendication 5 caractérisé en ce que ladite étape consistant à fixer lesdites rondelles à ouverture (34, 36) audit tube-image (20) comprend de coller lesdites rondelles (34, 36) sur des pattes de montage (24, 26) disposées sur ledit tube-image (20).

8. Procédé selon la revendication 5 caractérisé en ce que ladite étape consistant à fixer lesdites rondelles à ouverture (34, 36) audit tube-image (20) comprend de souder lesdites rondelles (34, 36) auxdites pattes de montage (24, 26) disposées sur ledit tube-image (20).

9. Procédé selon la revendication 5 caractérisé en ce que cette dite étape consistant à fixer lesdites rondelles (34, 36) audit tube-image (20) comprend les étapes consistant à :

s'alimenter en rondelles sous forme de bande (182) à partir d'une paire de bobines (178) ;

séparer les rondelles de tête des bandes respectives (182) ;

transporter lesdites rondelles séparées auxdites positions respectives par rapport audit tube-image (20) ; et

fixer lesdites rondelles sur ledit tube-image (20) auxdites positions respectives.

10. Tube-image (20) comportant un afficheur (38) avec des particularités d'alignement des bords (104, 106) et caractérisé par

un moyen de localisation mécanique (24, 26) pour être en concordance avec et s'engager avec un moyen de localisation supplémentaire (74, 76) à l'intérieur de l'enveloppe (22) ;

le moyen de localisation incluant le moyen d'ajustement de position (34, 36) qui est ajusté par rapport auxdites particularités d'alignement des bords pour localiser de façon précise l'afficheur à l'intérieur de l'enveloppe.

11. Tube-image selon la revendication 10 comportant une patte de montage (24, 26) disposée à chaque coin de l'écran d'affichage ; lesdites pattes de montage comportant les trous pour monter ledit tube-image dans une enveloppe ;

caractérisé en ce que ledit moyen d'ajustement comprend une paire de rondelles (34, 36) disposées sur lesdits trous de montage (84, 86) de telle sorte que les ouvertures (44, 46) desdites rondelles sont positionnées de façon précise par rapport audit écran d'affichage du tube-image (38).

12. Tube-image selon la revendication 11 caractérisé par un matériau adhésif ou de soudure disposé entre lesdites rondelles de positionnement (34, 36) et les pattes respectives desdites pattes de montage (24, 26).