PATENT SPECIFICATION (11) 1389424

1389424

(21) Application No. 24105/72 (22) Filed 23 May 1972

(31) Convention Application No. 217756 (32) Filed 14 Jan. 1972 in

(33) United States of America (US)

(44) Complete Specification published 3 April 1975

(51) INT CL² H01J 29/76

(52) Index at acceptance

H1D 4A4 4A7 4B2 4B3B 4B3Y 4B4 4C2X 4CY 4K4 4K7D 4K7Y 4K8 4X5

(19)

(54) CATHODE-RAY TUBE—YOKE PLATFORM—YOKE COMBINATION AND METHOD OF ASSEMBLING THE COMBINATION

(71) We, RCA CORPORATION, a corporation organized under the laws of the State of Delaware, United States of America, of 30 Rockefeller Plaza, City and State of New York, 10020, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a method for mounting a magnetic deflection yoke on the neck of a cathode-ray tube and to the combination of cathode-ray tube, yoke-platform and yoke produced thereby.

Cathode-ray tubes, such as color television picture tubes, may require a magnetic-deflection yoke mounted on the outside of the tube envelopes. The yoke comprises horizontal and vertical deflection coils and a suitable core or cores therefor. In some color television picture tubes, the yoke deflects three electron beams in both the vertical and horizontal directions to scan the viewing screen of the tube. In some tube-yoke combinations, the position of the yoke is adjusted relative to the tube. The yoke is then clamped on the tube in the adjusted position.

Several structures have been proposed for mounting and holding the yoke in the desired position on the tube. Usually the yoke is located in a housing. In one structure, the housing and yoke are positioned on the tube and glued in place. When the yoke is glued in place, the glue generally fills the space between the housing and the tube. This may require a bulky body of material, which may result in poor rigidity and stability of the yoke during tube operation. In addition, an uneconomical quantity of material may be required.

In a second structure, the housing is clamped on the tube and the yoke is positioned within the housing and clamped in place. When the yoke is clamped in place and held by friction, the yoke may be accidentally moved.

In a third structure, a platform is glued to the outside of the tube, then the yoke and housing are positioned over the tube and clamped to the platform. The glue may be provided by a tape with pressure-sensitive adhesive on both sides positioned between the tube and fingers on the platform. The tape may prevent slippage of the platform on the tube but is not a sole support for the platform and yoke attached thereto. A clamp attached to the yoke housing maintains the housing in position on the tube. A yoke mounted in this manner also may be accidentally moved and may not remain in operational relationship with the tube for the life of the tube or yoke.

According to the first aspect of the present invention, there is provided a cathode ray tube, a magnetic deflection yoke having a housing, and a platform rigidly adhered to the external surface of said tube with a hardened adhesive material, said housing including a plurality of recesses, a corresponding number of lugs extending from the platform with each of the lugs extending within and spaced from a different one of the recesses, and a hardened adhesive material filling the recesses to fix the lugs within the corresponding recesses.

According to a second aspect, the present invention provides a cathode ray tube, a magnetic deflection yoke, and a platform fixed to said yoke and to the external surface of said tube, said platform including at least one peripheral recessed portion therein forming a chamber between the external surface of said tube and said platform, a hardened adhesive material within said chamber between said platform and said tube, said adhesive material providing the sole support for said platform on said tube.

In one embodiment of the invention, the mounting means between the platform and

the yoke housing comprises a plurality of indentations in the housing, and a corresponding plurality of projections extending from the platform. Each of the projections is within and spaced from each of the indentations. A second hardened adhesive material is located between at least portions of each of the indentations and projections. This provides a permanent combination of tube, yoke platform and yoke which may eliminate the possibility of accidential movement of the yoke with respect to the tube and which may prevent misadjustment or further movement after the operational relationship of the combination is established. Furthermore, since the quantity of material within each indentation surrounding each projection remains essentially constant, a rigid, stable position of the yoke on the tube is achieved.

In another embodiment of the combination the mounting means between the platform and the yoke comprises at least three oversized holes in the housing and a corresponding number of threaded projections extending from the platform. Each of the threaded projections is within and spaced from each oversized hole. Two threaded adjustment means are positioned on each of the projections, one on each side of said housing fixedly clamping the housing therebetween. This provides a combination in which the yoke is adjustably fixed to and solely supported by the platform. This results in a rigid stable combination which permits adjustment of the yoke on the tube and which may eliminate the possibility of accidental movement of the yoke with respect to the tube.

The invention may include positioning a platform against a tube and injecting a first hardenable material between at least portions of the positioned platform and the tube. The first adhesive material is permitted to harden and to fix the platform on the tube. A yoke housing with magnetic deflection yoke therein is positioned on the tube adjacent the fixed platform. The position of the housing with respect to the fixed platform is then adjusted to obtain the desired operational relationship of the yoke with the tube. The housing with the yoke therein is then mounted to the platform in the desired operational relationship. The method provides an economical, fast and easy method for permanently mounting a platform on a tube as the sole support for a yoke.

Figure 1 is a partial broken-away elevational view of a cathode-ray tube-platform-yoke combination.

Figure 2 is an enlarged broken-away sectional view of a portion of the combination shown in Figure 1 on section 2—2.

Figure 3 is a sectional view of the combination shown in Figure 2 on section 3—3.

Figure 4 is an enlarged broken-away sectional view of a portion of an alternative combination similar to the combination shown in Figure 2.

Figure 5 is a sectional view of the combination shown in Figure 4 on section 5—5.

Figure 6 is an enlarged broken-away sectional view of a portion of a further alternative combination similar to the combination shown in Figure 2.

Figure 7 is a sectional view of the combination shown in Figure 6 on section 7—7.

Figure 1 illustrates a color television picture tube 20 of the apertured-mask type comprising an evacuated glass envelope 21. The envelope 21 includes a faceplate panel 22, a funnel 23, and a neck 24. A three-color phosphor viewing screen 25 is supported on the inner surface 26 on the faceplate panel 22. A preferred viewing screen 25 is of a known line type. A electron-gun assembly 27 positioned in the neck includes three electron guns (not shown), one for each of the three color phosphors on the viewing screen 25. The apertured mask 28 is positioned on the envelope 21 adjacent the viewing screen 25. The apertured mask 28 used with the line-type viewing screen 25 includes slot-shaped apertures. The electron-gun assembly 27 is adapted to project three electron beams on the viewing screen 25 through the apertured mask 28 to strike the viewing screen 25. The preferred electron-gun assembly 27 is of the inline type, that is, projects a plurality of electron beams which are in a line towards the screen 25.

A platform 29 is fixed to the outside surface of the funnel 23. A yoke assembly 30, comprising a yoke 31 and a housing 32 for the yoke 31, is positioned against the envelope 21 near the intersection of the funnel 23 and neck 24. A preferred yoke 31 is comprised of two pairs of opposed toroidal magnetic-field-producing coils (not shown). The yoke 31 may also include a direct current or permanet magnet such as convergence or purity device (not shown). The housing 32 with the yoke 31 therein is mounted to the platform 29, as will be described.

A Fixed Yoke Mounting

Example 1: Figures 2 and 3 better illustrate one embodiment of the invention comprising the tube 20, the platform 29 and the yoke assembly 30. The platform 29 is a circular ring-shaped member, which is positioned over the funnel 23. The platform 29 includes a forward inner surface 33 contoured to conform substantially to a portion of the outer surface of the funnel 23. The base of the platform 29 is concentrically positioned on the funnel 23 in a plane 34 substantially perpendicular to the axis 35 of the tube 20. The platform 29 includes four recessed portions 36 in the inner surface 33 substantially equally spaced around the periphery of the inner surface 33. In one preferred

embodiment shown in Figure 2, the recessed portions 36 comprise recessed segments of an annular ring. In one platform 29 used for a 17 inch color television picture tube, the recessed portions 36 are about 1.75 inches long by 0.75 inch wide by 0.31 inch deep. The platform 29 also includes holes or first passageways 37 therethrough opening into each of the recessed portions 36 as shown in Figures 2 and 3. With the platform 29 positioned against the funnel 23 as described above, the four recessed portions 36 form enclosures or chambers 38 between the funnel 23 and the platform 29.

A first "hardened" (i.e. originally applied in a soft condition but becoming hard in time) adhesive material 39 substantially fills the chambers 38 fixing the platform 29 to the funnel 23 in a nonadjustable position. The preferred first adhesive material is a hot-melt thermoplastic adhesive material. Suitable materials and melting temperatures are:

Material Designation	Marketed By	Melting Temperature
"Versalon" 1300	General Mills Chemical Co., Minneapolis, Minn.	92°C
"Versalon" 1138	"	125°C
"Versalon" 1165	"	134°C
Resyln 34-2927	National Starch and Chemical Corp., New York, N. Y.	58°C

"Versalon" is a Registered Trade Mark.

The first body of material 39 must remain solid at a tube-operating temperature of about 50°C and must melt below the temperature at which damage to the yoke or tube would result. The melting point could be about 150°C, to permit economical salvage of component parts. The material must also after solidification have good adhesion to the glass envelope and the platform, which may be a plastics material such as Noryl (Registered Trade Mark) No. SE—0—940 marketed by General Electric, Schenectady, N. Y., U.S.A. It is also desirable that the adhesive material be fast-solidifying to permit economical processing of a large number of assemblies. It is preferred that the first adhesive material solidify within about 15 seconds after application is complete.

The yoke 31 is mounted in a housing 32. The housing 32 also comprises a ring-shaped member which includes an inner surface 40 formed to substantially conform to a portion of the exterior surface of the yoke 31. The yoke 31 is temporarily retained in a fixed position in the housing 32 by flexible hooks 41 formed as part of the walls of the housing 32 as shown in Figures 2 and 3. The yoke 31 is fixed to the housing 32 and the housing 32 fixed to the platform 29 in a nonadjustable position by a second hardened adhesive material 42 between portions of the platform 29 and the housing 32. The preferred second adhesive material 42 is also a hot-melt thermoplastic adhesive material. Suitable materials and melting temperatures are:

Material Designation	Marketed By	Melting Temperature
"Versalon (RTM) 1138	General Mills Chemical Co., Minneapolis, Minn.	125°C
"Versalon" 1165	"	134°C

The second adhesive material 42 must remain solid at a yoke-operating temperature of about 100°C and must melt below the temperature at which damage to the yoke or tube would result, which occurs at about 150°C, to permit economical salvage of component parts. Where the second adhesive material 42 seals directly to the exterior surface (winding) of the yoke, it is preferred that the second body of adhesive material 42 remain solid at 125°C. The second adhesive material 42 must also, after hardening, have good adhesion to the platform 29 and housing 32 which may be a plastic such as "Noryl" No. SE—0—940 marketed by General Electric, Schenectady, N. Y. It is preferred that the second adhesive material 42 harden within about 30 seconds after injection is complete.

The platform 29 also includes projections or lugs 43. The lugs 43 extend from the platform 29 substantially parallel to the axis 35 of the tube 20 in the direction of the neck 24. In the preferred embodiment, eight lugs 43 are positioned in lug pairs 44 substantially equally spaced around the surface of the platform 29 as shown in Figure 2. It is preferred that each of the four lug pairs 44 be formed

directly opposite one of the four recessed portions 36 to provide structural alignment which results in integrity of the housing 32 with the platform 29 and tube 20. It is preferred that the first passageway 37 through the platform 29 open between each lug pair 44. For example, in a 17 inch color television picture tube, the lugs 43 extend about 0.70 inch, are about 0.094 inch thick and are about 0.5 inch long measured on a circular arc of about 2.562-inch radius.

The housing 32 also includes indentations or troughs 45 which fit over each lug pair 44 on the platform 29 as shown in Figures 2 and 3. The troughs 45 are larger than each corresponding lug pair 44 to permit adjustment of the position of the housing 32 with respect to the platform 29 prior to injecting adhesive material into the troughs 45. The housing 32 can be adjusted by movement normal to the axis 35 of the tube 20 in directions shown by arrows X and Y in Figure 2, movement parallel to the axis 35 of the tube 20 in a direction shown by arrow Z in Figure 1, rotation around the axis 35 of the tube 20 in a direction shown by arrow R in Figure 2, and tilting with respect to the axis 35 of the tube 20 in a direction shown by arrow T in Figure 1. The interior sidewalls 46 and exterior sidewalls 47 of the troughs 45 limit the adjustment normal to the axis 35 and tilting with respect to the axis 35. The end walls 48 of the troughs 45 limit the adjustment parallel to the axis 35, and the length of the lugs 43 engaged with the troughs 45 limits the movement along the axis 35. It is preferred that the troughs 45 be sufficiently larger than the lug pairs 44 to permit movement of about 0.125 inch in each of the directions discussed above.

The second hardened adhesive material 42 substantially fills the troughs 45 around each lug pair 44. The second hardened adhesive material 42 additionally fills a second passageway 50 between the interior sidewall 46 of troughs 45 and the exterior winding of the yoke 31 as shown in Figures 2 and 3, thereby rigidly fixing the yoke 31 to the housing 32. The second hardened adhesive material 42 fixes the housing 32 and the yoke 31 in a permanent nonadjustable position on the platform 29. By nonadjustable position it is meant a position which cannot be adjusted except by either removal or reheating of the adhesive material. With the adhesive material hardened, no adjustment can be accomplished.

Example 2: A second embodiment is shown in Figures 4 and 5. A platform 51 similar to platform 29 shown in Figures 2 and 3 is positioned against the funnel 23. The platform 51 comprising an annular ring-shaped member includes a forward inner surface 52 generally contoured to conform substantially to a portion of the outer surface of the funnel 23. The base 53 of the platform 51 is concentrically positioned in the funnel as described in Example 1. The forward inner surface 52 of the platform 51 includes a peripheral recess 54. The preferred recess 54 is about 1.00 inch in overall width and varies in depth as will be described. A central portion 55 of the recess 54 is about 0.62 inch deep by 0.500 inch wide and side portions 56a and 56b gradually decrease in thickness from 0.62 inch at the central portion 55 to zero at the edge of the recess 54. The platform 51 contacts the funnel 23 at the extreme edges 57a and 57b of the recess 54.

The platform 51 also includes side portions 58a and 58b, which have a cross-sectional wall thickness of about 0.31 inch. This permits conforming the inner surface 52 substantially to the shape of the surface of the funnel 23. In addition, where the combination may be subjected to extreme heat or cold the side portions 58a and 58b permit the platform 51 to flex slightly during expansion or contraction of the combination. The platform 51 also includes four holes or first passageways 59 opening into the recess 54 as shown in Figures 4 and 5.

With the platform 51 positioned against the funnel 23 as described above, the recess 54 forms a chamber 60 between the funnel 23 and the platform 51. A first hardened adhesive material 61 fills at least portions of the chamber 60 fixing the platform 51 against the funnel 23 in a nonadjustable position. The preferred first adhesive material 61 is the same as the first adhesive material 39 previously described in Example 1.

The platform 51 includes four projecting lugs 62 similar to the lugs 43 of Example 1. In the preferred embodiment, four lugs 62 are positioned substantially equally spaced around the base surface of the platform 51 as shown in Figure 5. For example, in one embodiment each lug 62 is about 0.343 inch in diameter and about 0.737 inch long. It is preferred that the platform 51 have the first passageways 59 therethrough opening substantially in the center of each of the lugs 60.

The yoke 31 is first temporarily mounted in a housing 63 similar to housing 32 described in Example 1 to form a yoke assembly 64. The housing 63 also comprises a ring-shaped member which includes four retainers 65 which conform to a portion of the exterior surface of the yoke 31. The yoke 31 is temporarily maintained against the retainers 65 in a fixed position in the housing 63 by flexible hooks 66 similar to hooks 41 in Example 1 as shown in Figure 5. The yoke 31 is permanently fixed in position in the housing by an adhesive material as will be described later.

The housing 63 also includes indentations or troughs 67 similar to troughs 45 in Example 1 a respective one of which loosely

fits over each of the lugs 62. Trough passageways 68 open into the bottom of each of the troughs 67 as shown in Figure 5. The troughs 67 are larger than each of their corresponding lugs 62 to give the loose fit to permit adjustment of the position of the housing 63 with respect to the platform 51 prior to injecting the first liquid adhesive material 61 into the troughs 67. It is preferred that the toughs 67 be sufficiently larger than the lugs 62 to permit movement of about 0.125 inch in each of the directions previously discussed in Example 1. The inner surface of the troughs 67 is formed by the outer surface of the yoke 31. Therefore, no second passageways 50 are required as described in Example 1.

A second hardened adhesive material 69 substantially fills the troughs 67 around each of the lugs 62. The second adhesive material 69 also contacts the outer surface of the yoke 31 at the inner side of the trough 67 as shown in Figures 4 and 5, thereby rigidly fixing the yoke 31 in the housing 63. The preferred second adhesive material 69 is the same as the second adhesive material 42 described in Example 1. The second adhesive material 69 fixes the housing 63 in a permanent nonadjustable position on the platform 51 and fixes the yoke 31 in a permanent nonadjustable position in the housing 63.

An Adjustable Yoke Mounting

Example 3: A third embodiment is shown in Figures 6 and 7. Referring to Figure 6, a platform 70 is fixed in a nonadjustable manner to the glass envelopes 21 of a tube 20 in substantially the same position as described in Example 1. The platform 70 contains one peripheral shallow recessed portion or groove 71 and first passageways 72 therethrough. For example, a preferred groove 71 is about 0.031 inch deep and about 0.75 inch wide. A first hardened adhesive material 73 corresponding to the first hardened adhesive material 39 in Example 1 fills at least portions of the groove 71, thereby adhering the platform 70 to the funnel 23.

A yoke 31 is mounted in a housing 74 to form a yoke assembly 75. The housing 74 is toroidal in shape and has a split 76a that extends radially through its thickness. A clamp screw and nut 76 bridge the split and engage shoulders on each side of the split to permit the housing 74 to be tightened over a portion of the exterior surface of the yoke 31 to maintain the yoke 31 in the housing 74 substantially as shown in Figures 6 and 7.

The yoke 31 is clamped to the housing 74 as described above and the housing 74 fixed to the platform 70. Although the relation of the housing 74 and platform 70 is fixed, it is adjustable as will be described. The platform 70 includes projections or threaded lugs 77 extending from the platform 70 substantially parallel to the tube axis 35 in the direction of the neck 24. It is preferred that three threaded lugs 77 are positioned equally spaced around the platform 70 substantally as shown in Figure 6. The heads of the threaded lugs 77 are counterbored within the groove 71 and retained by the first hardened adhesive material 73.

The housing 74 includes openings 78 therethrough corresponding to each of the threaded lugs 77 for mounting the housing 74 on the platform 70. Each of the openings 78 is larger than each of the threaded lugs 77 to permit translational adjustment of the yoke 31 with the tube 20, as previously described in Example 1. Internally threaded adjustment wheels 79 with a gear-shaped periphery are positioned on the threaded lugs 77 between the platform 70 and the housing 74. The yoke assembly 75 is positioned over the threaded lugs 77 against the adjustment wheels 79, and internally threaded nuts 80 and washers 81 are mounted on the ends of the threaded lugs 77 against the housing 74 as shown in Figure 7 to clamp the yoke assembly 75 therebetween to fix the housing 74 to the platform 70 in a mechanically adjustable position.

Mounting the Yoke on the Platform

In a preferred method for mounting a yoke 31 on the envelope 21 of a cathode-ray tube, a platform is positioned adjacent the envelope 21. It is preferred that the platform contain at least one recessed portion (such as recesses 36 of Example 1) on the inner surface of the platform against the envelope 21. The platform fits around the envelope 21 and is adjusted to be substantially perpendicular to the axis 35 of the tube 20.

A first liquid adhesive material is then injected between the recessed portion of the platform and the envelope 20. A yoke assembly comprised of a yoke 31 and yoke housing is positioned adjacent the platform. The yoke assembly is adjusted in position with respect to the tube 20 until an operational relationship of the combination is obtained. The yoke assembly is then fixed to the platform. The yoke assembly may be fixed to the platform in the permanent nonadjustable position of Example 1 or Example 2 as will be described in Method A and Method B respectively, or fixed to the platform in the adjustable position of Example 1 or Example 2 as will be decribed in Method A and Method B respectively, or fixed to the platform in the adjustable position of Example 2, as will be decribed in Method C.

Method A: Referring to Figures 2 and 3, a platform 29 is assembled over the neck 24 of the tube 20 and positioned with the con-

toured inner surface 33 in contact against the funnel 23.

A first adhesive material 39 is heated to a melting temperature, and a quantity thereof is injected in liquid form through the first passageways 37 until at least a portion of the four recessed positions 36 between the platform 29 and funnel 23 are filled. The first adhesive material 39 cools very rapidly from contact with the recessed portions 36 and envelope 21, solidifying in about 5 seconds. In Example 1, the platform 29 is fixed on the tube 20 in a permanent nonadjustable position. It is preferred that the platform 29 be fixed on the tube 20 prior to mounting of the yoke assembly 30, as will be described.

The yoke 31 and yoke housing 32 are temporarily preassembled into a yoke assembly 30 prior to mounting of the yoke assembly 30 on the tube 20. The yoke assembly 30 is preassembled by forcing the yoke 31 into the yoke housing 32, thereby deflecting the flexible hooks 41 shown in Figure 3 until the yoke 31 is fully seated in the yoke housing 32 and the flexible hooks 41 snap back into a substantially undeformed position over the end of the yoke 31, thereby retaining the yoke 31 in the housing 32 as shown in Figure 3.

The yoke assembly 30 with yoke 31 fixed therein by the flexible hooks 41 is then positioned in an electrical test set (not shown), which simulates a television receiver. The yoke assembly 30 is placed in a fixture adapted for moving the yoke assembly 30 in the directions previously described. A tube 20 with platform 29 attached thereon with a first hardened adhesive material 39, as previously described, is assembled in the test set in a manner such that the yoke assembly 30 is positioned substantially centered on the axis 35 of the tube 20, and the lug pairs 44 on the platform 29 are respectively engaged within the corresponding troughs 45 in the yoke housing 32.

The tube-and-yoke combination is now electrically operated to produce a test raster display on the screen 25. The yoke assembly 30 is then moved in the directions previously described until the desired operational position of the yoke assembly 30 on the tube 20 is obtained for optimum performance of the combination.

In adjusting the yoke assembly 30 for a 17-inch color television picture tube, the tube 20 is positioned in a horizontal viewing position with the yoke assembly 30 positioned thereon as previously described. The tube 20 and the yoke assembly 30 are then operated to provide a test raster on the screen 25. The optimum operational position of the yoke assembly 30 is found by first moving it axially in a direction shown by arrow Z in Figure 1 with the tube to align the color centers on the screen 20 as is known. The yoke assembly 30 is then rotated in a direction shown by arrow R in Figure 2 to provide a substantially vertical raster line and a substantially horizontal raster line. The yoke assembly 30 is then translated vertically in a direction shown by arrow Y in Figure 2 to superimpose substantially the vertical and horizontal raster lines for each color, and the yoke assembly 30 is translated horizontally in a direction shown by arrow X in Figure 2 to substantially equalize the total size of the raster for each color. The yoke assembly 30 may also be tilted in a direction shown by arrow T in Figure 1 with respect to the tube axis 35 to optimize the above conditions.

The yoke assembly 30 and the tube 20, maintained in their relative adjusted position, are moved to an upright position in the fixture so that the axis 35 is vertical with the neck 24 extending down. It is preferred that this occur in the test set to permit a subsequent optional retest, as will be described. This is accomplished by orienting and holding the tube 20 in a fixture and then pivoting the fixture to move the tube 20 and yoke assembly 30 to an upright position with the neck 24 extending downwardly.

With the yoke assembly 30 and tube 20 in the upright adjusted position, a second liquid adhesive material 42 is injected in the liquid state into the open end of each of the troughs 45, substantially filling each of the troughs 45. With the tube 20 in the upright position, the troughs 45 open upwardly, and visual control can be used to meter the quantity of adhesive that is injected. It is preferred that the second liquid adhesive material be injected between the lug pairs 44 so that it flows bilaterally around each of the lugs 43, thereby substantially filling the troughs 45 around the lug pairs 44.

In addition, the second liquid adhesive material 42 flows through each of the second passageways 50 until it contacts the outer surface of the yoke 31, substantially filling the second passageways 50. Although the yoke 31 may not accurately conform to the inside surface 40 of the yoke housing. 32, thin sections of the second adhesive material 42 harden so rapidly that a minimum amount of adhesive material flows through any cracks or irregularities between the yoke 31 and yoke housing 32. Within about 15 seconds, the second adhesive material 42 hardens, and within about 1 minute, the combination may be removed from the test set. In some tube types, the first adhesive material 39 may be restrained by the chambers 38 thereby causing breakage of the glass envelope from low temperatures such as about at about —40°F. When this occurs, the structure of Example 2 and Method B eliminates this problem.

The combination can be retested subsequent to the application and hardening of

the second adhesive material 42 before removal of the combination from the test set. It is preferred that, during this retest, the yoke assembly 30 is freely supported on the tube 20 as in a television receiver.

Method B: Method B is very similar to Method A, the difference primarily being due to the structural differences of the platform 51 and housing 63. Referring to Figures 4 and 5, a platform 51 is assembled over the neck 24 of the tube 20, and a quantity of a first melted adhesive material 61 is injected into the chamber 60 through passageway 59. The first adhesive material 61 cools very rapidly from contact with the room temperature, hardening in less than 15 seconds.

Since the first adhesive material 61 is injected through four passageways 59, it flows bilaterally from each of the four passageways 59 until the bilateral flows from each passageway meet to substantially fill the chamber 60.

Generally, the injection pressure, the injection time, and the injection temperature can be controlled to provide a desired amount of the first adhesive material. If a controlled amount of adhesive material which is less than the amount required to fill the chamber 60 is injected into each of the four passageways 59, four separate bodies of the first adhesive material 61 will be formed. The four bodies so formed would be substantially the same as the four recessed portions of the first adhesive material 39 of Example 1.

The body or bodies of first adhesive material 61 formed in the chamber 60 decrease in thickness towards the peripheral edges of the platform inner surface 52. Furthermore, the thinner edge thicknesses of adhesive material 61 are retained by the flexible side portions 58a and 58b of the platform 51. This permits a small amount of movement of the platform 51 to compensate for differences in coefficients of expansion and contraction of the glass funnel, the platform, and the adhesive material during temperature changes.

The yoke 31 and yoke housing 63 are preassembled into a yoke assembly 64 prior to mounting of the yoke assembly 64 on the tube 20. The yoke assembly 64 is preassembled by forcing the yoke 31 into the yoke housing 63, thereby deflecting the flexible hooks 66 shown in Figure 5 until the yoke 31 is fully seated against the retainers 65. After the yoke 31 is fully seated in the yoke housing 63, the flexible hooks 66 snap back into a substantially undeformed position over the end of the yoke 31 as shown in Figure 5, thereby temporarily retaining the yoke 31 in the housing 63.

The yoke assembly 64 with yoke 31 retained therein by the flexible hooks 66 and retainers 65 is then positioned in an electrical test set (not shown) which simulates a television receiver. The yoke assembly 64 and a tube 20 with platform 51 attached thereon are placed in a test set as described in Example 1 with the lugs 62 and troughs 67 engaged. The yoke asembly 64 is then adjusted until a desired operational relationship of the combination is obtained, such as described in Example 1.

With the yoke assembly 64 and the tube 20 maintained in an operational relationship at their optimum adjusted position, a second melted adhesive material 69 is injected through through passageways 68 from the bottom of the troughs 67. It is preferred that the melted second adhesive material 69 is injected simultaneously through all four trough passageways 68. The injected second adhesive material 69 then flows into the troughs 67 around the lugs 62. In practice, a controlled amount of the second adhesive material 69 is injected sufficient to bond the lugs 62 in the troughs 67. With a hot-melt second adhesive material 69 as previously described in Example 1, the material solidifies in the troughs 67 in less than 30 seconds.

Method B utilizes the same fixture as Method A to position the tube vertical for injection of the second adhesive material 69 into the troughs. Since the troughs 67 also include trough passageways 68, the second adhesive material 69 can be injected upward into the troughs 67. This permits filling the troughs 67 when additional chassis components or simulated components do not permit injection of the second adhesive material into the open end of the troughs as described in Method A.

Method C: Referring to Figures 6 and 7, a platform 70 is assembled on the neck 24 of the tube 20 and positioned with the contoured inner surface in contact against the funnel 23. The first melted adhesive material 69 is injected into the groove 71 through first passageways 72 to fix the platform 70 on the tube 20 in a permanent nonadjustable position such as previously described in Methods A and B.

The platform 70 and the threaded lugs 77 are preassembled prior to mounting on the tube 20. The heads of the threaded lugs 77 are counterbored within the groove 71, the first hardened adhesive material 69 substantially filling the counterbore to retain the lugs 77 in a fixed position in the platform 70.

The yoke 31 and the yoke housing 74 are preassembled into a yoke assembly 75 prior to mounting on the tube 20. The yoke assembly 75 is preassembled by inserting the yoke 31 into the housing 74 and tightening the clamp screw 76 to clamp the housing 74 around the yoke 31.

The adjusting wheels 79 are threaded over the threaded lugs 77 until they are sub-

stantially against the surface of the platform 70 as shown in Figure 7.

The yoke assembly 75 is then temporarily positioned in a test set on a fixture which provides movement in the direction X, Y, Z, R and T previously described in Method A.

The tube 20 is then positioned in the test set in a horizontal viewing position with the openings 78 in the yoke housing 74 engaging over the corresponding threaded lugs 77. The tube is positioned wth the yoke assembly 75 substantially centered on the axis 35 of the tube 20. The fixture maintains the yoke assembly 75 forced against all the adjusting wheels 79. The locking nuts 80 and washers 81 are started on each of the threaded lugs 58, but are not tightened within 0.125 inch from the yoke housing 54.

The tube-and-yoke combination is now operated, and the yoke assembly 75 is moved, in the directions described in Method A, until the optimum operational position of the yoke assembly 75 on the tube 20 is achieved. In adjusting the position of a yoke assembly 75 for a 17" color television picture tube to obtain the desired operational relationship of the tube-yoke combination, the yoke assembly 75 is first moved axially in a direction shown by arrow Z in Figure 1 towards the neck 24 of the tube 20 by rotating each adjusting wheel 79 an equal amount. This aligns the colour centers of the three electron beams on the screen as is known. The yoke assembly 75 is then rotated in a direction shown by arrow R in Figure 6 to align the vertical raster lines with the vertical direction of the screen and the horizontal raster lines with the horizontal direction of the screen. The yoke assembly 75 is then translated vertically in a direction shown by arrow Y in Figure 6 and horizontally in a direction shown by arrow X in Figure 6 as described in Method A to superimpose the individual raster lines from each of the three electron guns and superimpose the total rasters, for instance as claimed in our Patent Application 1779/72 (Serial No. 1389423. The yoke assembly 75 may also be tilted in a direction shown by arrow T in Figure 1 with the axis 35 by unequal adjustment of the adjusting wheels 79 to optimize the yoke position.

After the desired operational position is obtained, the adjusting wheels and lock nuts 80 with washers 81 are tightened against the yoke assembly 75 to fix the yoke assembly 75 to the platform 70 in an adjustable position. The yoke assembly 75 may be disengaged from the set-up fixture, and the combination retested to ensure that no movement of the combination occured during the injection of the second adhesive material 69.

GENERAL CONSIDERATIONS

Although the platform is described to contain one peripheral recessed portion or groove or four recessed portions in the preferred embodiments, other shapes are possible, such as a multiple number of parallel narrow grooves on the periphery of the inside contoured surface. Since a fast solidifying adhesive material is used, the length of its flow path and solidifying time partially determines the size and shape of the recessed portions. Empirical tests have shown that the adhesive material tends to cool and solidify too fast to apply through one passageway to encircle the envelope, and therefore multiple passageways are required for each peripheral groove.

Furthermore, the volume of the recessed portions determines the quantity of adhesive material used. Economies in manufacture can be achieved if the recessed portion, or portions, is sized no larger than necessary to achieve structural strength and rigidity.

In the embodiment for fixing the yoke assembly to the platform in a permanent nonadjustable manner, a peripherical tongue and groove can be used, but this embodiment may require and uneconomical amount of adhesive material. The preferred embodiment provides structural rigidity with a minimum quantity of a second adhesive material. The quantity of second adhesive material is also essentially constant regardless of the final position of yoke housing and platform.

Although a hot-melt adhesive material is described, other known adhesive materials such as paraffin wax or epoxy resin systems may be used if the solidification or curing time is not important. It is necessary for this combination and method only that the particular adhesive material selected satisfies the structural requirements as previously discussed. The adhesive material may also be applied in a bead form to the platform prior to assembly to the tube, rather than injected as described.

The above described invention has been directed to embodiments including color television tubes having a plurality of electron guns, or gun means providing a plurality of electron beams of different arrangements. However the invention is not limited to the described embodiments, but also has utility with other types of cathode ray tubes, such as single beam cathode ray tubes for black and white picture reproduction, or single or plural beam television camera tubes. Thus, the utility of the invention may extend to all types of cathode ray tubes requiring a deflection or focussing yoke, wherein it is desirable to position the yoke and fix it in an optimum relationship with the tube or the electron beams of the tube. As described above, the invention has particular utility with plural beam tubes, wherein a plurality of rasters are formed by scanning the beams over the tube screen. The permanent fixing of the yoke

with respect to the electron beams of the tube, as described, provides an optimum coincidence of one raster with another, when the several rasters are superimposed.

WHAT WE CLAIM IS:—

1. A cathode ray tube, a magnetic deflection yoke having a housing, and a platform rigidly adhered to the external surface of said tube with a hardened adhesive material, said housing including a plurality of recesses, a corresponding number of lugs extending from the platform with each of the lugs extending within and spaced from a different one of the recesses, and a hardened adhesive material filling the recesses to fix the lugs within the corresponding recesses.

2. A cathode ray tube according to claim 1 wherein the hardened adhesive material between the tube and the platform provides the sole support for the platform and the yoke thereon.

3. A cathode ray tube according to claim 2 wherein the platform includes at least one peripheral recessed portion forming at least one chamber between the external surface of the tube and the platform.

4. A cathode ray tube according to claim 3 wherein the platform has plural recessed portions therein and at least three projections extending therefrom, the first-mentioned adhesive material is located within at least a portion of the or each chamber, and the yoke housing has respective indentations enclosing and spaced from the projections of the platform, the second-mentioned adhesive material being located wthin the indentations and substantially surrounding the projections.

5. A method of mounting the yoke on a tube, for making the tube defined in claim 4, comprising positioning a platform against said tube, said platform having a plurality of projections extending therefrom, injecting a first hardenable liquid adhesive material between at least portions of said positioned platform and said tube, permitting said first adhesive material to harden and to fix said platform on said tube, positioning a housing for said yoke with said yoke therein, adjacent said fixed platform, said housing having a plurality of indentations corresponding to said projections, each of said projections being placed within and spaced from each of said indentations, while maintaining each of said projections within and spaced from each of said indentations, adjusting the position of said housing with respect to said fixed platform to obtain the desired operational relationship of said yoke with said tube then injecting a second liquid adhesive material between at least portions of said projections and said indentations, and then permitting said second adhesive material to harden and to fix said housing with said yoke therein on said platform.

6. A cathode ray tube, a magnetic deflection yoke, and a platform fixed to said yoke and to the external surface of said tube, said platform including at least one peripheral recessed portion therein forming a chamber between the external surface of said tube and said platform, a hardened adhesive material within said chamber between said platform and said tube, said adhesive material providing the sole support for said platform on said tube.

7. A cathode ray tube according to claim 6, wherein the inner surface of said platform includes at least two recessed portions therein substantially equally spaced on said inner surface forming chambers between said platform and said tube, said adhesive material being within at least portions of each of said chambers.

8. A cathode ray tube according to claim 6 or 7 comprising a plurality of indentations in said housing, a corresponding plurality of projections extending from said platform, each of said projections being placed within and spaced from each of said indentations, and a second adhesive material between at least portions of each of said projections and indentations.

9. A method of providing the tube defined in claim 6, comprising the steps of positioning a platform against said tube, said platform including at least one peripheral recessed portion therein forming a chamber between said tube and said platform and at least a first passageway into said receissed portion, injecting a first hardenable liquid adhesive material into said chamber through said passageway, said first adhesive material being between at least portions of said positioned platform and said tube and filling at least portions of said chamber, said adhesive material hardening to adhere said platform to fixed areas on said external surface of said tube, permitting said first adhesive material to harden and to fix said platform on said tube, positioning a housing for said yoke, with said yoke therein, adjacent said fixed platform, adjusting the position of said housing with respect to said fixed platform to obtain the desired operational relationship of said yoke with said tube and then mounting said housing with said yoke therein to said platform in said desired operational relationship.

10. A method according to claim 9, wherein the inner surface of said platform includes at least two peripheral recessed portions therein substantially equally spaced on said inner surface forming chambers between said tube and said platform and a first passageway into each of said recessed portions, said injecting step comprising injecting said first adhesive material into each of said chambers through each of said passageways, said first liquid adhesive material filling at least portions of

with respect to the electron beams of the tube, as described, provides an optimum coincidence of one raster with another, when the several rasters are superimposed.

WHAT WE CLAIM IS:—

1. A cathode ray tube, a magnetic deflection yoke having a housing, and a platform rigidly adhered to the external surface of said tube with a hardened adhesive material, said housing including a plurality of recesses, a corresponding number of lugs extending from the platform with each of the lugs extending within and spaced from a different one of the recesses, and a hardened adhesive material filling the recesses to fix the lugs within the corresponding recesses.

2. A cathode ray tube according to claim 1 wherein the hardened adhesive material between the tube and the platform provides the sole support for the platform and the yoke thereon.

3. A cathode ray tube according to claim 2 wherein the platform includes at least one peripheral recessed portion forming at least one chamber between the external surface of the tube and the platform.

4. A cathode ray tube according to claim 3 wherein the platform has plural recessed portions therein and at least three projections extending therefrom, the first-mentioned adhesive material is located within at least a portion of the or each chamber, and the yoke housing has respective indentations enclosing and spaced from the projections of the platform, the second-mentioned adhesive material being located wthin the indentations and substantially surrounding the projections.

5. A method of mounting the yoke on a tube, for making the tube defined in claim 4, comprising positioning a platform against said tube, said platform having a plurality of projections extending therefrom, injecting a first hardenable liquid adhesive material between at least portions of said positioned platform and said tube, permitting said first adhesive material to harden and to fix said platform on said tube, positioning a housing for said yoke with said yoke therein, adjacent said fixed platform, said housing having a plurality of indentations corresponding to said projections, each of said projections being placed within and spaced from each of said indentations, while maintaining each of said projections within and spaced from each of said indentations, adjusting the position of said housing with respect to said fixed platform to obtain the desired operational relationship of said yoke with said tube then injecting a second liquid adhesive material between at least portions of said projections and said indentations, and then permitting said second adhesive material to harden and to fix said housing with said yoke therein on said platform.

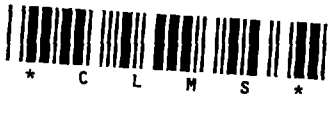
6. A cathode ray tube, a magnetic deflection yoke, and a platform fixed to said yoke and to the external surface of said tube, said platform including at least one peripheral recessed portion therein forming a chamber between the external surface of said tube and said platform, a hardened adhesive material within said chamber between said platform and said tube, said adhesive material providing the sole support for said platform on said tube.

7. A cathode ray tube according to claim 6, wherein the inner surface of said platform includes at least two recessed portions therein substantially equally spaced on said inner surface forming chambers between said platform and said tube, said adhesive material being within at least portions of each of said chambers.

8. A cathode ray tube according to claim 6 or 7 comprising a plurality of indentations in said housing, a corresponding plurality of projections extending from said platform, each of said projections being placed within and spaced from each of said indentations, and a second adhesive material between at least portions of each of said projections and indentations.

9. A method of providing the tube defined in claim 6, comprising the steps of positioning a platform against said tube, said platform including at least one peripheral recessed portion therein forming a chamber between said tube and said platform and at least a first passageway into said receissed portion, injecting a first hardenable liquid adhesive material into said chamber through said passageway, said first adhesive material being between at least portions of said positioned platform and said tube and filling at least portions of said chamber, said adhesive material hardening to adhere said platform to fixed areas on said external surface of said tube, permitting said first adhesive material to harden and to fix said platform on said tube, positioning a housing for said yoke, with said yoke therein, adjacent said fixed platform, adjusting the position of said housing with respect to said fixed platform to obtain the desired operational relationship of said yoke with said tube and then mounting said housing with said yoke therein to said platform in said desired operational relationship.

10. A method according to claim 9, wherein the inner surface of said platform includes at least two peripheral recessed portions therein substantially equally spaced on said inner surface forming chambers between said tube and said platform and a first passageway into each of said recessed portions, said injecting step comprising injecting said first adhesive material into each of said chambers through each of said passageways, said first liquid adhesive material filling at least portions of



each of said chambers and hardening to adhere said platform on said tube.

11. A method according to claim 9 or 10, wherein said housing has at least three identations and said platform has at least three corresponding projections, each of said projections being within and spaced from each of said corresponding indentations, said mounting step comprising injecting a second liquid adhesive material between at least portions of said projections and said indentations.

12. A method of mounting a magnetic deflection yoke on a cathode ray tube substantially as hereinbefore described with reference to Figures 1, 2 and 3; or to Figures 4 & 5; or to Figures 6 & 7.

13. A cathode ray tube having a magnetic deflection yoke mounted thereon, substantially as described hereinbefore with reference to Figures 1, 2 and 3; or to Figures 4 & 5; or to Figures 6 & 7.

JOHN A. DOUGLAS,
Chartered Patent Agent,
50 Curzon Street,
London W1Y 8EU,
Agent for the Applicant.

Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1975.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.