May 23, 1967 C. W. BURKE ETAL 3,321,577

ADJUSTABLE MOUNT FOR A CATHODE RAY TUBE

Filed July 5, 1963

3 Sheets-Sheet 1

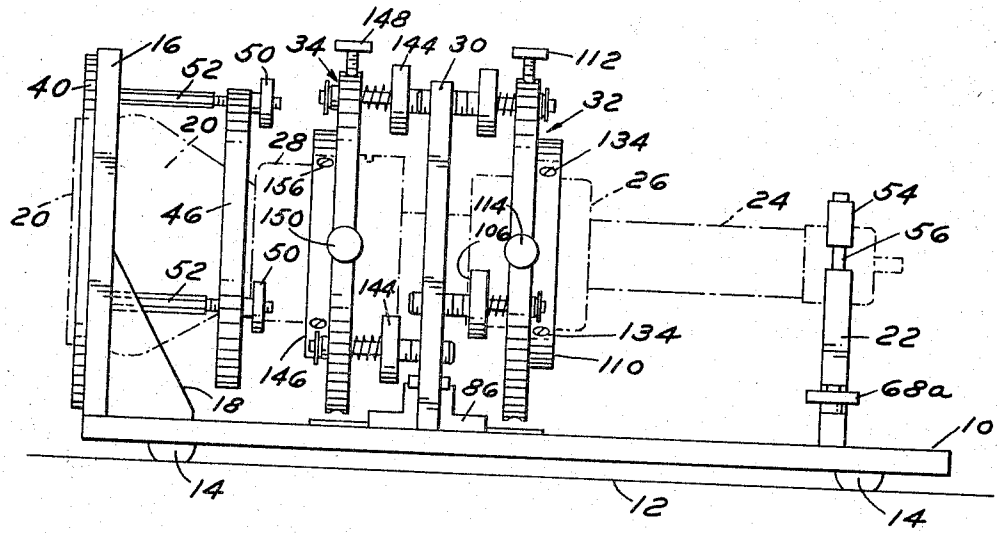


FIG. 1

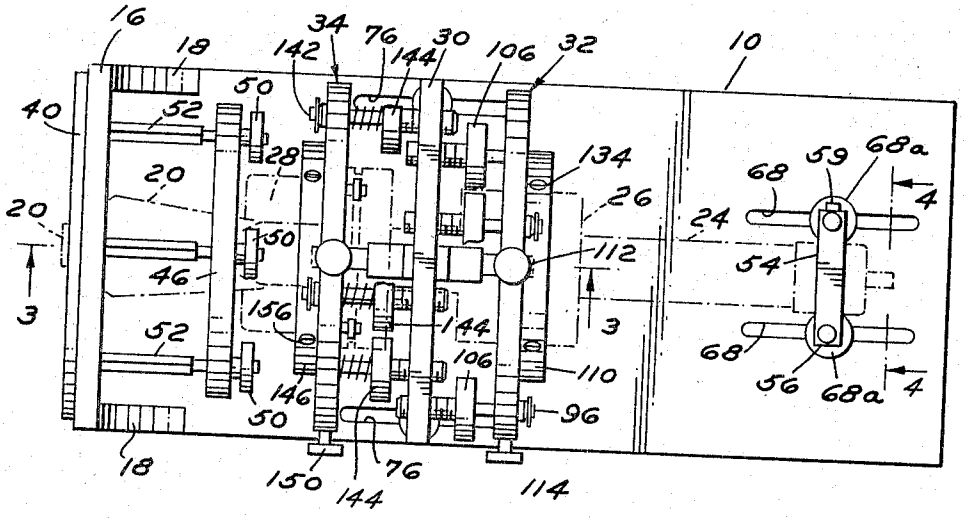


FIG. 2

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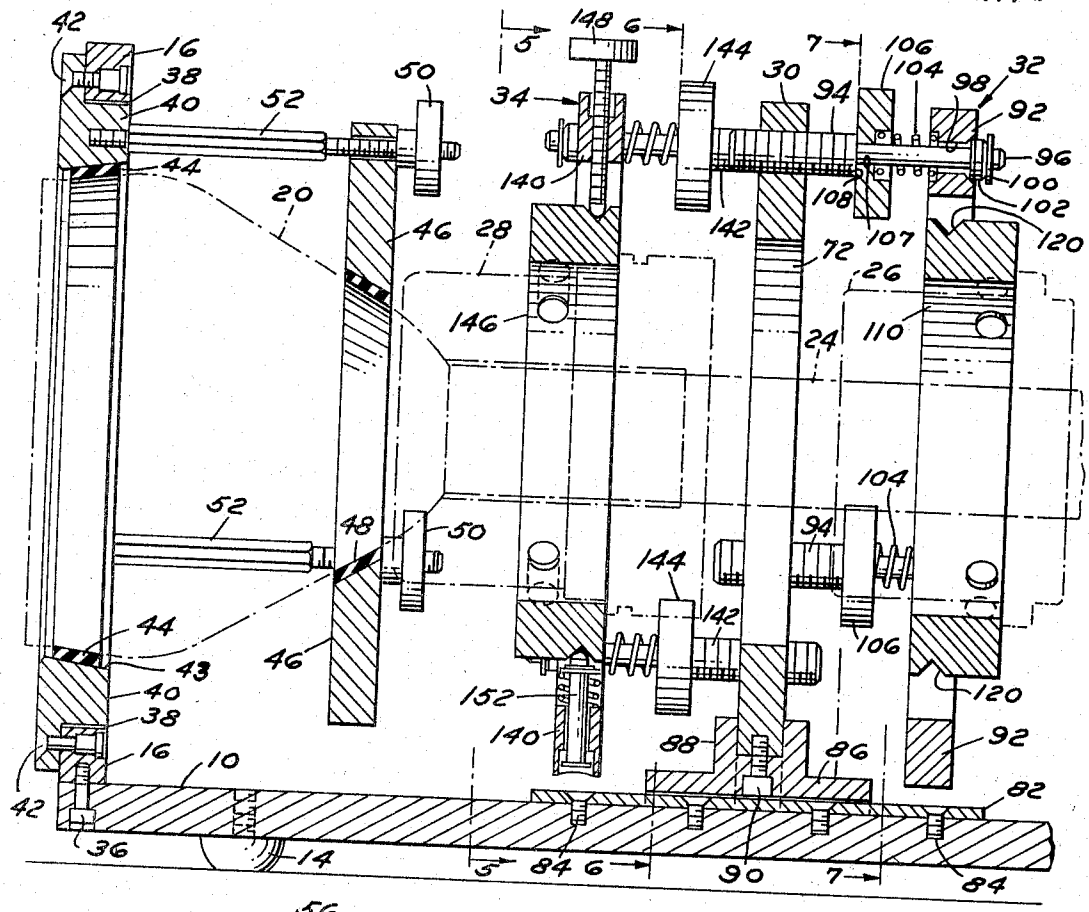


Fig. 3

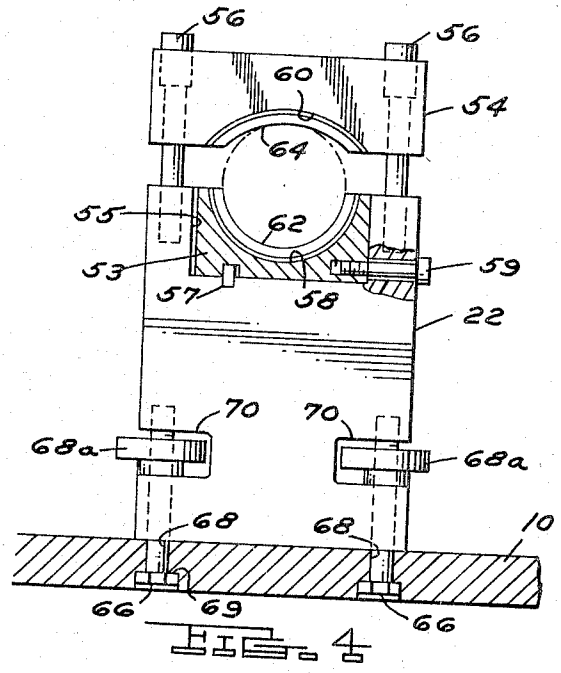


Fig. 4

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FIG. 5

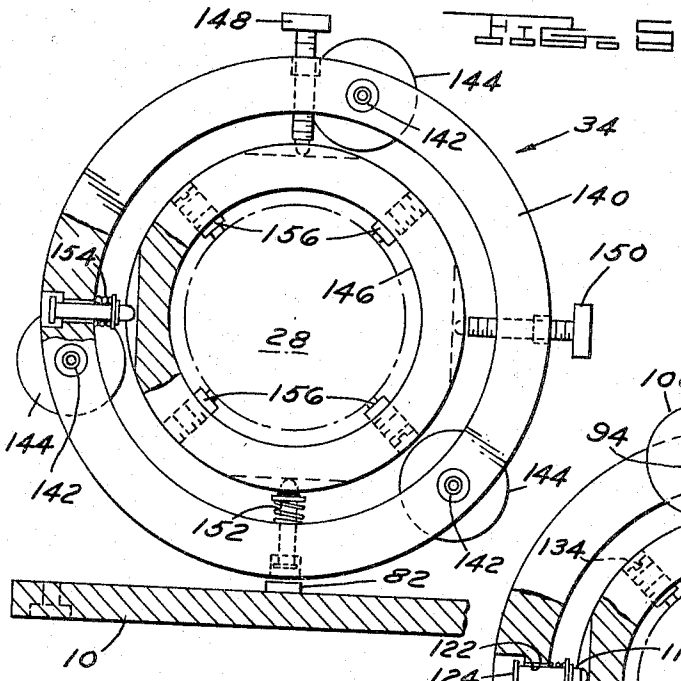


FIG. 7

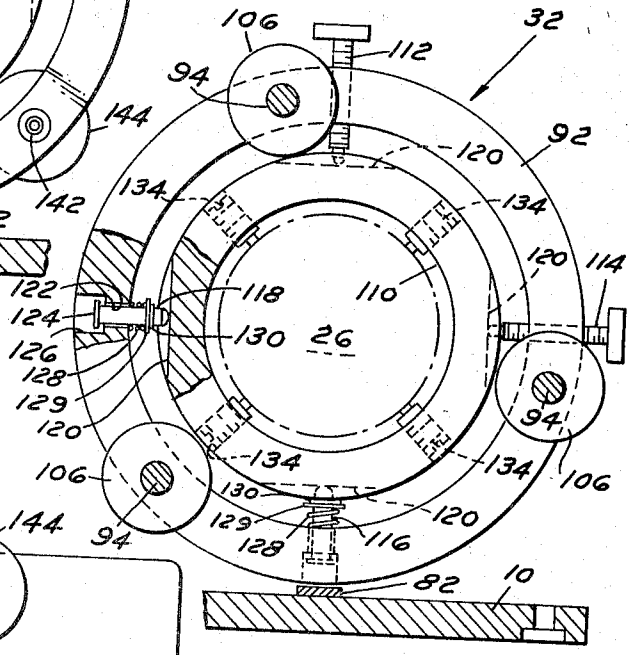
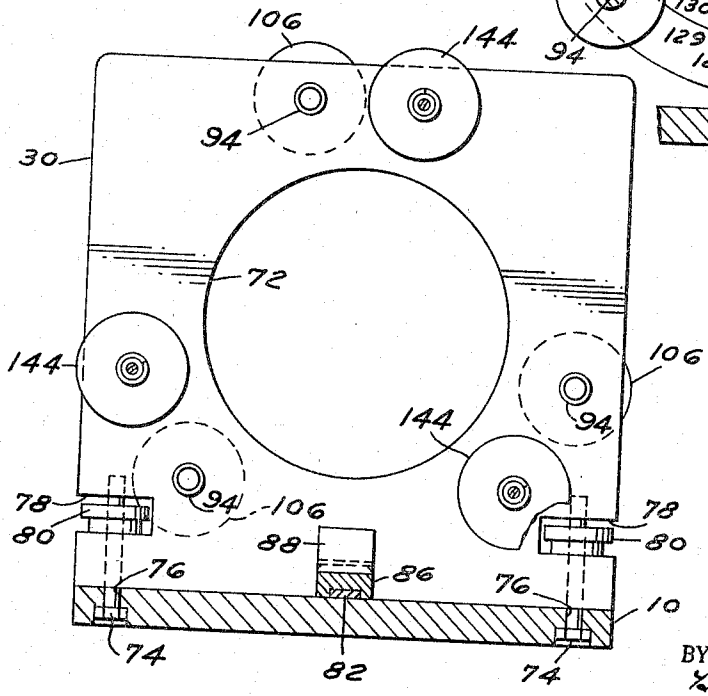


FIG. 6



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ADJUSTABLE MOUNT FOR A CATHODE RAY TUBE

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10 Claims. (Cl. 178—7.8)

This invention relates to an adjustable mount for supporting and focusing a cathode ray tube.

Apparatus employing cathode ray tubes normally includes an arrangement for supporting the tube and for releasing it for servicing or replacement. During the manufacture of cathode ray tubes, relatively wide tolerances are permissible in the positioning of the elements of the electron gun and as a result the tubes do not produce their cathode ray beams in the same position and direction. It is therefore apparent that when one tube is substituted for another in the apparatus, it becomes necessary to adjust the direction of the electron beam, and devices are commonly provided which make it possible to adjust the direction of the beam so that the spot on the fluorescent screen of the cathode ray tube appears at the desired position. It is particularly important to provide for micro adjustment of the deflection yokes and focus coils when working with high resolution cathode ray equipment in laboratory and test setups. However, the presently available mounts for this purpose are often costly and cumbersome in construction and operation and/or do not accommodate a sufficiently wide range of types and sizes of cathode ray tubes.

Accordingly, it is an object of the present invention to provide an improved precision cathode ray tube mount which facilitates micro positioning and high accuracy adjustment of the deflection yoke and focus coil relative to the cathode ray tube.

Another object is to provide an adjustable mount of the above character adapted to support the cathode ray tube on both ends to minimize vibration and to permit the tube to be rotated without affecting the yoke and coil positioning.

A further object is to provide a mount of the above character adapted to receive and support various sizes and types of cathode ray tubes, deflection yokes and focus coils which requires only minor disassembly of the mount when interchanging tubes.

Yet another object is to provide an improved cathode ray tube mount assembly adapted to achieve the above objects with simplified structure in order to reduce manufacturing costs and adjustment time without sacrificing precision control of the relative positioning of the cathode ray tube, focus coil and deflection yoke.

Other objects, advantages and features of the invention will become apparent from the following description taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a side elevational view of the cathode ray tube holder of the invention with a cathode ray tube and associated focus coil and deflection yoke indicated in phantom by broken lines.

FIG. 2 is a plan view of the apparatus of FIG. 1.

FIG. 3 is an enlarged fragmentary vertical section taken on the line 3—3 of FIG. 2.

FIG. 4 is a fragmentary vertical section taken on the line 4—4 of FIG. 2, with portions broken away and sectioned to illustrate detail.

FIGS. 5, 6 and 7 are fragmentary vertical sections taken respectively on the lines 5—5, 6—6 and 7—7 of FIG. 3, portions of FIGS. 5 and 7 being broken away and sectioned to illustrate detail.

Referring to FIGS. 1 and 2, the cathode ray tube mount

or holder of the present invention comprises a rectangular base 10 adapted to be supported on a horizontal surface 12 by four resilient feet 14. An upright plate 16, braced by gussets 18, supports the bowl 20 of a cathode ray tube, and another upright plate 22 near the rear of base 10 supports the gun end of the tube neck 24. The usual focusing coil 26 and deflection yoke 28 are supported about neck 24 but independently thereof by a central supporting assembly which includes an upright plate 30, a focus coil ring assembly 32 adjustably mounted on one side thereof and a deflection yoke ring assembly 34 adjustably mounted on the other side thereof.

The front plate 16 as well as the other structure for supporting bowl 20 of the tube are shown in more detail in FIG. 3. Plate 16 is rectangular and is secured along its bottom edge to base 10 by cap screws 36. Plate 16 has a cylindrical center opening 38 which receives an adaptor ring 40 removably secured by four screws 42 to the front face of plate 16. Ring 40 in turn has a center opening 43 complementary to the particular shape of bowl 20 of the cathode ray tube, herein illustrated as a fan-shaped bowl of relatively narrow, rectangular section. To accommodate various types and sizes of cathode ray tubes it is intended that a set of adaptor rings 40 be provided, one for each type of tube bowl. A rubber liner 44 is bonded to the periphery of ring opening 43 to resiliently encircle the converging end of bowl 20. The bowl is drawn against adaptor ring 40 by another adaptor ring 46 centrally apertured and provided with a rubber lining 48 adapted to bear against the diverging portion of bowl 20. Ring 46 is drawn towards ring 40 by taking up on three knurled thumb nuts 50, one on each of three spacer shafts 52 which are threaded into ring 40 at one end and pass through an associated hole in ring 46 at the other end.

The support for the gun end of neck 24 of the tube is shown in FIGS. 1, 2 and 4 and comprises plate 22, an insert block 53 mounted in a cut-out 55 in the upper end of plate 22 and a top block 54 secured by a pair of cap screws 56 to the upper end of plate 22. Semi-circular notches 58 and 60 (FIG. 4), of small and large radius respectively and each having a rubber liner 62 and 64 secured respectively thereto, are provided in the adjacent edges of blocks 53 and 54 to form an adjustable split clamp for the neck of the tube. Upper block 54 accommodates a range of tube neck sizes, but it is preferred that a separate lower block 53 be provided for each different neck size. To this end, block 53 is removably secured to plate 22 by a vertical locating pin 57 and a horizontal cap screw 59 threaded into block 53 but unthreaded in a smooth bore in plate 22 as shown in FIG. 4. Plate 22 is secured to base 10 by a pair of upright bolts 66 which pass through longitudinal slots 68 in base 10 and then upward into smooth bores in plate 22. A thumb nut 68*a* is threaded on each bolt 66 within a rectangular notch 70 in each side of plate 22 for drawing the bolt heads up against the countersunk shoulder 69 of slot 68 to clamp plate 22 firmly to base 10. Nuts 68*a* are loosened to permit plate 22 to be moved lengthwise along slot 68 as required for the particular tube length.

The details of the central sub-assembly for supporting focus coil 26 and deflection yoke 28 are best seen in FIGS. 3 and 5–7. Plate 30 is rectangular and has a center hole 72 large enough to permit yoke 28 as well as focus coil 26 and neck 24 to be passed axially therethrough. Plate 30 is clamped to base 10 by a pair of hex head bolts 74 (FIG. 6) which are inserted upwardly from the bottom of the base through longitudinal slots 76 therein (FIGS. 2 and 6) and into smooth bores in plate 30. The sides of plate 30 are notched at 78 to receive thumb nuts 80 which are threaded on bolts 74

for drawing plate 30 down tight against base 10 in a manner similar to rear plate 22. When nuts 80 are loosened, plate 30 may be moved longitudinally along base 10 within the limits of slots 76, this movement being guided by guide strip 82 (FIGS. 3 and 6) secured by screws 84 to base 10. A precision guide block 85 is notched on its undersides to slide on strip 82 and has an upright center portion 88 which is slotted to receive plate 30. Plate 30 is likewise slotted to receive block 86. A cap screw 90 (FIG. 3) secures the guide block to plate 30.

Center plate 30 provides support for both the focus coil ring assembly 32 and yoke ring assembly 34. Ring assembly 32 comprises an outer ring 92 (FIGS. 3 and 7) which is adjustably secured to plate 30 by three finely threaded screws 94 threaded into plate 30 at 120 degree intervals. Screw 94 has a reduced diameter stem 95 (FIG. 3) which extends through a hole 98 in ring 92 with a large clearance fit. Ring 92 is secured on stem 96 by a retaining ring 100 which snaps into a groove of the stem and backs up a beveled swivel washer 102 which bears against the chamfered end of hole 98. Ring 92 is pressed against washer 102 by a coil spring 104 which encircles stem 96 and butts at one end against plate 92 in the countersunk end of hole 98 and at the other end against a knurled knob 106 in a countersunk portion of a center hole 107 thereof. Knob 106 is press fitted on stem 96 so as to butt against a shoulder 108 of screw 94.

Ring assembly 32 also includes an inner ring 110 supported within and spaced from the I.D. of outer ring 92 (FIGS. 3 and 7) by a pair of precision adjusting thumb screws 112 and 114 threaded radially into ring 92 at the top and one side thereof respectively, and by a pair of spring biased pins 116 and 118 slidably mounted in outer ring 92 and respectively diametrically opposed to screws 112 and 114. The inner ends of screws 112, 114 and pins 116, 118 are made of non-marring material and have rounded points to engage and center in an associated V-shaped chordal groove 120 cut perpendicular to the axis of the associated screws 112, 114 and pins 116, 118 in the outer periphery of ring 110 (FIG. 7). Pins 116 and 118 slide in radial holes 122 of ring 92, and flanges 124 on the outer ends of the pins are disposed in counterbores 126 to limit radially inward movement of the pins. A coil spring 128 encircles each pin and bears at one end against the inner periphery of ring 92 and at the other against a washer 129 backed up by a retaining ring 130 snapped into a groove of the pin to thereby press the pins radially inwardly against inner ring 110.

Focus coil 26 is inserted co-axially within inner ring 110 until a flange of the coil abuts ring 110 (FIG. 3). The coil is then clamped in this position by four nylon tipped set screws 134 threaded into inner ring 110.

The deflection yoke ring assembly 34 (FIGS. 3 and 5) is similar in most respects to ring assembly 32 and includes an outer ring 140 secured by three finely threaded screws 142 threaded into the opposite side of plate 30 at 120 degree spaced intervals, slightly staggered from screws 94. Screws 142 and knobs 144 therefor are identical to screws 94 and knobs 106, as are the remaining parts of the thumb screw assembly. Ring assembly 34 also includes an inner ring 146 in which the deflection yoke 28 is received and clamped. Ring 146 is supported within ring 140 in the same manner as ring 110 within ring 92, e.g., by a pair of thumb screws 148 and 150 threaded radially through outer ring 140 and spaced 90 degrees from one another, and opposed by spring pressed pins 152 and 154 respectively. Deflection yoke 28 is clamped against inner ring 146 by four set screws 156 (FIG. 5).

From the foregoing description, it will now be apparent that the cathode ray tube mount of the present invention is relatively simple in construction and requires a minimum number of different parts. A wide variety of sizes and types of cathode ray tubes may be accommodated without disassembling the basic framework by providing a set of adaptor rings 40 and 46 and inner rings 110 and 146 for each type of tube and associated deflection yoke and focusing coil therefor.

Three dimensional precision adjustment of the yoke and focusing coil, jointly and individually, is readily obtainable. The three point suspension of ring assemblies 32 and 34 from the center plate 30 provides control of pitch and yaw adjustments. Thumb screws 112, 114 and 148, 150 provide vernier horizontal and vertical adjustment of the coil and yoke, while equal take-up on all three knobs 144 or 106 provides vernier longitudinal adjustment. Gross longitudinal adjustment of the yoke and coil as a unit is obtained by moving plate 30 longitudinally along base 10. Inner rings 110 and 146 can be individually rotated in quarter turn increments about their respective axes by loosening screws 112, 114 or 148, 150. For finer rotational adjustment, the coil or yoke can be rotated within inner rings 110 and 146 by loosening set screws 134 or 156. Set screws 134, 156 are readily accessible from outside the unit since they are axially offset in the inner rings so as to be disposed axially beyond outer rings 92 and 140. Thus the cathode ray tube can be rotated without changing the setting of inner rings 110 and 146 by loosening the set screws and the front and rear supports of the tube, then rotating the tube to the desired position and reclamping. The spring opposition to each precision adjusting screw insures that all adjustments are positive, smooth and remain as set without requiring additional locking devices. The large clearance pin and hole support of outer rings 92 and 140 on stems 96 of screws 94 and 142 respectively provides a universal mounting which permits the outer rings to cant or tilt relative to the screws to the limited extent necessary for adjustment.

Preferably the front and rear supports for the cathode ray tube are non-metallic so that the anode or cathode of the tube can be operated at ground potential. Also, the frame members are preferably made of aluminum and the screws and other hardware are aluminum and stainless steel to eliminate magnetic interference fields.

We claim:

1. An adjustable mount assembly for a cathode ray tube having an electron beam generated and projected therewithin under the control of a deflection yoke and a focusing coil, comprising a base, means secured to said base for supporting the tube above the base, an upright plate secured to said base and adapted to receive the neck of the tube therethrough, a first and second ring assembly for respectively supporting the yoke and the coil disposed on opposite sides of said plate and means supported by said plate supporting said ring assemblies in spaced relation from said plate and adjustable to impart longitudinal, pitch and yaw movement individually to said ring assembly to thereby correspondingly adjust the position of the respective yoke and coil associated therewith relative to the tube, means for supporting said tube comprises an upright front plate secured to said base adjacent one end thereof, said front plate having an aperture adapted to receive the tube therethrough, an adaptor ring supported by said front plate and adapted to engage a tapered portion of the bowl of the tube, a second adaptor ring adapted to engage an oppositely tapered portion of the tube bowl and adjustably secured to said first adaptor ring for clamping the bowl therebetween, and an upright rear split clamp for supporting the gun end of the neck of the tube, said rear clamp comprising an upright rear plate adjustably secured to said base for movement longitudinally thereof and a block adjustably secured to the upper end of said rear plate for receiving and clamping the tube neck between the rear plate and block.

2. An adjustable mount assembly for a cathode ray tube having an electron beam generated and projected therewithin under the control of a deflection yoke and a

focusing coil, comprising a base, first and second means secured to said base adjacent the opposite ends thereof and adapted to support the tube adjacent its opposite ends above the base, a guideway secured on said base intermediate said tube support means and extending toward said opposite ends of said base, an upright plate adapted to receive the neck of the tube therethrough and having a guideblock secured thereto slidably supporting said plate on said guideway, means releasably clamping said plate to said base, a pair of ring assemblies, one adapted to support the yoke and the other the coil, disposed on opposite sides of said plate and means supported by said plate individually supporting said ring assemblies in spaced relation from said plate and adjustable to impart longitudinal, pitch and yaw movement individually to said ring assemblies to thereby correspondingly adjust the position of the respective yoke and coil associated therewith relative to the tube.

3. The combination set forth in claim 2 wherein said first means for supporting said tube comprises an upright front plate secured to said base adjacent one end thereof, said front plate having an aperture adapted to receive the tube therethrough, an adaptor ring supported by said front plate and adapted to engage a tapered portion of the bowl of the tube, a second adaptor ring adapted to engage an oppositely tapered portion of the tube bowl and adjustably secured to said first adaptor ring for clamping the bowl therebetween, and said second support means comprises an upright rear split clamp for supporting the gun end of the neck of said tube, said rear clamp comprising an upright rear plate adjustably secured to said base for movement longitudinally thereof and a block adjustably secured to the upper end of said rear plate for receiving and clamping the tube neck therebetween.

4. An adjustable support for supporting and positioning a deflection yoke and a focusing coil relative to a cathode ray tube, comprising a base, an upright plate secured to said base and having an aperture therein adapted to receive the neck of the tube axially therethrough, at least three precision screws threaded into one side of said plate at spaced angular intervals around said aperture and extending perpendicularly from said one side of the plate, at least three screws threaded into the opposite side of said plate at angularly spaced intervals around said aperture and extending perpendicularly from said opposite side of the plate, said screws having a stem portion spaced from the plate with retainer means affixed thereto, each of said screws having an adjusting knob affixed thereto intermediate said retainer means and said plate and a coil spring encircling said stem portion and abutting said knob, first and second outer rings supported by said screws, one on said one side of the plate and the other on the opposite side, said outer rings having axially extending holes therethrough in registry with the associated screws and receiving the stem portions therethrough with a loose clearance fit, said retaining means bearing against one side of said outer ring and the other end of said springs bearing against the opposite side of said outer ring, first and second inner rings disposed respectively within and spaced from said first and second outer rings, said first and second inner rings being respectively adapted to receive the deflection yoke and focusing coil axially therethrough and including means for clamping the yoke and coil respectively thereto, said outer rings having first and second adjusting means threaded therein spaced about 90 degrees from one another and extending radially therefrom into engagement with the periphery of the inner ring disposed therein, said outer rings also having first and second spring biased pins slidably mounted therein respectively diametrically opposite said first and second adjusting means adapted to yieldably engage the periphery of the inner ring disposed therein and providing a basing force respectively opposing said first and second adjusting means.

5. The combination set forth in claim 4 wherein said inner rings each have a chordal groove in the outer periphery thereof adjacent each of said adjusting means and pins and extending perpendicular thereto, said adjusting means and pins having tips adapted to seat in said grooves of said inner rings whereby said first adjusting means and pin slide in their associated grooves when said inner ring is moved by adjusting said second adjusting means and vice versa.

6. The combination set forth in claim 5 wherein said means for clamping the yoke and coil in said inner rings comprises a plurality of angularly spaced set screws threaded radially in said inner rings and extending radially therefrom for engagement with the associated yoke and coil, said inner rings having one end thereof protruding beyond one face of the associated outer ring and said set screws being disposed in said protruding end clear of the associated outer ring so that said set screws are easily accessible for adjustment.

7. The combination set forth in claim 4 wherein the holes of said outer rings are chamfered at said one side of said outer ring, each of said retaining means having a conical surface bearing against the chamfered end of the associated outer ring hole for centering said stem portion in said hole and permitting swivel movement of said screw relative to the plate within the limits of the stem-hole clearance.

8. An adjustable mount assembly for a cathode ray tube having an electron beam generated and projected therewithin under the control of a deflection yoke and a focusing coil, said assembly comprising a base, means secured to said base for supporting the tube spaced from the base, a plate secured to said base and adapted to receive the neck of the tube therethrough, first and second ring assemblies disposed on opposite sides of said plate for respectively supporting the yoke and the coil, first and second adjusting means rigidly supported by said plate and respectively supporting said first and second ring assemblies in spaced relation from said plate, said first and second adjusting means each comprising three precision screw means arranged at 120 degree angular intervals relative to one another in the plane of said plate and extending from said plate with their axes parallel to one another, said screw means each being individually rotatable to threadably adjust the spacing between said plate and the associated ring assembly along the axis of said screw means whereby said screw means are operable to impart longtiudinal, pitch and yaw movement individually to the associated ring assembly for correspondingly adjusting the position of the yoke and coil associated therewith relative to the tube, and means securing each of said adjusting means to the associated ring assembly for limited universal movement of said ring assembly on the associated adjusting means to accommodate movement of said ring assembly relative to said plate in response to adjustment operation of the other screw means of the same adjusting means.

9. The assembly as set forth in claim 8 wherein said screw means of said first adjustment means are angularly offset in the plane of said plate from said screw means of said second adjusting means.

10. An adjustable mount assembly for a cathode ray tube having an eelctron beam generated and projected therewithin under the control of a deflection yoke and a focusing coil, said assembly comprising a base, means secured to said base for supporting the tube above the base, a plate secured to said base and adapted to receive the neck of the tube therethrough, first and second ring assemblies for respectively supporting the yoke and the coil disposed on opposite sides of said plate and means supported by said plate supporting said ring assemblies in spaced relation from said plate and adjustable to impart longitudinal, pitch and yaw movement individually to said ring assemblies to thereby correspondingly adjust the position of the respective yoke and coil associated there-

with relative to the tube, said ring assemblies each comprising an outer ring attached to the associated ring assembly supporting means and an inner ring disposed within and spaced from said outer ring, one of said inner rings being adapted to support the yoke and the other the coil, each of said inner rings having first and second diametrically opposed pairs of parallel chordal guideways in the outer periphery thereof, each of said outer rings having first and second threadable adjusting means mounted therein spaced about 90 degrees from one another and extending radially from said outer ring and slidably engaging one of said guideways of said first pair and one of said guideways of said second pair respectively, said outer ring also having first and second yieldable means mounted therein respectively diametrically opposite said first and second adjusting means and respectively slidably engaging the other guideways of said first and second pairs and exerting a yieldable biasing force respectively opposing said first and second adjusting means whereby said inner ring is adjustably supported for movement relative to the outer ring along first and second coordinates parallel to the axes of said first and second adjusting means and said inner ring is releasable from said outer ring for rotational movement relative thereto in quarter-turn increments while disposed within said outer ring.

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