

June 22, 1948.

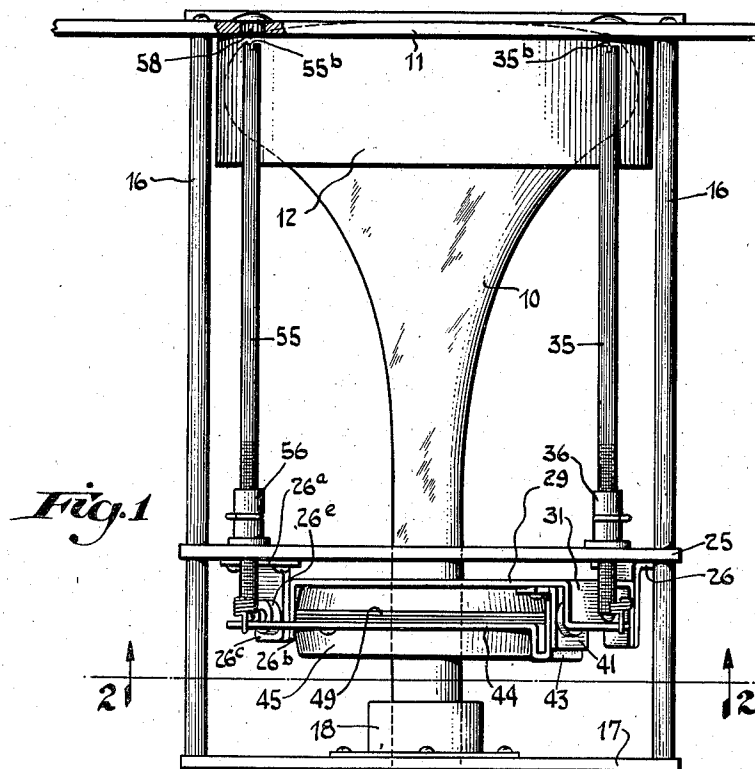
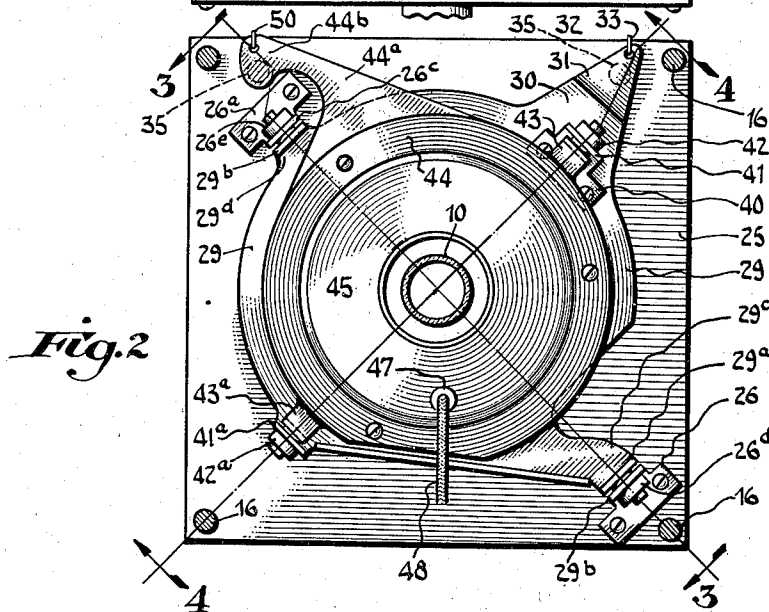
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2,443,973

CONTROL DEVICE FOR CATHODE RAY FOCUSING COILS

Filed Jan. 5, 1945

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

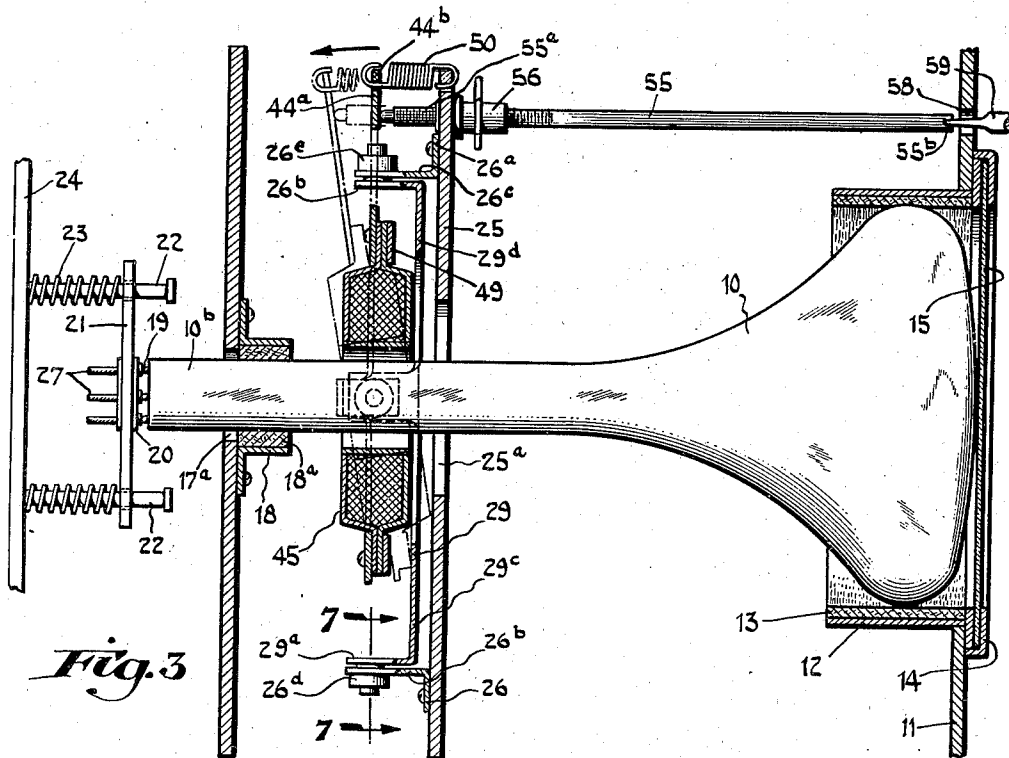


Fig. 3

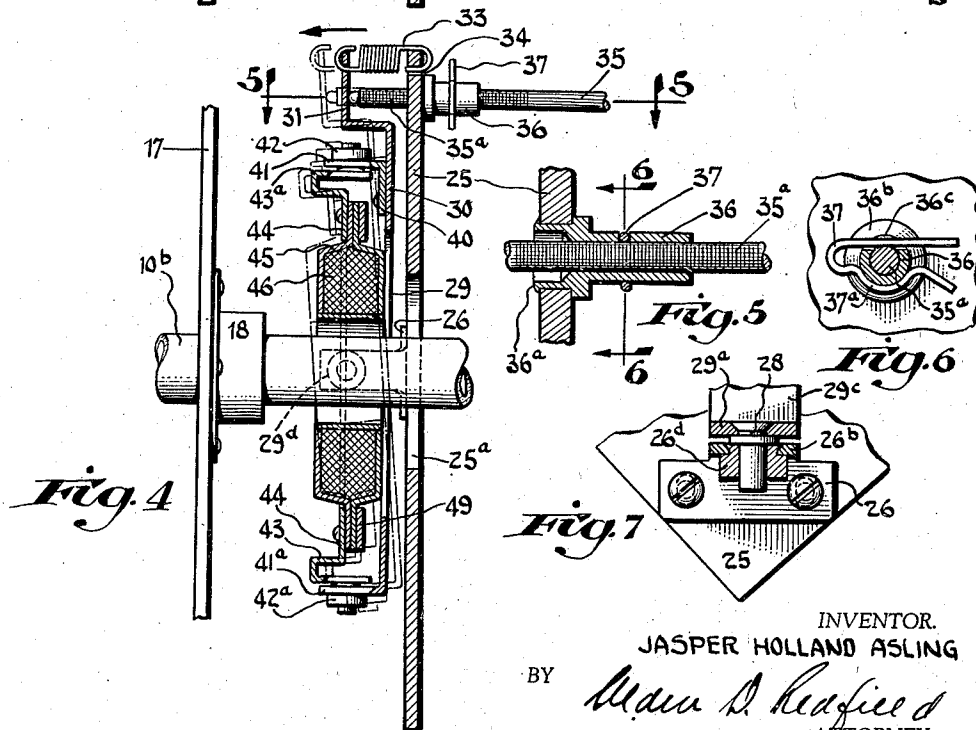


Fig. 4

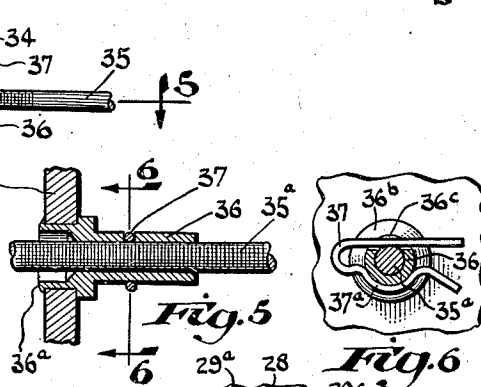


Fig. 5



Fig. 6

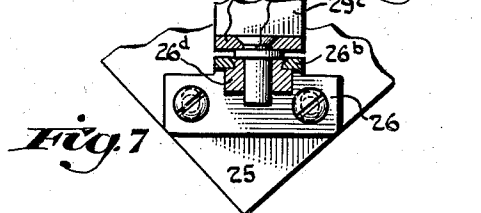


Fig. 7

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UNITED STATES PATENT OFFICE

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CONTROL DEVICE FOR CATHODE-RAY
FOCUSING COILS

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10 Claims. (Cl. 250—161)

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This invention relates to control devices for centering electronic beams and the like and is particularly concerned with a method and apparatus by which the focusing control of a cathode ray tube may be mounted in an enclosure in such a way that its axis with respect to the longitudinal axis of the tube may be adjusted. Cathode ray tubes may be directed or "focused" magnetically by means of a field produced by a coil. In such case, the invention contemplates the mounting of a coil so that its axis may be adjusted in two planes, and the field "aimed" so to speak so that the beam may be centered on the screen of the tube.

The adjustment and centering of the beam produced in a cathode ray tube has heretofore been a problem that has confronted the user of cathode ray equipment, particularly in portable and semi-portable equipment not susceptible to being permanently set up in a laboratory. It has been necessary to gain access to the interior of the cabinet or other structure in which such tubes are enclosed, and to either change the mounting of the tube or of the control inductance.

An important feature of the invention is to provide means operable from without the cabinet or enclosing structure of a cathode ray tube by which the electronic beam may be centered, viz., the beam may be accurately aimed at the center of the screen upon which the desired electronic image is produced.

The novel features that I consider characteristic of my invention are set forth in the appended claims. The invention itself, however, both as to its organization and method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment when read in conjunction with the accompanying drawing in which—

Fig. 1 is a plan view of a cathode ray tube, mounted according to the present invention.

Fig. 2 is a rear view taken along line 2—2 of Fig. 1.

Fig. 3 and Fig. 4 are sections taken along lines 3—3 and 4—4 respectively of Fig. 2.

Fig. 5 is a section showing details of the mounting adjustment taken along line 5—5 of Fig. 4.

Fig. 6 is a section taken along line 6—6 of Fig. 5.

Fig. 7 is a section on line 7—7 of Fig. 3, showing one of the gimbal pivots.

In the illustrative embodiment the front end of the cathode ray tube 10 (see Figs. 1 and 3) is

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mounted in a cabinet having a front wall 11 provided with a cylindrical mounting member 12, which may be lined with cylindrical pieces of felt 13 or other material adapted for supporting tubes of this type. Around the opening at the front end of member 12 may be secured a rim 14 for carrying a disk 15 of glass or other transparent material through which the front end of the tube may be viewed.

Secured to the front end of the cabinet as by supporting rods 16 is a back plate 17 provided with an opening 17a through which the rear end 10b of the cathode ray tube is extended. A cylindrical flanged member 18 also interiorly lined with soft supporting material 18a is secured to back plate 17 in order to support the rear end or neck portion 10c of the tube 10. The tube 10 is of conventional construction including a base provided with recesses through which the electrical contact is made between the internal elements of the tube and the external circuit through contact prongs 19 mounted on base 20, in turn mounted on plate 21. The plate 21 is resiliently mounted on studs 22 which extend through it, the latter being urged outwardly or to the right as shown in Fig. 3 by springs 23 coiled around the studs 22. The studs 22 may be conveniently mounted on a support 24. Electrically connected to the prongs 19 are conductors 27 preferably shielded as is well known in the art for connecting the tube with the external circuit.

Intermediate between the front wall 11 and the back plate 17 is secured a plate 25 of rectangular configuration, provided with an opening 25a through which the neck of the tube 10 is extended. Plate 25 is fixedly mounted on rods 16 which extend through its corners (see Figs. 1 and 2) and the plate is spaced so that it is parallel to the front wall 11.

Secured adjacent diagonally opposite corners of the plate 25 are brackets 26 and 26a having respectively upstanding portions 26b and 26c. This construction is best shown in Figs. 1, 2, 3, and 7. Mounted on these upstanding portions are bearings 26d and 26e adapted to journal trunnions 28 in the gimbal structure which will now be described.

The trunnions 28 are secured to upstanding portions 29a and 29b on extensions 29c and 29d respectively of gimbal ring 29. Gimbal ring 29 has an extension 30 90° displaced from the bearings 26d and 26e which extension 30 has an ear 31, provided with an opening 32, through which the end of tension spring 33 is hooked, the other

end being hooked through an opening 34 in the top part of plate 25.

The spring urges the ear 31 of the gimbal ring 29 toward the threaded end 35a of adjusting shaft 35 as shown in Fig. 4. This shaft 35 is mounted in a threaded supporting member 36 (see Figs. 4, 5 and 6) having bushing 36b that extends through and is secured to the plate 25 as by swaging or welding at 35a. The member 36 has a slot 36c into which one leg of a clip 37 extends in such a manner as to make operative contact with the threads on the shaft 35. The other leg of clip 37 has a rounded portion 37a engaging the lower cylindrical surface of the member 36, and the spring pressure between the opposed legs of the clip 37 is such as to provide friction contact of the upper leg of the spring with the threads of shaft 35 as shown in Figs. 5 and 6. This tends to lock shaft 35 in position and prevent rotation under vibration.

The other end of the shaft 35 extends close to the front wall 11 of the cabinet through which is provided an opening (not shown) through which access may be had to the end of the shaft 35 which is provided with a kerf.

With the structure above described, it will be observed that when a tool such as a screw driver is inserted through the opening into the kerf, the shaft 35 is turned, thus causing it to be moved lengthwise, reacting against the relatively fixed members 36 and 25. When the shaft 35 is moved to the left as shown in Fig. 4, the end thereof pressed against the ear 31 of gimbal 29 and rotates the gimbal on its axis 3-3, in bearings 26d and 26e. Movement of ear 31 to the left is accomplished against the pressure of the spring 33.

Also displaced 90° from bearings 26d and 26e on gimbal ring 29 and mounted thereon are two additional bearings 42 and 42a. The top such bearing 42 as shown in Fig. 2 is mounted on a bracket 40 having an upstanding portion 41 and the bottom such bearing 42a is mounted on an upturned ear 41a, integrally formed in the opposite part of the periphery of gimbal ring 29. This structure can best be observed from an examination of Figs. 2 and 4. Trunnions similar to trunnion 23 previously described are secured to bent-over extensions 43 and 43a of a second gimbal ring 44, to which is secured by machine screws or otherwise and by back ring 49 an annular casing 45, within which is housed a coil 46, connected to the circuit for focusing the tube 10 by conductor 48. A suitable opening 47 is provided in the casing 45 for the passage of this conductor.

The gimbal ring 44 has an extension 44a, the end 44b of which is arranged to act as a reaction surface against which the threaded end 55a of shaft 55 is spring pressed by spring 50. Shaft 55 is supported in a member 56 similar to member 36 previously described. Shaft 55 has a kerf 55b at its other end and like the end of the other shaft 35 is accessible through an opening 58 in the front wall 11 of the cabinet so that tool 59 such as a screw driver may be inserted therein for turning the shaft in member 46. Rotation of the shaft against ear 44b which is spring pressed there against as shown in Fig. 3 to turn the gimbal ring 44 on its axis 4-4.

It should be explained that the circuit used with the device that has been described is one in which an electronic beam produced on tube 10 is focused by the magnetic field of coil 46. Since the coil is arranged for rotation about two

diameters that are 90° displaced from one another, it will be observed that the direction of its flux can be changed or "aimed" and the beam properly centered on the screen of the tube 10 by selectively adjusting the position of the coil. This is accomplished by simply inserting a tool through the access openings in panel 11 and turning shafts 35 and 55.

Having thus described my invention, I claim:

1. An apparatus for selectively adjusting a coil about diameters 90° displaced from one another comprising in combination a plate, a gimbal ring pivotally mounted on said plate, a second gimbal ring pivotally mounted on the first on an axis 90° displaced from the axis thereof, a coil secured to the second ring within the periphery thereof, extensions on said rings 90° displaced from their respective axes, spring means operative to move said extension toward said plate, adjustable means secured to said plate each having a movable member abutting one of said extensions and operative to move same away from said plate whereby each ring may be selectively adjusted about its axis by movement of said movable member.

2. In a cathode ray device, a cabinet, a cathode ray tube mounted therein, and a focusing coil surrounding the neck thereof, a fixed plate mounted within the cabinet, a gimbal ring pivotally mounted thereon, a second gimbal ring mounted on the first at right angles to its axis of rotation, said coil being mounted on said second ring, and means mounted on said plate for selectively adjusting said rings about their respective axes.

3. In a cathode ray device, a cabinet, a cathode ray tube mounted therein, and a focusing coil surrounding the neck thereof, a fixed plate mounted within the cabinet, a gimbal ring pivotally mounted thereon, a second gimbal ring mounted on the first at right angles to its axis of rotation, said coil being mounted on said second ring, and means mounted on said plate for selectively adjusting said rings about their respective axes, said means being accessible from without the cabinet.

4. In a cathode ray device, a cabinet, a cathode ray tube mounted therein, and a focusing coil surrounding the neck thereof, a fixed plate mounted within the cabinet, a gimbal ring pivotally mounted thereon, a second gimbal ring mounted on the first at right angles to its axis of rotation, said coil being mounted on said second ring, and means mounted on said plate for selectively adjusting said rings about their respective axes, said cabinet having apertures therein whereby said means may be operated from without the cabinet.

5. An apparatus for selectively adjusting a coil about diameters 90° displaced from one another comprising a plate, a gimbal ring pivotally mounted on said plate, a second gimbal ring pivotally mounted on the first on an axis of 90° displaced from the pivotal axis of said first ring, an annular casing secured to said second-mentioned gimbal ring, a coil disposed within said annular casing, extensions on said rings displaced 90° from their respective axes of rotation, spring means operative to move said extensions toward said plate and movable with respect thereto, one end of one of said rods contacting one of said extensions and one end of the other of said rods contacting the other of said extensions, said rods being operative to selectively move said extensions away from said plate whereby each said ring

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may be selectively adjusted about its axis or rotation.

6. In a cathode ray device, a cabinet, a cathode ray tube mounted therein and having a neck, a focusing coil surrounding said neck, a fixed plate mounted within the cabinet, a gimbal ring pivotally mounted on said plate, a second gimbal ring pivotally mounted on said first ring at right angles to the axis of rotation thereof, said coil being mounted on said gimbal ring, extensions on said rings displaced 90° from their respective axes of rotation, spring means operative to move said extensions toward said plate, and adjustable means mounted on said plate co-acting with said extensions for selectively adjusting said rings about their respective axes of rotation.

7. In a cathode ray device, a cabinet, a cathode ray tube mounted therein, a focusing coil surrounding the neck thereof, a fixed plate mounted within the cabinet, a gimbal ring pivotally mounted on said plate, a second gimbal ring pivotally mounted on said first ring at right angles to the axis of rotation thereof, said coil being mounted on said second gimbal ring, extensions on said rings displaced 90° from their respective axes of rotation, spring means operative to move said extensions toward said plate, and adjustable means mounted on said plate co-acting with said extensions for selectively adjusting said rings about their respective axes of rotation, said adjustable means being accessible from without the cabinet.

8. In a cathode ray device, a cabinet, a cathode ray tube mounted therein, a focusing coil surrounding the neck of said tube, a fixed plate mounted within the cabinet, a gimbal ring pivotally mounted on said plate, a second gimbal ring pivotally mounted on said first gimbal ring at right angles to the axis of rotation of said ring, said coil being mounted on said second gimbal ring, extensions on said rings displaced 90° from their respective axes of rotation, spring means yieldably connecting said extensions and said plate operative to move said extensions toward said plate, and adjustable means mounted on said plate co-acting with said extensions for selectively adjusting said rings about their respective axes of rotation.

9. In a cathode ray device, a cabinet, a cathode ray tube mounted therein, a focusing coil surrounding the neck of said tube, a fixed plate mounted within the cabinet, a gimbal ring pivotally mounted on said plate, a second gimbal ring pivotally mounted on said first gimbal ring at right angles to the axis of rotation of said ring,

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said coil being mounted on said second gimbal ring, extensions on said rings displaced 90° from their respective axes of rotation, spring means yieldably connecting said extensions and said plate operative to move said extensions toward said plate, and adjustable means mounted on said plate co-acting with said extensions for selectively adjusting said rings about their respective axes of rotation, said cabinet having apertures therein whereby said means may be operated from without the cabinet.

10. In a cathode ray device, a cabinet, a cathode ray tube mounted therein, a focusing coil surrounding the neck of said tube, a fixed plate mounted within the cabinet, a gimbal ring pivotally mounted on said plate, a second gimbal ring pivotally mounted on said first gimbal ring, said coil being mounted upon said second gimbal ring, extensions on said rings displaced 90° from their respective axes of rotation, spring means yieldably connecting said extensions and said plate operative to move said extensions toward said plate, and adjustable means comprising a pair of rods mounted on said plate and movable with respect thereto, one end of one of said rods contacting one of said extensions and one end of the other of said rods contacting the other of said extensions, said rods being operative to selectively move said extensions away from said plate whereby each ring may be selectively adjusted about its axis of rotation.

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