May 20, 1952 P. R. J. COURT 2,597,298

BEAM CENTERING DEVICE FOR CATHODE-RAY TUBES

Filed Feb. 17, 1950

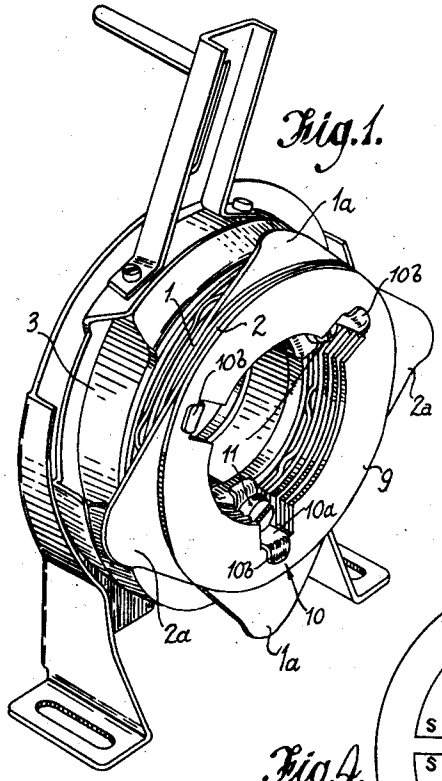


Fig. 1.

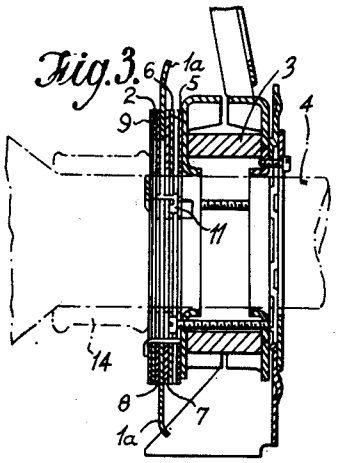


Fig. 3.

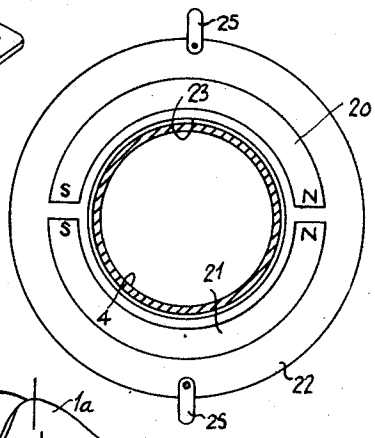


Fig. 4.

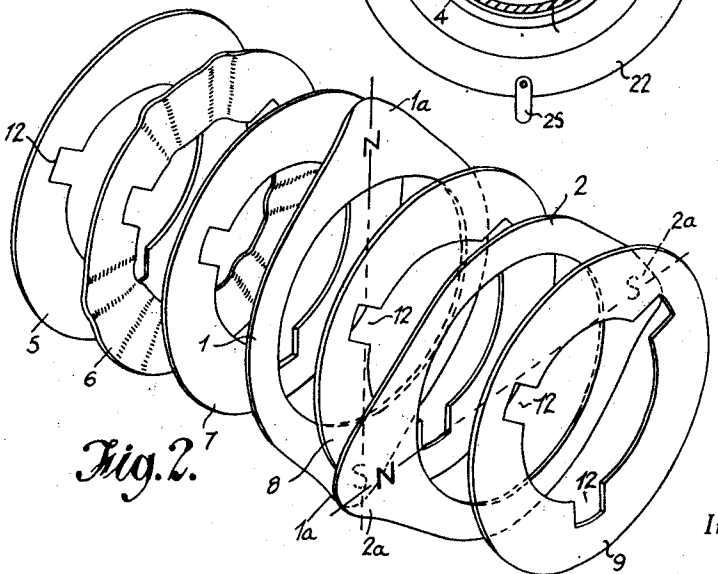


Fig. 2.

Inventor

PATRICK RICHARD JAMES COURT

By Blair & Black

Attorneys

Patented May 20, 1952

2,597,298

UNITED STATES PATENT OFFICE

2,597,298

BEAM CENTERING DEVICE FOR CATHODE-RAY TUBES

Patrick Richard James Court, Cambridge, England, assignor to Pye Limited, Cambridge, England, a British company

Application February 17, 1950, Serial No. 144,688
In Great Britain February 18, 1949

6 Claims. (Cl. 313—75)

1

The present invention relates to devices for centering the electron beam on the screen of a cathode ray tube, and is particularly applicable to the centering of the raster on the screen of the cathode ray tube of a television receiver.

According to the present invention a device for centering the electron beam of a cathode ray tube comprises two annular magnets, each permanently magnetised across its diameter, said two magnets being disposed side-by-side surrounding the neck of the cathode ray tube and mounted for independent rotation about said neck and substantially concentrically with the axis thereof.

Each magnet may comprise a single magnet or may be assembled from a pair of part-annular magnets arranged substantially concentrically to form a complete annulus but with narrow gaps between the ends of the pair of magnets, like poles of each of the magnets of a pair lying adjacent one another, the two pairs of magnets being disposed side-by-side around the neck of the cathode ray tube and mounted for independent rotation around said neck and substantially concentrically with the axis thereof.

The resultant magnetic field due to each annular magnet (or pair of part-annular magnets) is very uniform at the centre or axis of the neck of the cathode ray tube where the electron beam passes, and by rotating either or both of the magnets which are arranged close together but not touching, around the tube neck, the strength and direction of the resultant magnetic field along the axis of the tube neck may be changed in accordance with the relative positions of the magnets. The magnetic field at the axis of the cathode ray tube will actually be the vector sum of the two separate fields.

The magnets may be conveniently made quite small, of only slightly larger internal diameter than the external diameter of the neck of the cathode ray tube, and each magnet is preferably thin and flat in the axial direction of the assembly. The magnets may be separated from one another by an intervening layer of non-magnetic material.

In the case where each magnet comprises a pair of part-annular magnets, each part-annular magnet is preferably almost a complete semi-annulus, so that when a pair of magnets are arranged concentrically only narrow gaps exist between adjacent ends of the magnets. The magnets may be carried on insulating discs or members which may be constructed to rotate around the neck of the tube, and the magnets

2

of one pair may be separated from the magnets of the other pair by an interposed layer of non-magnetic material.

The advantages obtained by the invention are: (1) simplicity, (2) compactness, (3) economy, (4) a large degree of shift control and (5) absence of astigmatism, which is due to the fact that the magnetic field at the centre of each magnet is very uniform, so that the resultant vector field is very uniform.

As applied to a magnetically focussed and magnetically deflected cathode ray tube, the two magnets may be arranged concentrically round the neck of a cathode ray tube, between the focus magnet or coil and the deflector coils. By simply rotating the two magnets with respect to each other and with respect to the tube, the electron beam may be moved to any desired position, within the limits imposed by the strength of the magnet fields.

In order that the invention may be more clearly understood reference will now be made to the accompanying drawings, in which:

Fig. 1 shows a perspective view of one embodiment according to the invention.

Fig. 2 shows a view similar to Fig. 1 but with the elements of the centering device exploded.

Fig. 3 shows a section through the device mounted on a cathode ray tube.

Fig. 4 shows an end view of an alternative construction of magnet.

Referring to Figs. 1, 2 and 3 of the drawings, the centering device comprises two annular permanent magnets 1, 2 magnetised across their diameters as more clearly indicated in Fig. 2. These magnets may be made of thin sheet metal and are mounted at the front of a focussing magnet 3 so as to be rotatable around the axis of this magnet and thus around the axis of the neck of the cathode ray tube 4, extending through the centre of the assembly. Positioned between the focussing magnet 3 and the magnet 1 are three annular spacers of non-magnetic and preferably insulating sheet material 5, 6 and 7; between the two magnets 1 and 2 is a further annulus of non-magnetic sheet material 8; and in front of the magnet 2 is another annulus of non-magnetic sheet material 9. The whole assembly is held in position to the front of the focus magnet 3 by means of three clips 10 secured to the magnet 3 by screws 11.

The longitudinally extending limbs 10a of these clips are positioned on a circle corresponding approximately to the internal diameter of the magnets 1 and 2 so that the latter are guidingly ro-

tatable therearound. The internal diameters of the spacers are smaller than the internal diameter of the magnets 1 and 2, recesses 12 being formed in the internal peripheries of the spacers to accommodate the clips 10, whereby rotation of the spacers is prevented. The whole assembly is held against the focus magnet 3 by the outwardly turned ends 10b of the clips 10 bearing on the outer surface of the spacer 9. The spacer 6 is of wavy or corrugated form so as to exert a slight axial pressure on the elements of the assembly and create friction between the magnets 1 and 2 and the adjacent spacers so that the magnets will remain in the adjusted position to which they are turned. To facilitate turning, the magnets are provided with ears 1a, 2a extending beyond the external periphery of the insulating spacers.

By making the centering assembly narrow in the axial direction, it can be disposed in between the focus magnet and the deflector coils 14, as shown in Fig. 3.

Centering of the cathode ray beam is achieved by simply rotating the two annular magnets independently around the neck of the cathode ray tube.

Instead of making each of the magnets 1, 2, as a single annular magnet which is magnetised across its diameter, each magnet may comprise a pair of flat part-annular magnets 20, 21, as shown in Fig. 4, fixed concentrically to a thin flat ring 22 of non-magnetic material. Each of the magnets 20, 21 is almost a complete semi-annulus, so that if the magnets are secured concentrically on the supporting ring 22, the ends of the two magnets are spaced apart by narrow gaps. Like poles of the pair of magnets 20, 21 lie adjacent to one another. The central hole 23 in each ring 22 is made of a size to fit the neck of the cathode ray tube, two such rings each carrying pairs of part-annular magnets being disposed around the neck of the tube and arranged side-by-side between the focussing magnet and the deflector coils. The two rings may be separated by a further ring 25 of non-magnetic material to prevent contact between the two sets of magnets. If desired, two further rings of non-magnetic material may be used to space the magnet rings from the deflector coils and from the focus magnet respectively.

The internal peripheries of the magnets 20, 21, when concentrically secured on the supporting ring, are preferably slightly spaced from the internal periphery of the ring, so that the said internal periphery forms a bearing with the external surface of the neck of the cathode ray tube, around which the ring can be rotated. To facilitate adjustment, the rings on which the magnets are mounted may be provided with projecting arms or lugs.

Whilst particular embodiments have been described, it will be understood that various modifications may be made without departing from the scope of the invention. For example, the magnets may be mounted for rotation around the deflection coils, for example, adjacent the end thereof which lies adjacent the bulb of the cathode ray tube when the deflector coils are mounted on the tube neck. By positioning the beam centering magnets adjacent the bulb of the tube, corner cutting of the beam (that is interception of the deflected beam by the corner of the tube between the neck and bulb portions) may be prevented or reduced. With this embodiment the two magnets may rotate around a cylindrical

member, which may be grooved, fitted around the deflector coil assembly adjacent one end thereof.

According to a further modification, the pairs of magnets may be provided with windings, means being provided for varying the current flowing through the windings. In this way, for example, by arranging the two pairs of magnets at right angles to one another, the raster will be normally displaced off-centre and towards one corner of the screen, and by separately energising the windings in opposition to the field produced by the permanent magnets, the position of the raster can be shifted towards the centre. This modification provides a centering arrangement in which the control is effected electrically instead of mechanically.

It will also be understood that the arrangement according to the invention can be applied to cathode ray tubes employing electrostatic deflection and/or focussing.

I claim:

1. A device for centering the electron beam of a cathode ray tube comprising two annular magnets each permanently magnetised across its diameter means for supporting said two magnets side-by-side and coaxially surrounding the neck of the cathode ray tube, each magnet being independently rotatable around the common axis, a thin annular spacer of non-magnetic material positioned between said magnets, and resilient means urging said magnets axially towards one another with the spacer compressed therebetween.

2. A device for centering the electron beam of a cathode ray tube comprising two annular magnets each permanently magnetised across its diameter, each of said magnets being made from thin sheet magnetic material with the thickness of the sheet defining the axial length of a magnet, means for supporting said two magnets coaxially side-by-side and surrounding the neck of the cathode ray tube and with each magnet independently rotatable around the common axis, a thin annular spacer of non-magnetic material positioned between said magnets, resilient means urging said magnets axially towards one another with the spacer therebetween, and means for rotating each of said magnets independently about said common axis.

3. A device for centering the electron beam of a cathode ray tube comprising a support member having a central aperture through which the neck of a cathode ray tube is adapted to pass, two annular magnets each permanently magnetised across its diameter, a plurality of members extending longitudinally from one side of the support member, the outer surfaces of said members lying on a circle of a diameter corresponding to the internal diameters of the annular magnets and substantially coaxial with the aperture in the support member, said annular magnets being arranged side-by-side and surrounding said longitudinal members so as to be independently rotatable therearound, a thin annular spacer of non-magnetic material positioned between said annular magnets and having at least one notch on its inner periphery adapted to engage with one of said longitudinal members to prevent rotation of said spacer, and means for holding the two magnets in positions adjacent opposite faces of said spacer respectively.

4. A device as claimed in claim 3, comprising also two annular members of non-magnetic material positioned respectively adjacent the outer faces of said annular magnets, an annular cor-

rugated member of resilient material positioned between the support member and the annular member nearest thereto, at least one notch in each of said annular members and the corrugated member engaging with one of the longitudinal members to prevent relative rotation therebetween, abutments carried from the free ends of the longitudinal members and bearing against the end of the outer annular member, said abutments being so spaced from the support member that the corrugated member will be slightly compressed and thereby urges the two annular magnets together with the spacer therebetween, and at least one ear projecting from the outer periphery of each of the annular magnets and beyond the external peripheries of the annular members.

5. A combined focussing and beam centering device for the cathode ray tube of a television receiver, comprising a focussing device having a central aperture through which the neck of a cathode ray tube is adapted to pass, two annular magnets each permanently magnetised across its diameter, a plurality of members extending longitudinally from one side of the focussing device, the outer surfaces of said members lying on a circle of a diameter corresponding to the internal diameters of the annular magnets and substantially coaxial with the aperture in the focussing device, said annular magnets being arranged side-by-side and surrounding said longitudinal members so as to be independently rotatable therearound, a thin annular spacer of non-magnetic material positioned between said annular magnets and having at least one notch on its inner periphery adapted to engage with one of said members to prevent rotation of said spacer, two annular members of non-magnetic material positioned respectively adjacent the outer faces of said annular magnets an annular corrugated member of resilient material positioned between the focussing device and the annular member adjacent thereto, at least one notch in each of said annular members and the corrugated member engaging with one of the longitudinal members to prevent relative rotation therebetween, abutments carried from the free ends of the longitudinal members and bearing against the end of the outer annular member, said corrugated member urging the assembly against the abutments, and at least one ear projecting from the outer periphery of each of the annular magnets and beyond the external peripheries of the annular members.

6. A device for centering the electron beam of a cathode ray tube comprising two annular magnets each permanently magnetised across its diameter, means for supporting said two magnets side-by-side and coaxially surrounding the neck of the cathode ray tube, and with each magnet independently rotatable around the common axis, a thin annular spacer of non-magnetic material extending radially between said magnets, and at least one ear connected to and extending outwardly from each of said magnets.

PATRICK RICHARD JAMES COURT.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,102,421	Kuehni	Dec. 14, 1937
2,188,579	Schlesinger	Jan. 30, 1940
2,195,470	Roosenstein et al.	Apr. 2, 1940
2,224,933	Schlesinger	Dec. 17, 1940
2,455,977	Bocciarelli	Dec. 14, 1948
2,456,474	Wainwright	Dec. 14, 1948
2,498,354	Bocciarelli	Feb. 21, 1950
2,513,929	Gethman	July 4, 1950
2,525,919	Loughren	Oct. 17, 1950
2,544,875	Bennett	Mar. 13, 1951
2,544,898	Obszarny et al.	Mar. 13, 1951

FOREIGN PATENTS

Number	Country	Date
464,637	Great Britain	Apr. 21, 1937