July 16, 1940. A. BLAIN 2,207,777

CATHODE RAY DEFLECTING DEVICE

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FIG. 1.

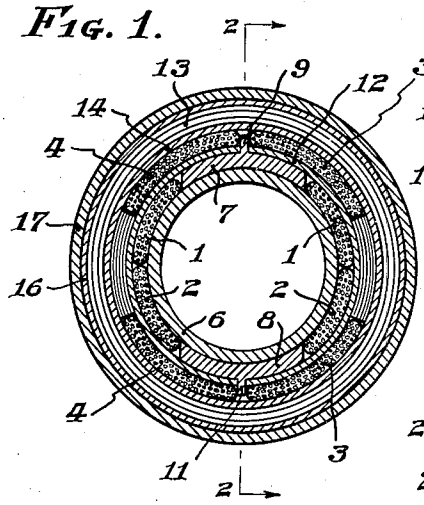

FIG. 2.

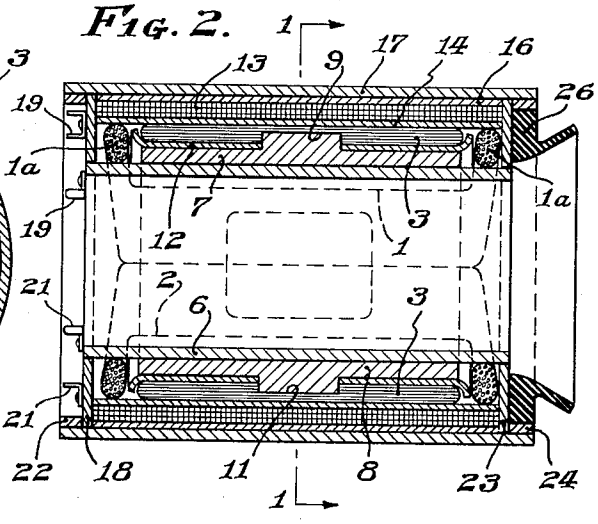

FIG. 3.

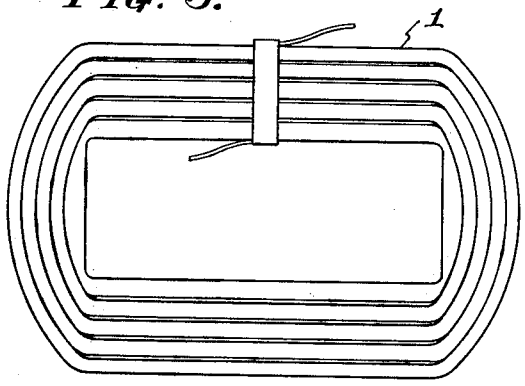

FIG. 4.

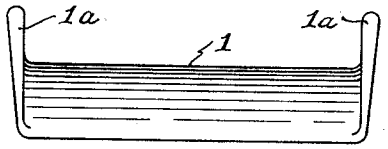

FIG. 5.

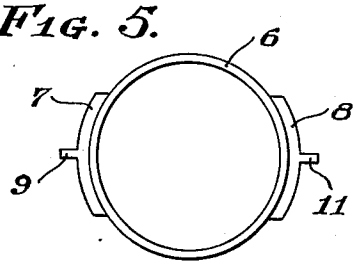

FIG. 6.

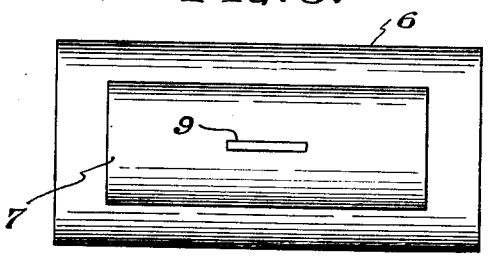

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FIG. 7.

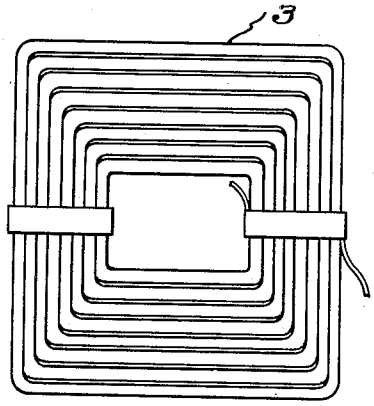


FIG. 8.

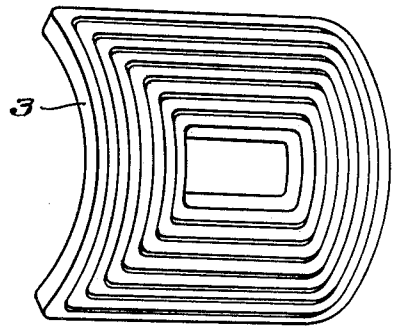
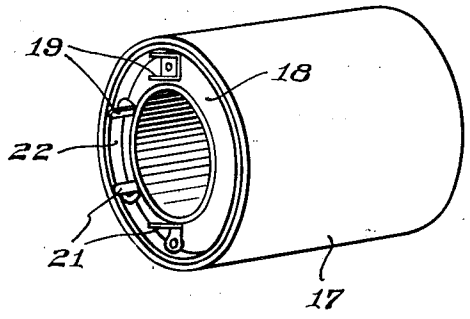


FIG. 9.



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Patented July 16, 1940 2,207,777

UNITED STATES PATENT OFFICE

2,207,777

CATHODE RAY DEFLECTING DEVICE

Albert Blain, Philadelphia, Pa., assignor to Radio Corporation of America, a corporation of Delaware

Application November 16, 1937, Serial No. 174,837

7 Claims. (Cl. 250—157)

My invention relates to cathode ray tube deflecting devices and particularly to deflecting devices of the electromagnetic type.

Specifically, my invention resides in an improved deflecting yoke of the general character described and claimed in Patent No. 2,167,379, issued July 25, 1939, in the name of W. A. Tolson, and assigned to the Radio Corporation of America. In yokes of this character, the deflecting coils are wound as distributed windings such as concentric windings, lap windings, or wave windings. Two horizontal deflecting coils are placed on a supporting tube in diametrically opposed relation and on top of these coils two vertical deflecting coils are positioned in diametrically opposed relation and at right angles to the horizontal deflecting coils.

A tube of magnetic material is positioned over the coil assembly to give the deflecting coils the desired inductance.

An object of my invention is to provide an improved deflecting yoke of the above-described character.

More specifically, one object of my invention is to provide a deflecting yoke in which the deflecting coils are more accurately centered than in previous constructions.

Another object of my invention is to provide a deflecting yoke in which the available space is utilized most effectively for the deflecting coils.

Still another object of my invention is to provide a deflecting yoke which may be manufactured and assembled at a low cost.

In the preferred embodiment of my invention, the horizontal and vertical deflecting coils are centered with respect to the supporting tube upon which they are mounted. The horizontal deflecting coils are centered by means of a rectangular centering plate or the like which fits into the opening at the center of the coil winding. Thus, the outer edges of adjacent horizontal coils may be brought into contact with each other whereby the deflecting windings are more evenly distributed. The result is an improvement in the uniformity of the magnetic deflecting field whereby less defocusing of the cathode ray is obtained during deflection.

The vertical deflecting coils preferably are centered by means of a rib extending from the above mentioned centering plate.

The invention will be better understood from the following description taken in connection with the accompanying drawings in which

Figure 1 is a cross-sectional view taken on the line 1—1 in Figure 2 looking in the direction of the arrows,

Figure 2 is a view taken in cross-section on the line 2—2 in Figure 1 looking in the direction of the arrows,

Figure 3 is a plan view of a horizontal deflecting winding before it has been formed for assembly,

Figure 4 is a side view of the winding shown in Figure 3 after it has been formed for assembly,

Figure 5 is an end view of the supporting tube for the deflecting coils,

Figure 6 is a side view of the supporting tube shown in Figure 5,

Figure 7 is a plan view of a vertical deflecting coil before it is formed for assembly,

Figure 8 is a veiw of the coil shown in Figure 7 after it has been formed for assembly, and

Figure 9 is a view in perspective of the completely assembled deflecting yoke.

Referring to Figs. 1 and 2, the deflecting yoke includes a pair of diametrically opposed horizontal deflecting coils 1 and 2 and a pair of diametrically opposed vertical deflecting coils 3 and 4. The horizontal deflecting coils 1 and 2 are mounted upon a supporting tube 6 which is shown more clearly in Figs. 5 and 6. This tube which is of fibre or some other insulating material has attached thereto rectangular centering plates 7 and 8 which also are of an insulating material, such as fibre. Preferably, these centering plates have centering ribs 9 and 11 thereon, which also are of insulating material for the purpose of centering the vertical deflecting coils 3 and 4.

In the specific construction illustrated, each horizontal deflecting winding consists of a plurality of concentrically wound coils as illustrated in Fig. 3, each coil preferably consisting of several turns. All the coils are wound in the same direction and connected in series.

The two horizontal deflecting windings may be connected in series or in parallel as preferred and in such direction that the fields are aiding in accordance with the usual practice.

In accordance with the teachings of the above-mentioned Tolson patent, each horizontal deflecting is preformed to make it conform with the shape of the supporting tube to facilitate assembly. In accordance with one feature of my invention, the ends of the coils 1 and 2 are bent upwardly as indicated at 1*a* in Fig. 2 whereby for a given over-all length of deflecting yoke the effective length of the horizontal deflecting winding is a maximum.

As illustrated in Figures 1 and 2, the upper

horizontal deflecting winding 1 is positioned over the centering plate 7 with the centering plate fitting snugly into the central rectangular opening of the deflecting winding. In a similar manner, the lower horizontal deflecting winding 2 is positioned over the centering plate 8 with the centering plate fitting snugly into the rectangular opening of the deflecting winding. It will be seen that with this construction the deflecting windings 1 and 2 are acurately located with respect to each other and with respect to the supporting tube 6.

The above-described centering arrangement makes it possible to have the sides of the two horizontal deflecting windings 1 and 2 in contact with each other or contiguous as illustrated in Figs. 1 and 2 whereby there is an improvement in the uniformity of the deflecting field.

Insulating material 12 such as paper is wound over the horizontal deflecting coils 1 and 2 before the vertical deflecting windings are put in place. It will be seen that the vertical deflecting windings 3 and 4 are so positioned that their deflecting field is at right angles to the deflecting field produced by the horizontal deflecting coils. In the structure illustrated, the vertical deflecting coils are centered with respect to each other and with respect to the horizontal deflecting coils by means of the centering ribs 9 and 11 with which the sides of the deflecting windings come in contact. It will be understood that the use of the centering ribs is not an essential feature of my invention but their use is desirable since they facilitate centering of the windings 3 and 4.

The vertical deflecting coils 3 and 4 preferably are substantially the same as those described in the above-mentioned Tolson application. As shown in Fig. 7, where the winding 3 is illustrated, each vertical deflecting winding consists of a plurality of concentrically wound coils, each coil consisting of several turns. All the coils are wound in the same direction and connected in series. The two vertical deflecting windings may be connected in series or in parallel as preferred and in such a direction that their fields are aiding in accordance with the usual practice.

In Fig. 8 the vertical deflecting winding 3 is shown preformed to conform with the outer diameter of the assembled horizontal deflecting coils 1 and 2, whereby the assembly of the windings is facilitated.

The cylinder of magnetic material which surrounds the deflecting windings preferably consists of a plurality of layers, three layers for example, of oxidized iron wire, as indicated at 13. In a preferred construction, paper or other insulating material 14 is wound over the windings 3 and 4, one layer of iron wire is then wound over the insulation 14 and then two other layers of iron wire are wound on top of the first layer.

Instead of the iron wire a solid steel tube may be utilized as described in the above-mentioned Tolson application. However, the tube of iron wire is preferred since it reduces losses in the circuit and generally improves the deflection characteristics of the yoke.

The assembly of the yoke is completed by covering the iron wire with insulating material 16 such as paper or wax and then sliding the complete assembly into a protecting tube 17 of fibre or other suitable insulating material. An end ring 18 carrying a pair of terminals 19 for the horizontal deflecting coils and a pair of terminals 21 for the vertical deflecting coils is then put in place after soldering the ends of the coils to the terminals, this end ring being held in place by means of a ring indicated at 22 which may be glued to the outer protecting tube.

At the other end of the deflecting yoke an end ring 23 is set into the protecting tube 17 and held in position by a fibre ring 24.

Preferably a soft rubber ring 26 having a conical portion is fastened into the end of the deflecting yoke whereby the deflecting yoke may be shoved firmly against the conical end of a cathode ray tube to hold the yoke firmly in position on the cathode ray tube without injuring either the yoke or the tube.

The completely assembled deflecting yoke is illustrated in Fig. 9, this figure being drawn on a reduced scale. It will be seen that the completely assembled yoke is compact and neat in appearance.

It will also be apparent from the foregoing description that a deflecting yoke constructed in accordance with my invention may be easily and rapidly assembled while maintaining accuracy in the relation of the various elements whereby the cost of the yoke is reduced as compared with the yoke shown in the above-identified Tolson application.

I claim as my invention:

1. An electromagnetic deflecting device for a cathode ray tube, said device comprising a supporting tube, centering means mounted on one side of said tube and on the outer side thereof, a second centering means mounted on the opposite side of said tube and on the outer side thereof, a pair of distributed windings each so wound that there is an opening in the middle thereof which is not occupied by the winding, one of said windings being supported on one side of said supporting tube and on the outer side thereof with at least a portion of the inner winding edge defining the opening in said one winding in engagement with one of said centering means, and the other of said windings being supported on the opposite side of said supporting tube and on the outer side thereof with at least a portion of the inner winding edge defining the opening in said other winding in engagement with the other of said centering means.

2. The invention according to claim 1 characterized in that the adjacent sides of said windings are contiguous.

3. An electromagnetic deflecting device for a cathode ray tube, said device comprising a non-magnetic cylindrical supporting tube, centering means mounted on one side of said supporting tube and on the outside thereof, a second centering means mounted on the opposite side of said supporting tube and on the outside thereof, a pair of concentrically wound distributed windings each of which has an opening in the middle thereof not occupied by the winding, one of said windings being mounted on one side of said supporting tube with the said opening in said one winding fitting over one of said centering means, and the other of said windings being mounted on the opposite side of said supporting tube with the said opening in said other winding fitting over the other of said centering means.

4. The invention according to claim 3 characterized in that the adjacent sides of said windings are contiguous.

5. The invention according to claim 3 characterized in that each of the said centering means is a substantially rectangular plate which fits snugly into the opening of a distributed winding.

6. An electromagnetic deflecting device for a cathode ray tube, said device comprising a supporting tube, centering means mounted on one side of said tube, a second centering means mounted on the opposite side of said tube, a pair of distributer windings each so wound that there is an opening in the middle thereof which is not occupied by the winding, one of said windings being supported on one side of said supporting tube with at least a portion of the inner winding edge defining the opening in said one winding in engagement with one of said centering means, and the other of said windings being supported on the opposite side of said supporting tube with at least a portion of the inner winding edge defining the opening in said other winding in engagement with the other of said centering means, a second pair of distributed windings substantially surrounding said first pair of coils and located to produce a magnetic field substantially at right angles to the field produced by the first pair of windings, a centering element located upon and centrally of said one centering means and of sufficient height to be engaged by the second pair of windings, and a second centering element located upon and centrally of said other centering means and also of sufficient height to be engaged by the second pair of windings, each of said centering elements occupying only a small part of the circumference of said supporting tube, the outer edges of the windings comprising said second pair being in engagement with said centering elements whereby the second pair of windings is centered with respect to said supporting tube.

7. An electromagnetic deflecting device for a cathode ray tube, said device comprising a supporting tube, centering means mounted on one side of said tube, a second centering means mounted on the opposite side of said tube, a pair of distributed windings each so wound that there is an opening in the middle thereof which is not occupied by the winding, one of said windings being supported on one side of said supporting tube with at least a portion of the inner winding edge defining the opening in said one winding in engagement with one of said centering means, and the other of said windings being supported on the opposite side of said supporting tube with at least a portion of the inner winding edge defining the opening in said other winding in engagement with the other of said centering means, a second pair of distributed windings substantially surrounding said first pair of coils and located to produce a magnetic field substantially at right angles to the field produced by the first pair of windings, a centering element located upon and centrally of said one centering means and of sufficient height to be engaged by the second pair of windings, a second centering element located upon and centrally of said other centering means and also of sufficient height to be engaged by the second pair of windings, each of said centering elements occupying only a small part of the circumference of said supporting tube, the outer edges of the windings comprising said second pair being in engagement with said centering elements whereby the second pair of windings is centered with respect to said supporting tube, and a cylinder of magnetic material surrounding said second pair of windings.

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