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DEFLECTING COIL

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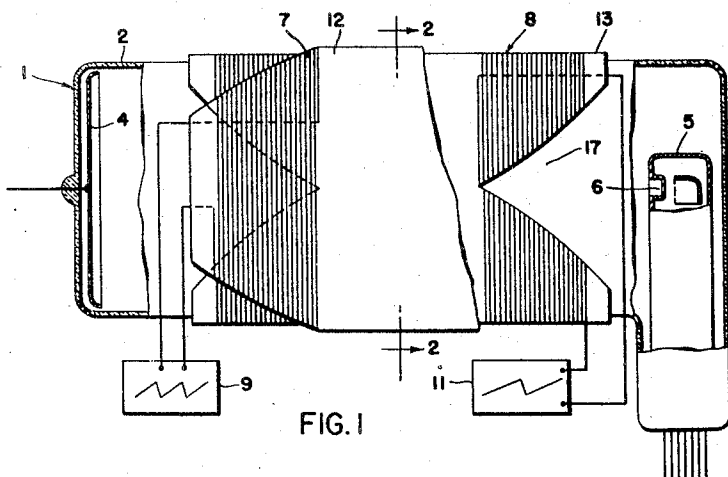


FIG. 1

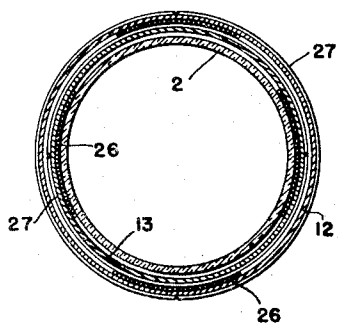


FIG. 2

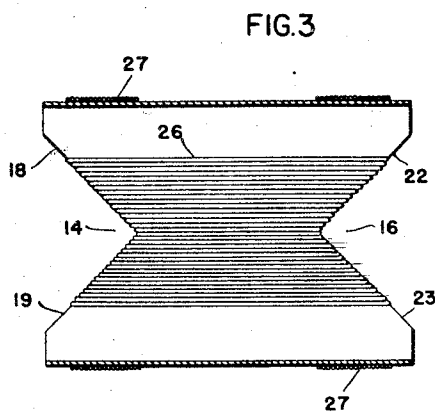


FIG. 3

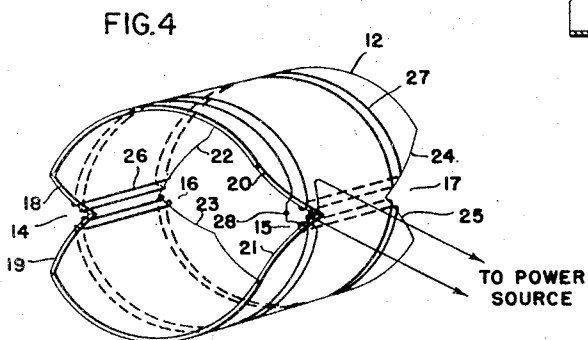


FIG. 4

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This invention relates generally to cathode-ray deflecting devices and is particularly directed to deflecting coils for use with a dissector tube to deflect an electron beam.

It is well known in the prior art to employ magnetic deflecting devices for deflecting a cathode ray in two directions substantially at right angles to each other. The deflecting device usually consists of two pairs of deflecting coils, one pair being used for horizontal deflection and the other for vertical deflection. Each pair of coils consists of two halves. For developing a required field through the coils, currents of saw-tooth wave form are passed therethrough.

In the construction of deflecting coils, it is a common practice to wind the coil about a trapezoidal form, after which the windings are tied or taped together. Thereafter the coils are shaped to the desired curvilinear form and placed about the tube envelope.

Inasmuch as the deflection system normally consists of two pairs of coils, it is necessary to form four sets of individual coils with the result that when all the coils are arranged on the tube, a bulky coil system is formed. In the arrangement of the coils about the tube, it is necessary to position one coil over the other, whereby the winding of one coil is spaced a considerable distance from the electron beam emitted by the cathode. As a result, it is necessary to apply a greater voltage to the outermost coils to create a uniform flux field. Hence, it is seen that prior art coils are bulky and inefficient.

It is the object of this invention to provide a novel, compact cathode-ray deflecting device.

Another object of this invention is to provide a deflecting device which is efficient at scanning voltages of relatively low value.

In accordance with the present invention, there is provided a dissector tube having an electron-emitting cathode and an electron-accelerating anode. Arranged about the tube intermediate the anode and cathode is a deflecting element consisting of a pair of cylindrical forms and a pair of coils wound thereon, each coil being arranged to provide magnetic fields at right angles to one another.

At the ends of each cylindrical form is a pair of notches. The coils are wound on individual cylindrical forms which are telescoped over one another. Each form has single-layer windings disposed adjacent the inner walls thereof, the end conductors being wound through said notches and about the outer surface of the form, thereby

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forming a coil that is compact and in the closest possible relation to the axis of the tube.

For a better understanding of the invention, together with other and further objects thereof, reference is made to the following description, taken in connection with the accompanying drawings, and its scope will be pointed out in the appended claims.

In the accompanying drawings:

Fig. 1 is an elevational view of a complete deflecting coil assembly in operative relation with a dissector tube.

Fig. 2 is a sectional view taken on lines 2-2 on Fig. 1.

Fig. 3 is a longitudinal section of one of the deflecting coils.

Fig. 4 is a perspective view of a deflecting coil form showing the method of winding a coil.

Referring to the drawings, the dissector tube 1 comprises an evacuated envelope 2 containing an electron-emitting cathode 4 and an electron-accelerating anode 5. For deflecting an electron beam emitted by the cathode with respect to the scanning aperture 6 of the anode, there is arranged about the envelope 2, intermediate the cathode and anode, two deflecting coils 7 and 8 disposed at right angles to each other so that horizontal and vertical deflecting fields are set up when said coils are connected to a suitable power source such as a "saw-tooth wave" generator 9 or 11.

Each deflecting coil is wound on an individual insulated cylindrical form such as 12 and 13, the form 12 being slightly larger in diameter than form 13. At the extreme ends of each form is formed a pair of diametrically-opposite notches 14 and 15; 16 and 17 having diverging edge portions 18, 19, 20, 21, 22, 23, 24 and 25.

Each coil consists of two halves having side windings 26 disposed against the inner walls of the forms and end windings 27 disposed around the outer-end surface of the form.

Referring to Fig. 4, there is shown a detailed arrangement of the two halves of one coil. The first turn of the winding of the one half may be traced from the power source such, for example, as generator 9, Fig. 1, outside of the form 12 around the edge 20 of the notch 15, through the inside of the form to the opposite end thereof to the notch 17 and then outwardly and around the edge 24 of the notch 17 and around the outer surface of the form to the diametrically-opposite notch 16. This first turn is then wound inwardly and around the edge 22 of the notch 16 and adjacent the inner surface of the form to the notch

14. It is then passed outwardly and around the edge 18 of the notch 14 and over and around the opposite outer-end surface of the form and back to notch 15 for a repeated winding for the desired number of turns. The winding of the other half of the coil is substantially identical and when outer ends of the windings of each half are joined together as at 28, the two halves form a unitary coil structure.

It is to be observed that the side portions 26 of the coil are uniformly laid parallel to each other and in a single layer whereby a uniform deflecting field is obtained which is very essential for successful operation of a cathode-ray tube. While there has been shown a coil structure of single-layer windings, it is to be realized that the coil may be wound with a plurality of layers and thus provide a similar deflecting field.

In operation, the deflecting coils 7 and 8 are positioned about the dissector tube substantially 90° apart for moving the electron beam emitted by the cathode 4 in two directions over the scanning aperture 6 of the anode. Current of "saw-tooth wave" form is passed through the coils to develop the required magnetic field.

While there has been chosen a dissector tube to illustrate this invention, it is to be understood that the invention may also be applied to other forms of cathode-ray tubes such as the iconoscope, oscillograph, kinescope or the orthicon.

While there has been described what is at present considered the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is, therefore, aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A magnetic deflecting element including a coil and a cylindrical form, said form being notched at each end thereof, said coil consisting of a winding having its longitudinal conductors disposed on one surface of the form, the lateral end conductors being wound through each notch and about the other surface of the form.

2. A magnetic deflecting element comprising a form, a coil wound on said form, said form having a pair of notches formed at each end thereof to provide diverging edges adapted to support the windings of said coil, said coil consisting of longitudinal conductors disposed on one surface of said form, the lateral end portions of said conductors being laid around the adjacent diverging edges of each notch and around another surface of said form.

3. A deflection coil comprising a cylindrical form and a coil, said form including a pair of notches formed at each end thereof to provide diverging edges of the form adapted to support the winding of a coil, said coil consisting of a single-layer winding having two halves, each of which includes two parallel oppositely-facing single layers disposed adjacent the inner walls of said form, the end turns of each half being laid around the adjacent diverging edges of each notch and around the outer surfaces of the end portions of said form.

4. A magnetic deflecting element including a coil and a form, said form having cutaway portions at each end thereof to provide converging edge portions adapted to support the winding of said coil, said coil consisting of a winding having

a longitudinal part of its conductors on one side of the form and its lateral end conductors being wound around the converging edge portions to the other side of said form.

5. A deflection element comprising a cylindrical form and a coil, said form having end portions thereof cut away to form a pair of diametrically-opposite V-shaped notches at each end whereby to provide diverging edge portions adapted to support the windings of said coil, each pair of notches being in alignment with one another, said coil consisting of a single-layer winding having two substantially identical halves and consisting of two parallel oppositely-facing layers disposed adjacent said inner walls and between the aligned notches, the end turns of each half being laid around the adjacent diverging edge portion of each notch and around the outer surfaces of the end portions of said form.

6. A magnetic deflecting element comprising a form, said form having an outer and an inner wall and having end portions serrated to form a pair of diametrically-opposite V-shaped notches whereby to provide diverging edge portions, a coil wound on said form, said coil consisting of a single-layer winding having two substantially identical halves and consisting of two parallel oppositely-facing single layers disposed adjacent said inner wall, the end turns of each half being laid around the adjacent diverging edge portion of each notch and around the outer surfaces of the end portions of said form.

7. Cathode-ray tube beam deflecting apparatus comprising a pair of coils and a pair of forms adapted to produce a magnetic field in two directions, each of said forms being notched at each end thereof, and said coils consisting of windings having a part of their conductors disposed on one side of said form, the end conductors being wound through each notch and about the other side of said form.

8. Cathode-ray tube beam deflecting apparatus comprising a pair of coils and a pair of cylindrical forms telescoped over one another adapted to produce a pair of magnetic fields, each having a different direction and each of said forms being notched at each end thereof, each of said coils consisting of a winding having a part of its conductors disposed on the inner surface of one of said forms, the end conductors being wound through each notch and about the outer surface of the form.

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