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MAGNETIC STRUCTURE FOR USE IN ION-TRAPS

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Fig. 1

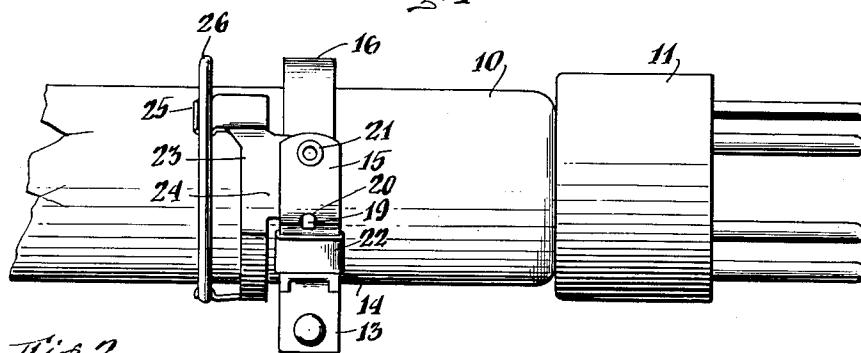


Fig. 2

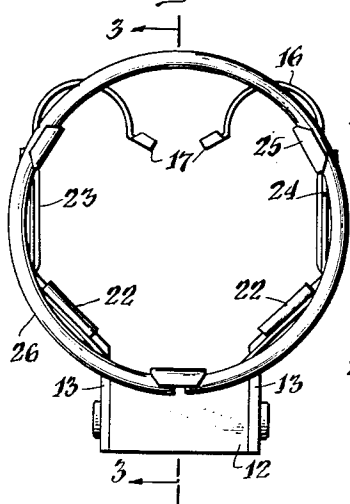


Fig. 3

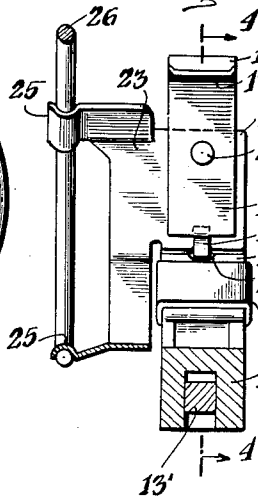


Fig. 4

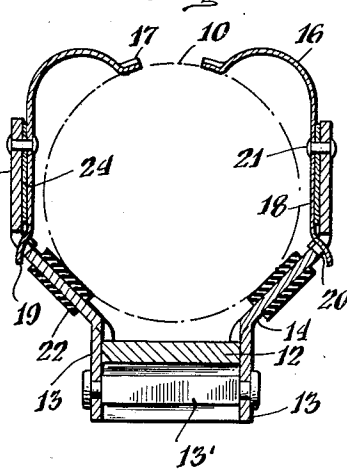


Fig. 5

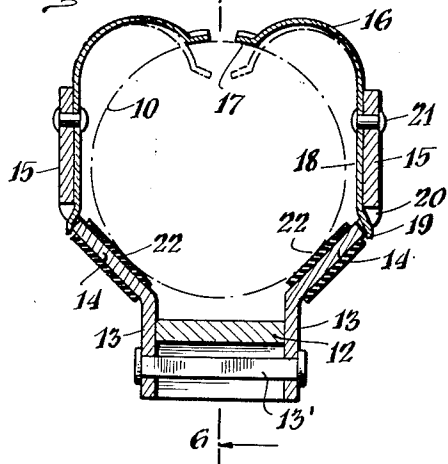
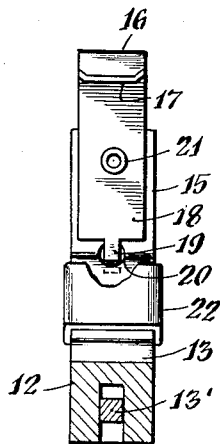


Fig. 6



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MAGNETIC STRUCTURE FOR USE IN
ION-TRAPSGeorge J. Mucher, Rochester, N. H., assignor to
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3 Claims. (Cl. 313—75)

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This invention relates to a structurally and functionally improved ion trap especially intended for association with a cathode ray tube such as is used in television receivers.

It is an object of the invention to furnish a unit of apparatus which may readily be applied to the neck of an electronic tube and may thereupon be adjusted with facility with respect to said tube in both rotative and axial directions.

A further object is that of furnishing an ion trap which when once adjusted to proper position will remain fixed against any probability of accidental displacement with respect to the part upon which it is mounted; the adjustments achievable by shifting the trap being such that, without difficulty, an operator may relate the same to a given installation with such precision that the best operating results of the electronic tube are readily achieved.

Another object is that of furnishing a device of this type which will embody relatively few parts each individually simple and rugged in construction, such parts being capable of quantity production and assemblage by relatively unskilled labor, and when assembled furnishing a unit operating over a long period of time with freedom from all difficulties.

With these and other objects in mind, reference is had to the attached sheet of drawings illustrating practical embodiments of the invention and in which:

Fig. 1 is a fragmentary side elevation of an electron tube with one form of trap mounted thereon;

Fig. 2 is a face view of such trap;

Fig. 3 is a sectional side view taken along the lines 3—3 and in the direction of the arrows as indicated in Fig. 2;

Fig. 4 is a sectional view taken along the lines 4—4 and in the direction of the arrows as indicated in Fig. 3;

Fig. 5 is a view similar to Fig. 4, but showing an alternative form of construction; and

Fig. 6 is a transverse sectional view taken along the lines 6—6 and in the direction of the arrows as indicated in Fig. 5.

Primarily, referring to Fig. 1, the numeral 11 indicates the neck portion of a cathode ray tube which may be provided with the usual plug base 11. In accordance with conventional practice,

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this base is larger than the neck of the tubes. The complete tube and its component focusing and deflecting mechanism have not been shown in that they comprise no part of the present invention. It suffices to say that within the neck of the tube there is provided the usual electron gun in which the necessary beam is generated and directed towards the target area or screen at the end of the tube. The electron beam is focused and deflected to trace a pattern on the target screen of the tube. The focusing coil and deflector are located adjacent the neck of the tube to the left of the ion trap as viewed in Fig. 1; the focusing means being usually disposed between the ion trap and the deflecting means.

The electron beam includes both ions and electrons. It is most desirable to prevent the bombardment of the viewing screen by the ions. The latter being many times heavier than electrons and varying widely in weight, their inertia is greater than the power of the deflection means to deflect them over the full area of the screen. Thus, the screen of the cathode ray tube may have a relatively small area subjected to an intensive bombardment. Under these circumstances this area of the screen would break down after a relatively short period of time. The ion trap of the present invention permits of a controlled deflection of the ions such that injury to the screen will be prevented.

One preferred form of ion trap has been shown in Figs. 5 and 6. In those views the numeral 12 indicates a magnet which is preferably U-shaped in section and to the opposite ends of which arms 13 are applied. These arms may be secured in position by means of a securing element 13' which has its opposite ends extending through openings in the arms and is headed beyond the same; its shank extending within the space defined by the legs of element 12. This shank as shown especially in Fig. 6, is preferably non-circular in cross section so as to prevent relative rotation of the parts.

Arms 13 are bent or extended so as to project upwardly and outwardly as indicated at 14 and then preferably in a purely vertical direction, as at 15. Spring clips 16 which may be of relatively light stock have engaging portions 17 adjacent their outer ends. Their bodies 18 extend in face to face contact with the vertically pro-

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jecting portions 15 and terminate at their lower ends in offset portions 19. These extend through openings 20 formed in the arms preferably at points adjacent the juncture of portions 14 and 15. Rivets 21 may secure the bodies 18 against the inner faces of portions 15. In this manner the clip structures are firmly mounted and braced against deflection in so far as their inner ends are concerned.

Normally the contact portions 17 of the clip 16 will occupy the position indicated in dotted lines in Fig. 5. It is preferred that at least the inner surface of the upwardly and outwardly extending parts 14 be covered with a layer of cushioning material such as rubber. To this end sleeves 22 of such material may encircle those portions. A structure is thus provided which may readily be expanded to pass over the base portion 11 of the tube 10 by simply springing the clips or arms 16 outwardly. When the unit occupies a position upon the neck of the electronic tube, then the clip or resilient arm portion 16 will occupy a position such as indicated in full lines in Fig. 5. In such position it will be apparent that the two engaging portions will bear against the outer face of the tube neck and will yieldingly urge angularly extending parts 14 of the legs into contact with the outer neck surface. Such contact will not be injurious because of the cushioning material 21 which is preferably provided. Also, that cushioning material will frictionally engage the surface of the neck in a manner such that unless the trap is deliberately shifted with respect to that surface, the frictional contact of the parts will prevent accidental movement.

In any event, it will be apparent that with this unit mounted upon the neck of the tube, an operator may readily adjust the same axially of that portion. This adjustment will continue until the stream of electrons discharged by the tube gun is being dispersed to best advantage over the surface of the screen. Thereupon the units may be rotated with respect to the tube neck in order to again assure proper deflection. As will readily be appreciated the rotational adjustment might be resorted to prior to the axial adjustment, or both axial shifting and turning might be simultaneously resorted to.

The structure shown in Figs. 1 to 4 is basically substantially identical with the structure heretofore described in connection with Figs. 5 and 6. For this reason similar reference numerals have been used to designate the same parts. In addition, however, it will be noted that in the first group of figures a mounting 23 is provided which may be in the form of a strip having angularly disposed faces extending throughout the greater part of a circle. These faces may be generally parallel to their adjacent arm portions. This strip is provided with a pair of rearward extensions 24 which may be interposed between portions 15 and 18 and through which the rivets 21 may pass. This strip is formed of non-magnetic material such as brass and may be provided with a plurality of forwardly extending portions 25 which are bent to form supports. These receive and mount a magnet 26 in the form of a split ring. The strip 23 incorporates resilient properties as do also the mounting portions 25 thereof. The magnet 26 defines a circle of lesser diameter (when unmounted) than the supports 25. Therefore, when the magnet 26 is mounted it will yieldingly bear against and be in turn yield-

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ingly engaged by the mounting portions 25. Accordingly, frictional engagement between the parts will occur such that the ring 26 will not be accidentally rotated with respect to its mounting. However, it may readily be so rotated if sufficient force is applied.

The magnetic force or strength of the element 12 and the parts associated therewith may be, for example, from forty-three to fifty gaussses. The magnetic force developed by magnet 26 may be, for example, from eight to fifteen gaussses. As will be apparent with the parts assembled in the manner shown, they may be expanded so as to pass over the base 11 onto the neck 19 of the electronic tube.

The assembly may be both axially and rotatably shifted with respect to that neck in order to insure the best operating characteristics of the tube. After this adjustment has been made to best advantage, then magnet 26 may be rotated with respect to its mounting. This will permit of a fine or vernier adjustment of the parts which will allow the operator to obtain a functioning of the tube to maximum advantage.

Thus, among others, the several objects of the invention as afore-noted are achieved. Obviously numerous changes in construction and rearrangement of the parts might be resorted to without departing from the spirit of the invention as defined by the claims.

I claim:

1. A magnetic structure for supplying a magnetic field in the ion trap of a cathode ray tube, said structure comprising in combination a substantially square-faced block of material providing a permanent magnet, relatively rigid arms having their inner end portions disposed one in contact with each of the opposite end faces of said block, said arms extending upwardly and outwardly from said block and terminating in substantially parallel end portions spaced from each other a distance greater than the diameter of a tube neck which they are to encircle, spring clips having their inner ends secured against movement with respect to the end portions of said arms and extending inwardly therefrom to have their outer ends spaced from each other and tube-engaging portions adjacent outer ends of said clips.

2. A magnetic structure for supplying a magnetic field in the ion trap of a cathode ray tube, said structure comprising in combination a substantially square-faced block of material providing a permanent magnet, relatively rigid arms having their inner end portions disposed one in contact with each of the opposite end faces of said block, said arms extending upwardly and outwardly from said block and terminating in substantially parallel end portions spaced from each other a distance greater than the diameter of a tube neck which they are to encircle, spring clips having their inner ends secured against movement with respect to the end portions of said arms and extending inwardly therefrom to have their outer ends spaced from each other, tube-engaging portions adjacent outer ends of said clips, said magnet block being U-shaped in cross section, a securing element disposed between said magnet arms and restrained from rotation by contact with the inner faces thereof and said element extending through the adjacent inner end portions of said arms to maintain the latter against displacement with respect to said block.

3. A magnetic structure for supplying a mag-

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netic field in the ion trap of a cathode ray tube, said structure comprising in combination a substantially square-faced block of material providing a permanent magnet, relatively rigid arms having their inner end portions disposed one in contact with each of the opposite end faces of said block, said arms extending upwardly and outwardly from said block and terminating in substantially parallel end portions spaced from each other a distance greater than the diameter of a tube neck which they are to encircle, spring clips having their inner ends secured against movement with respect to the end portions of said arms and extending inwardly therefrom to have their outer ends spaced from each other, tube-engaging portions adjacent outer ends of said clips, a strip connected against movement with respect to said arms, extensions projecting from said strip and to one side of said arms and clips and mounting portions forming a part of said extensions to provide a support for a ring-shaped magnet.

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