Nov. 13, 1951

G. J. MUCHER

2,575,067

ION TRAP

Filed May 13, 1948

Fig. 1

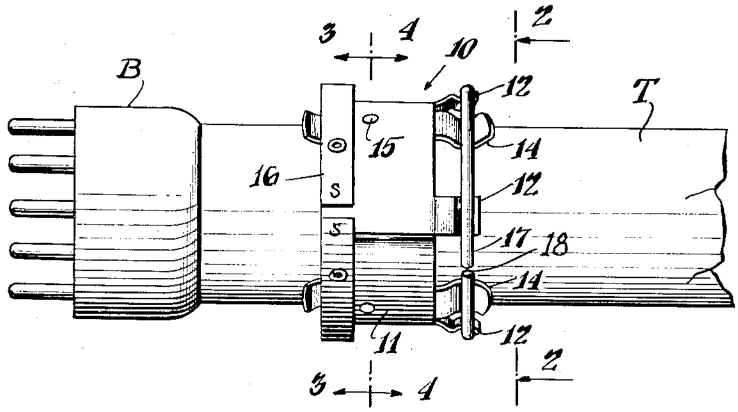


Fig. 2

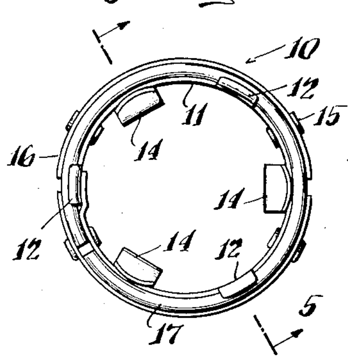


Fig. 3

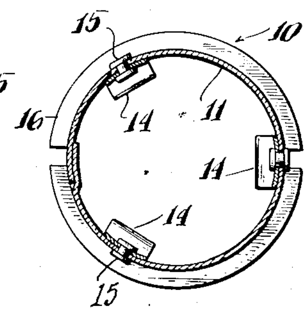


Fig. 4

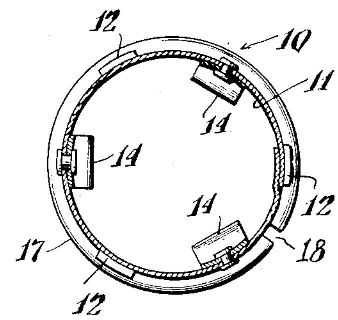
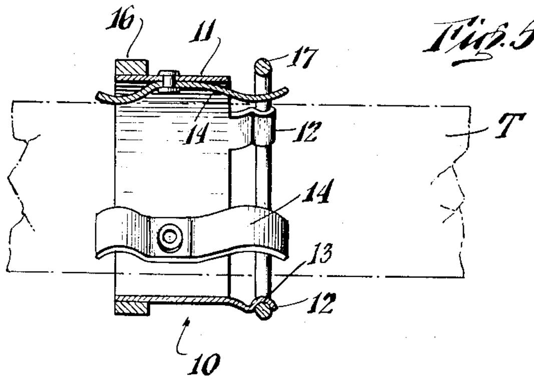


Fig. 5



INVENTOR.

George J. Mucher

BY

Dull and Kane

ATTORNEYS

Patented Nov. 13, 1951 2,575,067

UNITED STATES PATENT OFFICE

2,575,067

ION TRAP

George J. Mucher, Brooklyn, N. Y., assignor to Clarostat Mfg. Co., Inc., Brooklyn, N. Y., a corporation of New York

Application May 13, 1948, Serial No. 26,765

10 Claims. (Cl. 313—75)

1

This invention relates to electronic apparatus, and particularly to apparatus for use with cathode ray tubes such as used in television receiving systems.

Although the invention is not limited to the viewing tubes of television systems, it has advantages particularly appropriate for such use and will be described with respect thereto. The kinescope, which is the electron tube used for reproducing a television image at the receiver, is a cathode ray tube in which a stream of electrons is discharged by an electron gun and is caused to traverse the viewing screen at the enlarged end of the tube. The viewing screen is of fluorescent material which glows at the point of impact of the electron stream thereon. Means are employed to focus the electron stream, and apparatus intermediate the focusing means and the screen causes the electron stream to traverse the viewing screen and produce the image by variation in the intensity of illumination of said screen.

It has been found most desirable to prevent the bombardment of the viewing screen by ions. Ions are many times heavier than electrons and vary widely in weight; their inertia is greater than the power of the deflection means to deflect them over the full area of the screen, and the screen may thus be subjected to a relatively small area of bombardment which breaks it down after relatively short use.

Magnetic devices are used to prevent the ions from reaching the screen. Some such devices comprise magnets of opposite polarity maintained in suitable spaced relationship about the neck of the kinescope. These magnetic devices, which are known in the art as "ion traps," are placed suitably intermediate the electron gun and the focusing coil. The magnet nearest the electron guns is the stronger and deflects the ray toward the side wall of the tube. The second magnet picks up, i. e. deflects, the electrons away from the wall of the tube and brings them into the field of the focusing coil; the ions, being much heavier and possessing greater inertia, are not returned to the field of the focusing coil and are dissipated as heat at the wall of the tube.

Field conditions peculiar to each installation require that the poles of the magnets of the ion trap be adjusted relative to each other and that the ion trap be shifted axially of the tube to its point of greatest effectiveness. Once the adjustment is made it should remain fixed until some subsequent change in operating conditions makes it necessary to readjust either the relation of the magnetic poles or the position of the

2

trap on the neck of the tube. This adjustment is made by the service man, who may be mechanically inept or careless, and who is usually working under adverse conditions. Some presently known ion traps are supported on the tubes by means of rubber spacers or plates which rest directly on the tube. Such plates are frequently so affected by the heat of the tube that they stick to the walls thereof and make it most difficult to remove the trap or to shift it along the neck of the tube. Other traps clamp to the tube by screw clamps or the like and it is difficult to tighten or loosen the clamps to accomplish the adjustment or readjustment. With either type of trap, there is great danger of breaking the tube while making the adjustment. A further complication is inherent in the tube itself; the trade has standardized on a tolerance of ⅛" in the diameter of the neck of the tube. Hence a mass produced ion trap must embody some means of adjusting to the neck diameter of a particular kinescope.

The present invention aims to provide an improved ion trap which may be easily placed about the neck of the cathode ray tube, which may be easily adjusted for relative polarity position of the respective magnets and which may easily be shifted axially along the neck of the tube.

It is therefore an object of the invention to provide an improved mounting for the magnetic elements of an ion trap.

It is a further object of the invention to provide an ion trap which resiliently embraces the wall of the electron tube for conformity to the diameter thereof, and which will remain in axially adjusted position without the necessity of screw clamps or the like.

It is a further object of the invention to provide an ion trap which may be readily passed over the tube base when necessary to install or remove the trap, without having to loosen or displace component parts of the trap for its mounting means.

Other features and advantages will hereinafter appear.

In the accompanying drawings,

Fig. 1 is a side elevation showing a portion of the neck of an electronic tube with my improved ion trap mounted thereon;

Fig. 2 is an end elevation of the trap, looking in the direction of the arrows 2—2 in Fig. 1;

Figs. 3 and 4 are vertical sectional elevations, looking respectively in the direction of the arrows 3—3 and 4—4 of Fig. 1; and

Fig. 5 is a horizontal sectional elevation, taken in the arrows 5—5 of Fig. 2.

In the accompanying drawings Fig. 1 shows an ion trap 10 constructed pursuant to the present invention and mounted upon the neck of an electronic tube T. The tube has the usual plug base B; such base is ordinarily of slightly larger diameter than the neck. The complete tube and its component focusing and deflecting mechanisms have not been shown inasmuch as they comprise no part of the present invention. It is to be understood, however, that within the neck of the tube there is provided the usual electron gun (not shown) in which the electron beam is developed and directed toward the target area or screen at the end of the tube. As is well known, the electron beam is focused and then deflected to trace a pattern on the target screen. The focusing coil and the deflector means are located on or about the neck of the tube to the right of the ion trap as viewed in Fig. 1. The focusing means are disposed intermediate the ion trap and the deflecting means.

The trap comprises a non-magnetic sleeve 11, which may be of brass or other suitable material, projecting from one end of which are a suitable plurality, ears 12 having channels or grooves 13. Formed either integral with the sleeve or suitably affixed to the underside thereof, are spring clips 14 for resiliently supporting the sleeve on the neck of the tube. Said clips are so arranged that the sleeve 11 is parallel to the axis of the tube. As illustrated, the clips are affixed to the sleeve 11 by means of suitable non-magnetic rivets 15. It will be noted that the ends of the clips 14 nearest the base B are shorter than their opposite ends, so that if necessary the trap 10 may be moved relatively close to the end wall of the tube base. The clips are sufficiently springable or resilient to adjust to the tube neck diameters of from 1⅜″ to 1½″; said diameters representing the standard minimum and maximum neck diameters for kinescope tubes.

The sleeve 11 mounts two permanent magnets. Magnet 16 has a strength of from 43 to 50 gausses; theoretically it would be preferable to make the magnet in one piece comprising an almost complete circle interupted only by a relatively short air gap at the poles. It is commercially more expedient, however, to form the magnet of two substantially semi-circular half portions so arranged that the common poles are adjacent as indicated in the drawings.

Magnet 17 has a strength of from 8 to 15 gausses and is preferably a rigid wire of circular cross section uninterrupted except for the short gap 18. The front magnet 17 is in reverse polarity arrangement with respect to the rear magnet 16. The minimum diameter of magnet 17 is slightly less than that of a circle passing through the base of the grooves 13, so that the ears 12 frictionally hold the magnet while permitting a forcible rotation thereof.

The magnet 16 is riveted to the sleeve 11 and is arranged at right angles to the axis of the sleeve. The magnet 17 is secured only by frictional engagement with the ears 12 and is in substantial parallelism with the magnet 16. The magnet 17 may be rotated about the sleeve 10 by placing the end of a screw driver, for example, within the space 18 and exerting the necessary directional pressure against an end wall of the magnet; thus the pole positions of the magnet with respect to each other may be easily adjusted in the field.

The spring clips provide for easily shirting the device along the tube neck, and grip said neck with sufficient force to prevent accidental movement either axially or rotatably of the tube neck after adjustment has been made. There is no organic material in contact with the tube neck to soften or disintegrate due to the operating temperature of the tube.

It will be noted that the minimum effective diameters of the ion trap are such that it may be easily slid over the tube base during the insertion or removal of the device. It is unnecessary, therefore, to remove or loosen any parts during such insertion or removal, and the possibility of tube breakage or damage during the removal or adjustment of the trap is greatly reduced.

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. An ion trap comprising a sleeve of non-magnetic material having a plurality of inorganic, non-magnetic spring clip means for frictionally securing said sleeve upon a tubular support in parallelism with the axis thereof; a permanent magnet secured about said sleeve at one end thereof; a plurality of springable ears projecting from said sleeve at the opposite end thereof; and a second permanent magnet rotatably carried by said ears and extending about said sleeve substantially in parallelism with said first-named magnet.

2. An ion trap comprising a sleeve of non-magnetic material; a plurality of non-magnetic, inorganic resilient members extending from said sleeve member to resiliently secure said sleeve upon a tubular support in parallelism with the axis thereof, a plurality of spring members extending axially from said sleeve at one end thereof, said spring members each having a channel which collectively define a circle having a diameter greater than the diameter of said tubular support and arranged in a plane perpendicular to the axis thereof; a ring-shaped magnet carried by said spring members within the channels thereof; and a second ring-shaped magnet carried by said sleeve and circumscribing the same adjacent the opposite end thereof.

3. An ion trap comprising a sleeve of non-magnetic material; inorganic spring means for supporting said sleeve upon a tubular member in spaced relationship therewith, and in substantial parallelism with the axis thereof; a magnet fixed about said sleeve adjacent one end thereof, said magnet having an annular field substantially at right angles to the axis of said sleeve; a second magnet disposed about said sleeve adjacent the opposite end thereof, said second magnet also having an annular field in substantial parallelism with the field of the first-named magnet; and means for securing said second magnet to said sleeve while permitting rotation of said magnet in a plane perpendicular to the axis of said sleeve.

4. In an ion trap a mounting member for application to the neck of a cathode ray tube, means providing a magnet-mounting surface forming a part of said member, supporting means extending inwardly of and secured to said mounting member to contact the surface of a tube and bearing surfaces forming a part of said supporting means whereby said mounting member may be

shifted with respect to the tube surface while mounted thereon.

5. In an ion trap a mounting member for application to the neck of a cathode ray tube, means providing a magnet-mounting surface forming a part of said member, supporting means extending inwardly of and secured to said mounting member to contact the surface of a tube, ears extending axially of said member and providing a support for a second magnet and bearing surfaces forming a part of said inwardly extending supporting means whereby said mounting member may be shifted with respect to the tube surface while mounted thereon.

6. An ion trap including a sleeve of non-magnetic material to encircle the neck of a tube, a permanent magnet mounted upon said sleeve adjacent one end of the same, ears extending axially of and beyond the opposite end of said sleeve and a second permanent magnet supported by said ears.

7. An ion trap including a sleeve of non-magnetic material to encircle the neck of a tube, a permanent magnet mounted upon said sleeve adjacent one end of the same, ears extending axially of and beyond the opposite end of said sleeve, a second permanent magnet supported by said ears and neck-engaging clips of resilient material secured to the inner sleeve face and extending in the direction of the sleeve axis.

8. A mounting for adjustably positioning and holding a ring-shaped magnet around a glass tube, said mounting comprising a member of non-magnetic material having a larger inside diameter than the outside diameter of the glass tube, the ring-shaped magnet being held in position on the outside of said member by engagement therewith, a plurality of clips of non-magnetic resilient material disposed within said member, and means preventing relative movement of said clips longitudinally and circumferentially of said member but permitting individual movement of each clip radially relative to said member for adapting the mounting to various diameters of glass tubes and frictionally holding the mounting in adjusted position thereon.

9. A mounting according to claim 8 wherein said magnet has an air gap and its inside diameter is slightly less than the outside diameter of said member, whereby the magnet is sprung over said member and the engagement therewith is increased by the resilience of said magnet.

10. A mounting according to claim 9 wherein said member has a groove around its outer surface and said magnet is sprung into said groove.

GEORGE J. MUCHER.

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
2,181,850	Nicoll	Nov. 28, 1939
2,188,579	Schlesinger	Jan. 30, 1940
2,211,614	Bowie	Aug. 13, 1940
2,274,586	Branson	Feb. 24, 1942
2,431,113	Glyptis et al.	Nov. 18, 1947
2,456,474	Wainwright	Dec. 14, 1948
2,455,977	Bocciarelli	Dec. 14, 1948
2,460,609	Torsch	Feb. 1, 1949
2,499,065	Heppner	Feb. 28, 1950
2,513,929	Gethmann	July 4, 1950
2,544,898	Obszarny et al.	Mar. 13, 1951
2,552,342	Mucher	May 8, 1951
2,553,792	Smith et al.	May 22, 1951

FOREIGN PATENTS

Number	Country	Date
501,931	Great Britain	Mar. 8, 1939