United States Patent [19]

Puhak

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[45] **Mar. 25, 1975**

[54] **MAGNET RETAINING MEANS FOR A CRT BEAM ADJUSTMENT DEVICE**

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[21] Appl. No.: **442,460**

[52] **U.S. Cl.** **335/212,** 335/285

[51] **Int. Cl.** **H01f 7/00**

[58] **Field of Search** 335/210, 211, 212, 285, 335/302, 303, 306; 313/77

[56] **References Cited**

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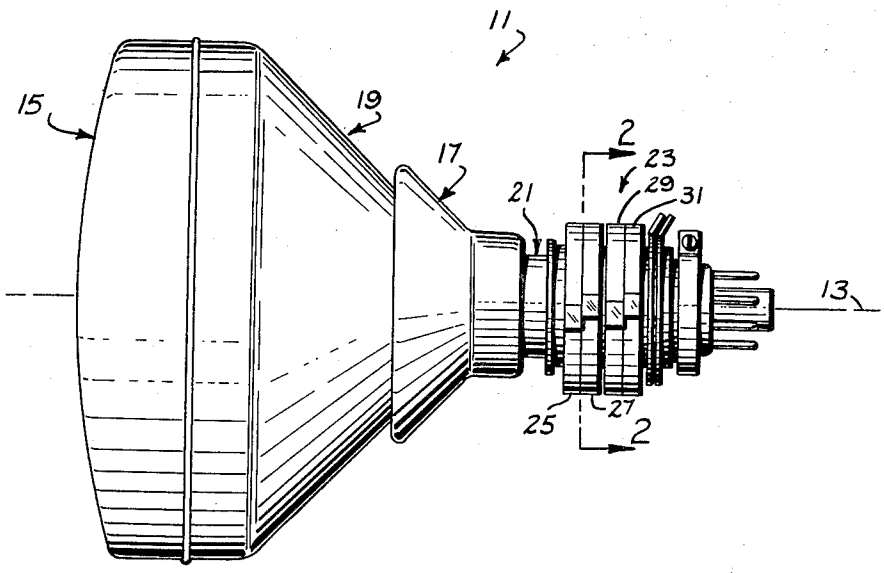
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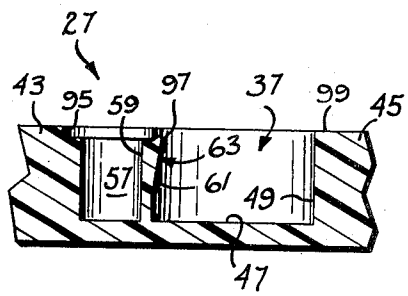
Primary Examiner—Harold Broome
Attorney, Agent, or Firm—Norman J. O'Malley; Frederick H. Rinn; Cyril A. Krenzer

[57] **ABSTRACT**

Improved means are provided for retaining magnets in an electron beam adjustment device formed for external positioning on the neck of a cathode ray tube. The device is comprised of at least one rotatable body member having a plurality of open-top pockets formed therein to accommodate compatibly shaped magnets. The body material adjacent to the pockets has at least one cavity formed therein adjacent to a pocket. Both the cavity and the associated pocket have a common discrete portion of sidewall wherefrom a substantially resilient protuberance is formed to extend into the pocket to provide compressive snap-in means for securely retaining a magnet therein.

10 Claims, 7 Drawing Figures





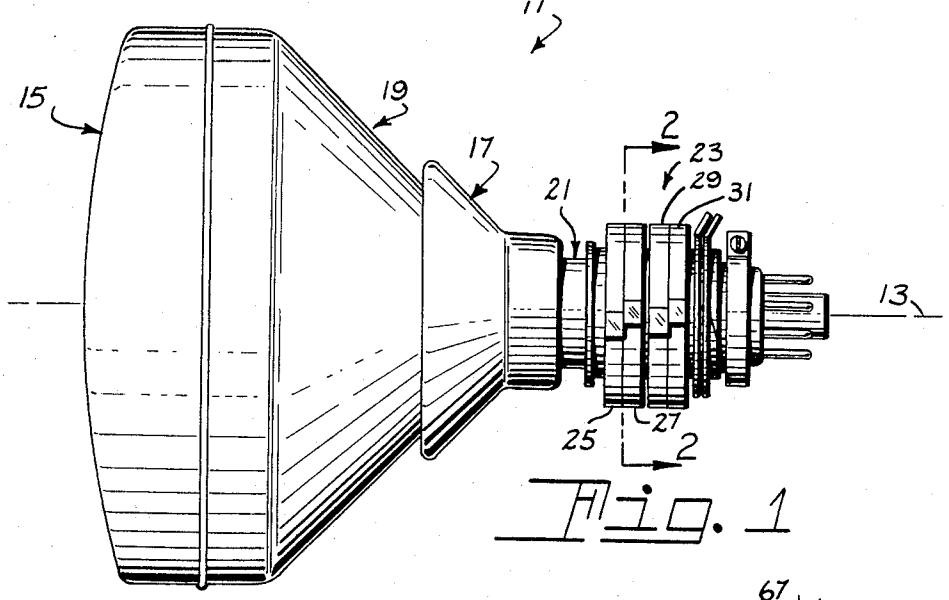


Fig. 1

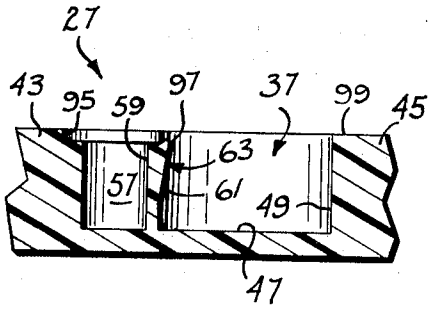


Fig. 3

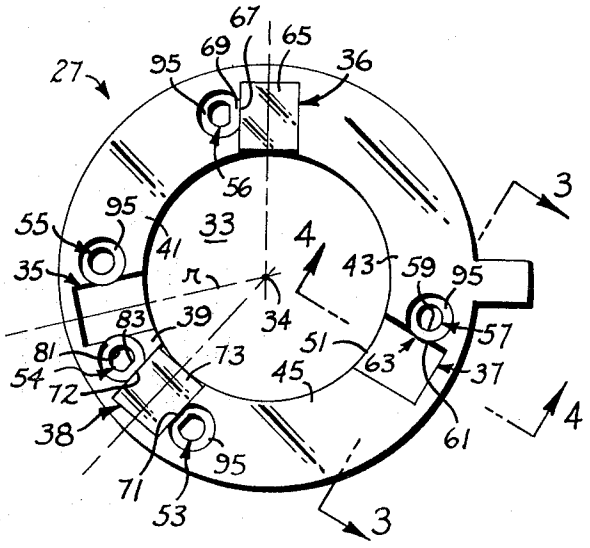


Fig. 2

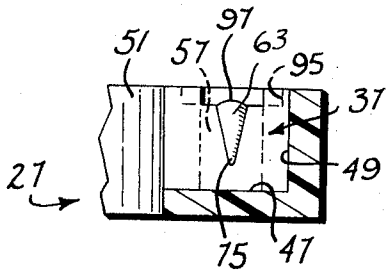


Fig. 4

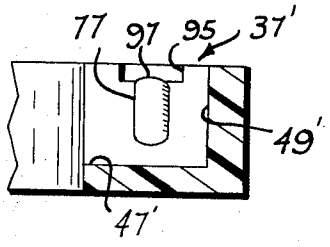


Fig. 5

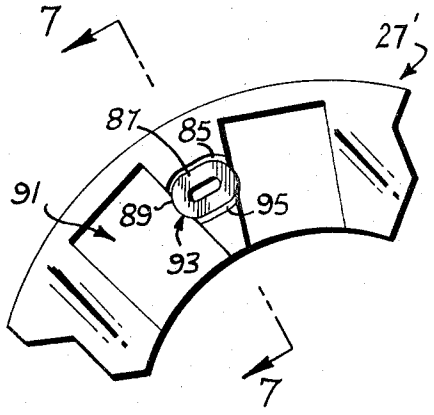


Fig. 6

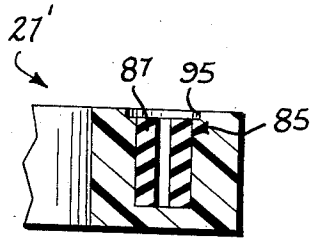


Fig. 7

MAGNET RETAINING MEANS FOR A CRT BEAM ADJUSTMENT DEVICE

BACKGROUND OF THE INVENTION

This invention relates to an external device for controlling electron beams within a cathode ray tube and more particularly to means for retaining magnets in an externally positioned cathode ray tube beam adjustment device.

In a plural beam color cathode ray tube of the type conventionally employed in color television applications, the several electron beams, emitted from electron gun means oriented in the neck portion of the tube, are directed to a patterned cathodoluminescent screen to effect a predetermined display of imagery thereon. For the beams to converge and impinge discrete areas of the screen pattern in the desired manner, it is imperative that the beams be accurately controlled in their travel to the screen. External control of the respective electron beams is augmented by a beam adjustment device formed for positioning on the exterior surface of the neck portion of the tube in the region of the electron gun. For example, one such control means, commonly referenced as a static convergence device, is conventionally comprised of at least one set of insulative ring-like members contiguously related in a manner to be adjustably rotatable on the neck portion of the tube. Each of these members has a plurality of pockets formed therein to accommodate compatibly shaped magnet members which are securely affixed in the respective pockets by a suitable cement-type bonding material that is prone to become a somewhat messy aggravation. This type of bonding fixation, which requires a set-time for adherence, several minutes for instance, has also been found to result in several additional disadvantages. For example in those instances, when due to human error, one or more of the magnets are incorrectly positioned with reference to proper polar orientation, or inserted into the wrong pockets, removal of the magnet to correct the error, either ruins the magnet or the holding member or both. Such mutulation of the holding member also results in the loss of any magnets which have been priorly positioned and affixed therein.

OBJECTS AND SUMMARY OF THE INVENTION

It is an object of the invention to reduce the aforementioned disadvantages by providing an improved magnet retaining means integrally associated with the body member of the beam adjustment device. Another object is to provide an electron beam adjustment device employing magnet retaining means that enable the individual magnets to be inserted and removed without harm to either the magnet or the device. A further object is to provide an electron beam adjustment device having magnet retaining means therein that provide facile insertion and removal of the magnets as may be desired.

These and other objects and advantages are achieved in one aspect of the invention wherein an electron beam adjustment device, shaped for exterior positioning on the neck portion of a cathode ray tube, is formed of a substantially planar body member having an aperture therein to facilitate slidable encompassment on the neck portion of the tube. A plurality of individual open-top magnet accommodating pockets, each separated from one another by intervening body material, are

formed inward as individual recesses from one surface of the body member in substantially radial relationship with the aperture in that member. Each of the pockets has a bottom and a defining sidewall with an opening therein facing into the aperture. At least one cavity is formed in the intervening body material that separates two sequential pockets, in a manner whereof each of the related pockets has a cavity formed adjacent thereto. Each of these cavities has at least one sidewall portion common to a sidewall portion of a related pocket wherefrom a substantially resilient protuberance is formed in a manner to extend from the sidewall of the pocket into the pocket to provide a compressive snap-in means for retaining a compatibly shaped magnet member in the pocket.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an exterior view of a color cathode ray tube illustrating the orientation of the electron beam adjustment device on the exterior of the neck portion thereof;

FIG. **2** taken along the line **2—2** of FIG. **1** is a plan view of a planar body member of the beam adjustment device illustrating a plurality of magnet accommodating pockets and retention means for holding the magnets therein;

FIG. **3** is an enlarged partial sectional taken along the line **3—3** of FIG. **2** illustrating details of a pocket and an associated cavity;

FIG. **4** is a partial sectional taken along the line **4—4** of FIG. **2** illustrating a substantially resilient protuberance projecting into the pocket;

FIG. **5** illustrates another embodiment of the pocket related protuberance;

FIG. **6** is a partial plan view showing two magent accommodating pockets and an associated cavity embodiment formed to contain a resilient insert member; and

FIG. **7** is a partial sectional view taken along the line **7—7** of FIG. **6** detailing the cavity with the insert therein.

DESCRIPTION OF THE PREFERRED EMBODIMENT

For a better understanding of the present invention, together with other and further objects, advantages, and capabilities thereof, reference is made to the following specification and appended claims in connection with the aforedescribed drawings.

With reference to the drawings, there is illustrated in FIG. **1**, a cathode ray tube **11** of a type commonly employed in color television applications which is shown to have a longitudinal axis **13** therethrough. Such tubes conventionally utilize a plurality of electron beams emanating from electron generating means in either delta or in-line orientation. The paths of the respective beams, which are directed to converge in the region of the screen, are partially controlled by several devices oriented on the exterior of the tube. The image display raster, which is visible in the cathodoluminescent screen disposed on the viewing portion of the face panel **15**, is formed by electron beams controlled by magnetic fields effected by the coils of the yoke member **17**; such member being positioned upon the tube envelope at substantially the transitional region between the funnel **19** and the neck **21** portions thereof. Positioned rearward thereof on the neck portion of the

tube is an exemplary convergence or beam adjustment device **23** containing a plurality of magnetic means arranged to impart a controlling field which is essential to effect the desired shifting of the beams. This beam convergence device **23,** which for example is of the type employed to produce static convergence of a substantially in-line arrangement of beams, is comprised of a plurality of substantially planar body members **25, 27,** 29, 31, each of which has a similar aperture **33** formed therein of a size to facilitate slidable encompassment of the neck portion **21.** The respective body members may be formed of an insulative substance having a degree of ductility such as a thermoplastic material capable of withstanding the regional environmental temperature encountered during tube operation. In operation, each of the members is rotatably adjusted to effect the proper magnetic fields.

In greater detail, each of the body members has a plurality of individual open-top magnet-accommodating pockets formed therein. For clarification, one body member **27** is illustrated in FIGS. **2, 3,** and **4** wherein several pockets **35, 36, 37,** and **38** are shown, the disposition of which is not intended to be definitive of a particular magnetic arrangement. The exemplary pockets are separated from one another by substantial segments of intervening body material such as denoted by **39, 41, 43,** and **45.** Each individual pocket is formed inward as a recess from one surface of the body member in substantially radial relationship to the aperture **33,** as delineated by *r* originating from the axis **34** of the aperture. In the structure of the device as shown, the axis of the aperture **34** is substantially coaxial with the axis **15** of the tube **11.** The formation of each pocket, for example **37,** comprises a bottom **47** and a defining sidewall **49** with an extensive opening **51** therein facing into the related aperture **33.** There are cavities such as **53** to **57** formed in the associated substantial segments of intervening body material separating the sequentially related pockets in a manner that each of the related pockets has a cavity formed adjacent thereto. Each cavity is substantially axially parallel with the axis of the aperture in the body member. It is to be noted that the exemplary cavity **57** has a discrete sidewall portion **59** that is common to a sidewall portion **61** of the related pocket **37** wherefrom a protuberance **63** is formed to extend from the sidewall of the pocket into the pocket. The thickness of the this discrete region is such that the interaction of the common wall portions **59–61** imparts a degree of resilience to the protuberance **63** thereby providing a compressive snap-in means for retaining a compatibly shaped magnet member when such is inserted into the pocket. Attention is directed to pocket **36,** in FIG. **2,** which has a compatibly shaped magnet member **65** compressively retained therein; the related pressure between the magnet and the proturberance effecting a temporary resilient deformation of the common sidewall portion **69.** In referring to pocket **38,** two adjacent cavities **53** and **54** are related thereto in a manner to provide two opposed protuberances **71** and **72** thereby effecting retentive means for two edges of the magnet member **73.** While the cavities are shown to have bottoms, they can be extended as substantially cylindrical openings through the body member, and the term "cavity" is intended to connote a meaning of comparative breadth.

In FIGS. **3** and **4** it is shown that the protuberance **63** does not extend to the bottom of the pocket **47.** Rather, the respective protuberance **63** is shaped as a substantially triangular-related arrowhead-formation vertically oriented relative to the pocket sidewall, with the thin apex **75** of the formation being located proximal to the bottom surface **47** of the pocket **37.** A protuberance formation of this detailed shaping permits the discrete wall section to impart a gradient of retentive flexure to the protuberance portion **63** of the pocket sidewall when the magnet member is inserted into the pocket.

Another embodiment of the protuberance structure is shown in FIG. **5.** In this particular formation, the protuberance **77** is a substantially vertically oriented blister-shaped elongation formed relative to the pocket sidewall **49'** with a sloped edge **79** proximal to the bottom surface **47'** of the pocket **37'** but removed therefrom. A protuberance of this shaping also beneficially utilizes a gradient of retentive resilience provided by the commonly related portion of the sidewall.

As further delineated in FIG. **2,** one cavity such as **54** can provide retentive means for two adjacent pockets, i.e., **35** and **38.** In this instance, each of the pockets utilizes different or substantially opposed discrete portions **81** and **83** of the cavity sidewall to impart resilience to its respective protuberance.

In referring to FIGS. **6** and **7,** another embodiment of the invention is illustrated wherein the cavity **85** is of a size to accommodate a flexure member **87** that is formed to seat in the cavity, the flexure member having a peripheral portion formed to extend or protrude through a sidewall gap **89** into the pocket **91** to provide a resilient protuberance **93.** In this embodiment, the body member can be made of a substantially rigid substance, such as glass, ceramic, or hard plastic material; the associated flexure member **87** being formed of rubber or resilient plastic material. The protuberance region of the flexure member forms the discrete wall portion common to both the cavity **85** and the pocket **91.**

The static convergence adjustment device **23** is usually comprised of two or more body members **25, 27,** 29 and **31** oriented to be rotatably slidable upon one another to provide proper adjustment of the magnetic fields emanating from the magnets therein, whereupon the inter-related adjustment is "locked" by means not shown. Since smooth slidability between contiguous members is essential to achieve fine adjustments, it has been found beneficial to provide a counterbore, collectively referenced as **95,** in the top surface of the intervening body material immediately peripheral to the cavities. This counterbore or countersunk region provides a recess into which the lip or tongue **97** of the protuberance can extend without projecting above the plane **99** of the surface of the body member. Thus, there are no projections extending beyond the surface of the body member to hinder slidable rotatable adjustment relative to a contiguous member.

This invention provides improved magnet retaining means that are integrally associated with the respective body members of the beam adjustment device. The improved means for securely retaining the individual magnets facilitates rapid and facile insertion and removal of the magnets without harm to either the magnets or the body member of the device. While the improved magnet retention means has been described in conjunction with a color CRT beam adjustment device, it is not limited thereto as the compressive snap-in means is equally applicable to other types of cathode

ray tubes whereof external magnets may be utilized for beam adjustment.

While there have been shown and described what are at present considered the preferred embodiments 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 as defined by the appended claims.

What is claimed is:

1. In an electron beam adjustment device having a plurality of separate magnets retentively inserted therein and formed for positioning on the neck portion of a cathode ray tube having an axis therethrough, magnet retaining means comprising:

a substantially planar body member having an aperture therein of a size to facilitate slidable encompassment of said neck portion and having an axis related to said tube axis;

a plurality of individual open-top magnet accommodating pockets separated from one another by intervening body material and formed inward as a recess from one surface of the said body member in substantially radial relationship to said aperture, each of said pockets having a bottom and a defining sidewall with an opening therein facing into said aperture;

at least one cavity formed in the intervening body material separating two sequential pockets in a manner that each of the related pockets has a cavity formed adjacent thereto; each of said cavities having at least one discrete sidewall portion common to a sidewall portion of an adjacent pocket; and

at least one substantially resilient protuberance formed on the pocket side of said common sidewall portion in a manner to extend from the sidewall of the pocket into said pocket to provide a compressive snap-in-means for retaining a compatibly shaped magnet member in said pocket.

2. Magnet retaining means according to claim **1** wherein said cavity is a substantially cylindrical formation having an axis parallel to said aperture axis in said body member.

3. Magnet retaining means according to claim **1** wherein each of said protuberances is a portion of a substantially resilient section of the wall defining the cavity formed in said intervening body material adjacent to said pocket, and wherein said wall section is of a thickness to impart a degree of retentive flexure to the protuberence portion of said pocket sidewall when said magnet member is inserted into said pocket.

4. Magnet retaining means according to claim **1** wherein the respective sidewall defining each of said cavities has at least one gap formed therein in a manner to open through the sidewall of said adjacent pocket, and wherein said cavity is of a size of accommodate a flexure member formed to seat in said cavity, said flexure member having a peripheral portion formed to extend through said sidewall gap into said pocket to provide said resilient protuberance.

5. Magnet retaining means according to claim **1** wherein said cavity extends completely through said body member.

6. Magnet retaining means according to claim **1** wherein said protuberance is a substantially triangular-related arrow head formation vertically oriented relative to said pocket sidewall with the thin apex thereof located proximal to the bottom surface of said pocket.

7. Magnet retaining means according to claim **1** wherein said protuberance is a substantially blister-shaped elongation formed relative to said pocket sidewall with a sloped edge thereof proximal to the bottom surface of said pocket.

8. Magnet retaining means according to claim **1** wherein said body member is formed of a plastic material having a degree of ductility to facilitate the desired flexure of said protuberance.

9. Magnet retaining means according to claim **1** wherein the aperture in said planar body member is substantially coaxial with the axis of said tube.

10. Magnet retaining means according to claim **1** wherein the top surface of said intervening material immediately peripheral to said cavity is provided with a counterbore, and whereof said protuberance has a projecting lip extending into the region of said counterbore.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,873,953
DATED : March 25, 1975
INVENTOR(S) : Peter G. Puhak

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 6, Line 12: "size of" should read --- size to ---.

Signed and sealed this 13th day of May 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks

UNITED STATES PATENT OFFICE

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