March 27, 1956 G. BIRKBECK 2,740,064

PERMANENT MAGNET FOCUSSING DEVICE FOR CATHODE RAY TUBES

Filed Aug. 21, 1953 2 Sheets-Sheet 1

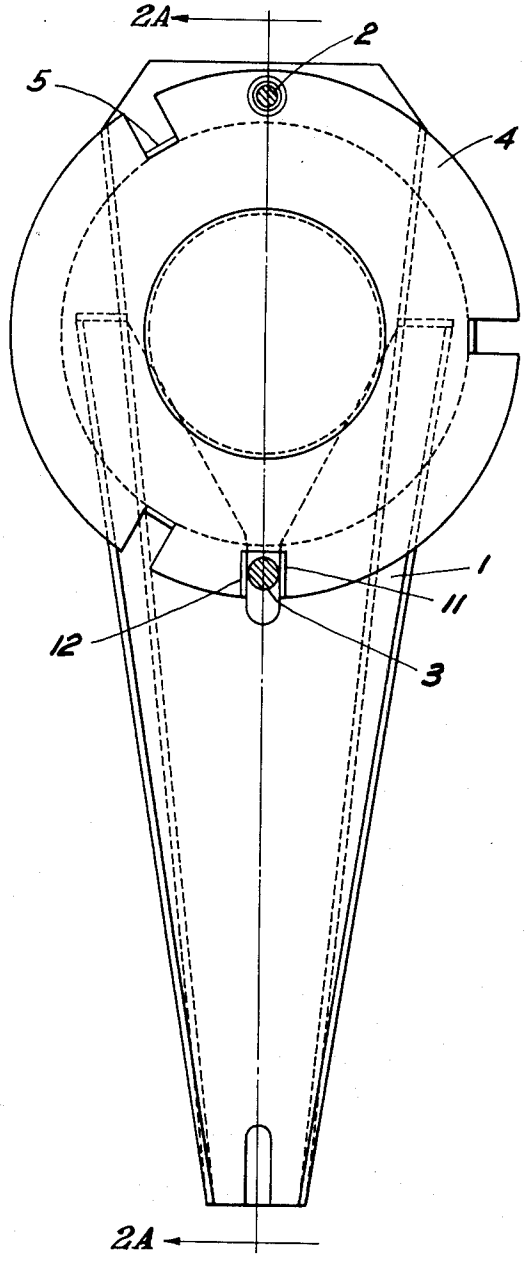

Fig. 2.

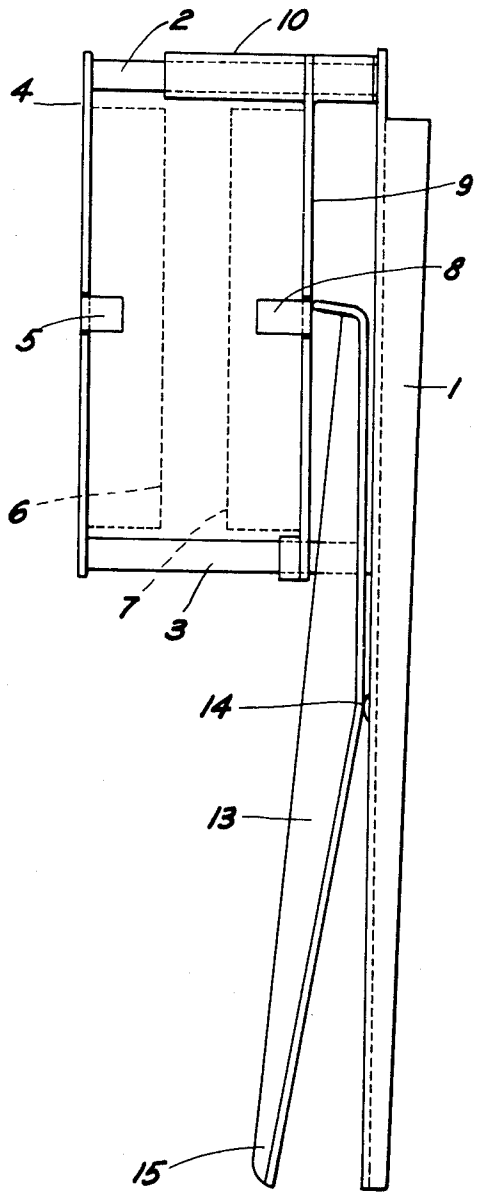

Fig. 1.

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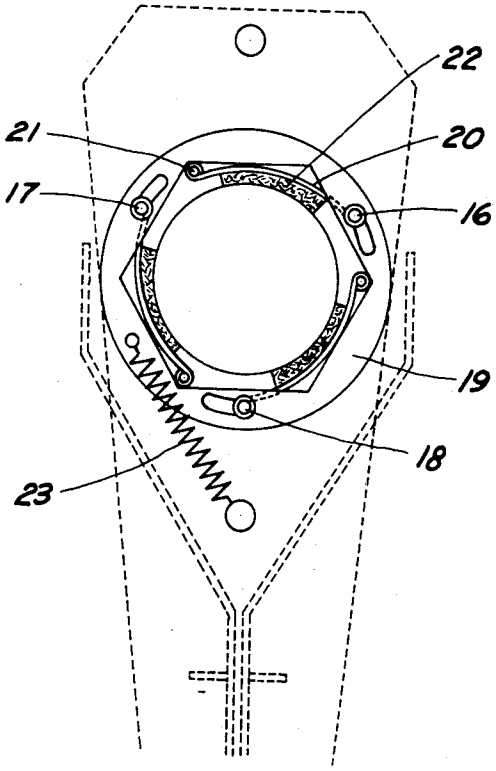

Fig. 3.

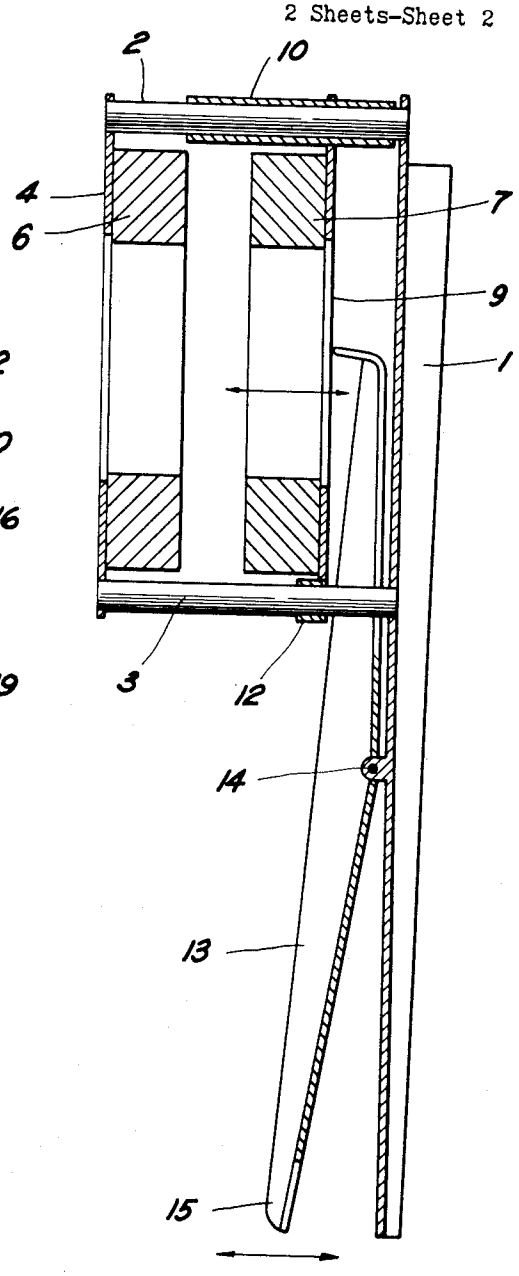

Fig. 2A

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United States Patent Office 2,740,064 Patented Mar. 27, 1956

2,740,064

PERMANENT MAGNET FOCUSSING DEVICE FOR CATHODE RAY TUBES

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Application August 21, 1953, Serial No. 375,782

Claims priority, application Great Britain August 26, 1952

5 Claims. (Cl. 313—84)

The invention relates to television receivers or like apparatus of the kind employing a cathode ray tube with permanent magnet focussing of the electron beam.

With the advent of permanent magnet materials of the ceramic type for example permanent magnets known under the trade name "Ferroxdure" the problem of mounting such magnets when used as focussing magnets for a cathode ray tube has arisen since they cannot be produced to very close tolerances on their physical dimensions.

Further it is desirable that any adjustment of the focussing magnets should be readily available to the user of the receiver as for example a control knob on the front or side of the receiver cabinet.

The object of the invention is to provide a simple and efficient focussing mount for permanent magnets of the ceramic type as above defined which is readily controllable from any position convenient to the user of the television or like receiver.

According to the invention a permanent magnet focussing mount for the cathode ray tube of a television receiver or like apparatus comprises a main support member adapted to be accurately located with respect to the cathode ray tube neck, a first permanent magnet of annular form surrounding and coaxially located with respect to the tube neck and secured on an extension of the member and a second permanent magnet of annular form coaxially located with respect to the tube neck and mounted on a secondary support member adapted to be moved relatively to said first magnet and coaxially therewith and a lever fulcrumed on the main support member for moving said secondary support member and controlled in any suitable manner as for example by a Bowden cable.

Other features of the invention will be apparent from the following description of one embodiment which is given by way of example only with reference to the drawings accompanying the specification in which:

Figure 1 is a side elevation of the focussing mount.

Figure 2 is a front elevation of the same.

Figure 2A is a cross-sectional view along the line 2A—2A, and

Figure 3 is a rear view showing the cathode ray tube locating means.

Referring now to Figures 1, 2A and 2 the focussing mount comprises a main support member **1** in the form of a metal plate having its long edges bent over to increase the longitudinal rigidity and carrying a pair of guides **2** and **3**, to the outer ends of which a plate **4** is attached. This plate has a member of extending tabs **5**, for example, three, which are adapted to be bent up against the peripheral wall of an annular permanent magnet **6**, so as to hold it securely on the plate. The plate has an aperture for the tube neck as has also the main support member **1**.

A second annular magnet **7** is secured in a like manner by tabs **8** to an apertured plate **9** which is mounted for movement towards and away from the plate **4** whilst maintained in parallel relation by means of the tubular

guide **10** secured to the plate **9** engaging the guide **2** with a sliding fit. Adjacent the guide **3** the plate **9** is slit and a pair of guide flanges **11** and **12** (Figure 2) bent at right angles are arranged to embrace guide **3**.

Movement of the magnet **7** towards the magnet **6** is effected by a lever **13** which may be fulcrumed on the plate **1** as by pivot **14**. The lever has a forked end as shown in Figure 2 and the turned up ends of the fork engage the back of the plate **9** at a suitable position. The polarity of the magnets is such that they tend to repel one another so that no return spring is necessary. Movement of the end **15** of the lever **14** towards the support member **1** may be effected in any suitable manner as for example by a Bowden cable so that the focus control can be brought to a convenient point of the receiver cabinet.

In order that the above described assembly may be correctly located with respect to the neck of the cathode ray tube which projects through the magnets and the main support member **1**, there is provided on the back of this member an adjustable locating device of the "iris" type which is shown in Figure 3.

Concentrically located with respect to the tube neck aperture in the main support member **1** are three equally spaced pins **16**, **17** and **18** upon which a circular plate **19** is mounted, the pins passing through arcuate slots in the plate so that it has a few degrees of rotational freedom. Each pin also forms a fulcrum for an arcuate lever as **20**, which carries at its remote end an operating pin **21** engaging the wall of a hexagonal aperture in the plate **19**. Each lever **20** carries a pad **22** for example of felt or rubber for engaging the neck of the tube. The plate **19** is urged in the direction to cause closure of the pads on the neck of the tube by a spring **23** secured at one end to the plate **19** and at the other end to the support member **1**.

Since the dimensional tolerances on the magnets, when these are of the "Ferroxdure" type such as that disclosed in Philips Technical Review, vol. 13, No. 7, are relatively large it is necessary to ensure that they are accurately coaxially located with respect to the neck of the cathode ray tube.

During assembly of the parts therefore, a mandrel is employed. This, at one end has the same diameter as the neck of the tube and a portion of larger diameter on which the annular magnets are located.

The assembly is carried out by inserting the mandrel through the plate **4**, the magnet **6**, the magnet **7**, plate **9** and main support member **1** in that order and locating the end of the mandrel in the locating device by manually turning the plate **19** to expand the levers **20**, and allowing it to spring back. The mandrel is thus located at one end by the locating device and at the other end it is located in the aperture in the plate **4**. The magnets are then positioned by the mandrel in their correct co-axial relationship with the mandrel and the securing tabs **5** and **8** are bent up to lock the magnets in position. The mandrel can then be removed and the assembly is completed. Thus any variations in the outside diameter or thickness of the magnets are compensated and when magnet **7** is moved relatively to magnet **6** it remains co-axially aligned therewith and with the longitudinal axis of the cathode ray tube.

The invention is not limited to the exact embodiment above described since changes may be made to suit particular circumstances as they arise in practice.

What is claimed is:

1. A permanent magnet focussing device for cathode ray tubes and the like, comprising a main support member having an aperture adapted to accommodate the neck of the cathode ray tube, a first annular permanent magnet mounted within said main support and coaxially with said aperture, a secondary support member slideably mounted on said main support, a second annular permanent magnet

mounted on said secondary support and slideable therewith, said second magnet being parallel to, coaxial with, and spaced from said first magnet, and a lever member pivotably mounted on said main support and coupled to said second permanent magnet, whereby motion of said lever changes the spacing between said two permanent magnets and thus the focussing action of the device.

2. A focussing device as set forth in claim 1 wherein the two magnets are magnetized in the direction of their thickness and exhibit opposite polarities such that they repel each other.

3. A focussing device as set forth in claim 2 wherein both support members are each provided with apertured plates having peripheral tabs embracing and securing thereto their respective magnets.

4. A focussing device as set forth in claim 2 wherein an iris locating device is provided on the main support member for securing the latter in a coaxial position to the neck of the tube.

5. A permanent magnet focussing device for cathode ray tubes and the like, comprising a main support member having an aperture adapted to accommodate the neck of the cathode ray tube, a first annular permanent magnet fixedly mounted within said main support and coaxially with said aperture, a secondary support member slideably mounted on said main support, a second annular permanent magnet fixedly mounted on said secondary support and moveable therewith, said second magnet being

parallel to, coaxial with, and spaced from said first magnet, both of said magnets being magnetized in the direction of their thickness and exhibiting opposite polarities such that they repel each other, a lever member pivotably mounted on said main support and having an end in engagement with the rear of said secondary support whereby motion of the other end of said lever changes the spacing between the two magnets, and an adjustable locating device mounted on said main support for securing the latter to the neck of the cathode ray tube, said locating device comprising a plurality of pins, a partially rotatable plate having a hexagonal aperture aligned with the aperture in said main support and mounted on said pins, a plurality of arcuate levers each having one end pivotably mounted on one of said pins and the opposite end seated in a corner of the hexagonal aperture, a plurality of inwardly-facing resilient pads each mounted on one of said arcuate levers, and biasing means urging said plate into rotation, whereby the pads are urged inwardly to engage the neck of the cathode ray tube.

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