

[54] **MAGNETIC CONVERGENCE DEVICE
FOR USE IN AN IN-LINE TYPE COLOR
CATHODE RAY TUBE**

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

[58] Field of Search.....313/75, 76, 77;
335/210, 212

[56]

**References Cited
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Primary Examiner—George Harris
Attorney—Robert D. Flynn et al.

[57]

ABSTRACT

A mounting plate having first and second arcuate slits is mounted on the neck portion of an in-line type color cathode ray tube. On both surfaces of the mounting plate are slidably disposed first and second arcuate racks and first and second magnetic convergence units each having an E-shaped convergence core, by means of screws passing through the arcuate slits. First and second pinions geared to the arcuate racks are fixed to one end of first and second shafts rotatably fitted to the mounting plate, the other end of the shafts being fixed to the first and second adjusting wheels.

4 Claims, 4 Drawing Figures

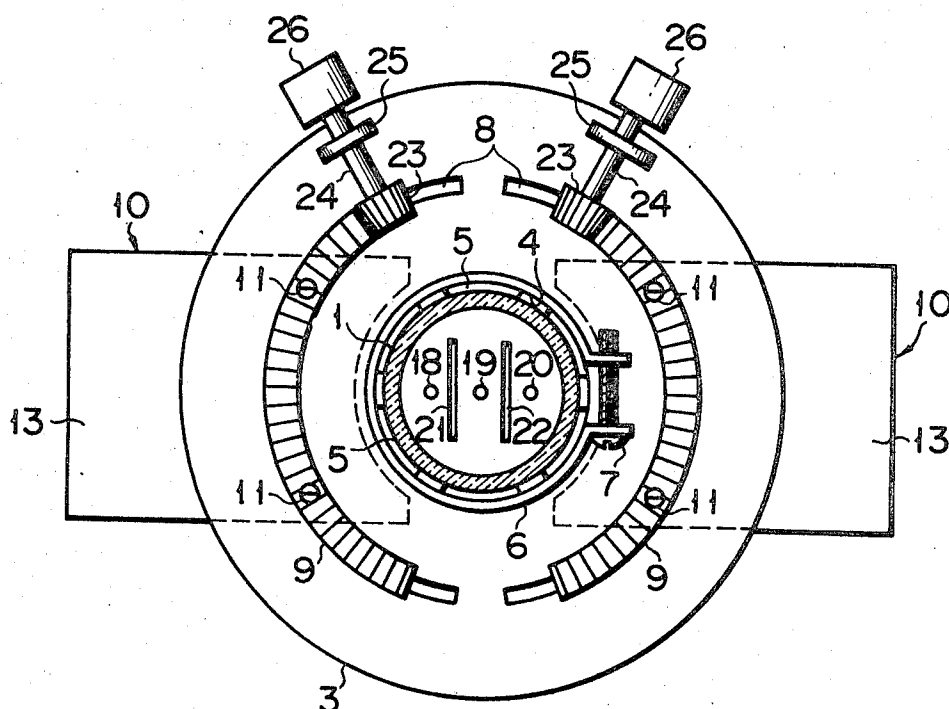


FIG. 1

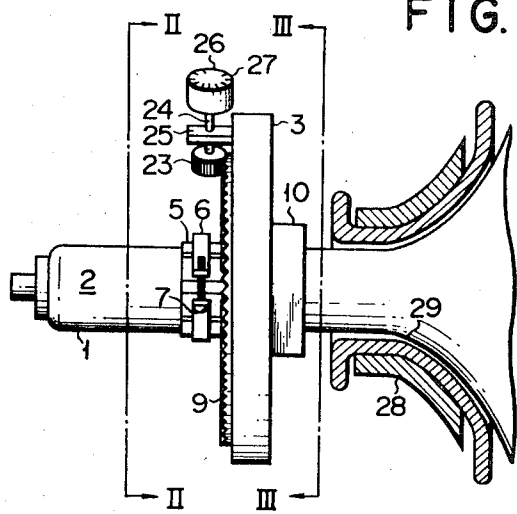


FIG. 2

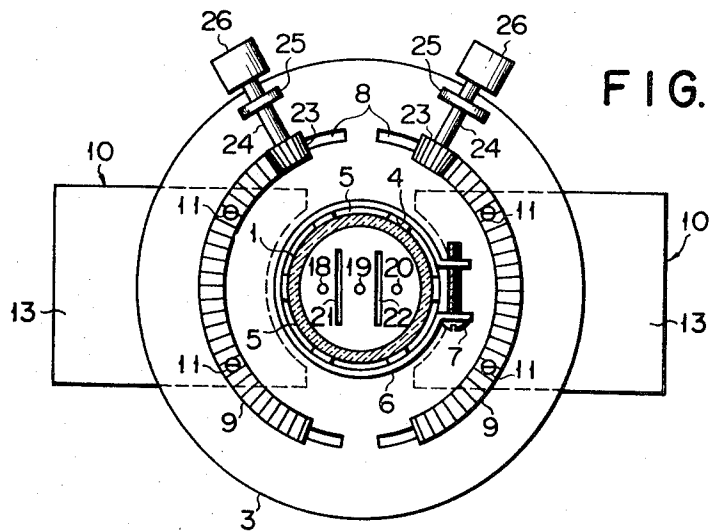


FIG. 3

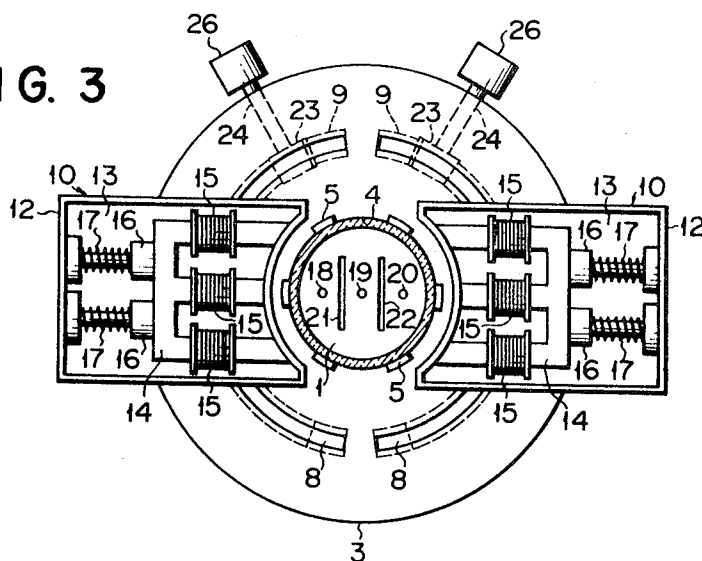
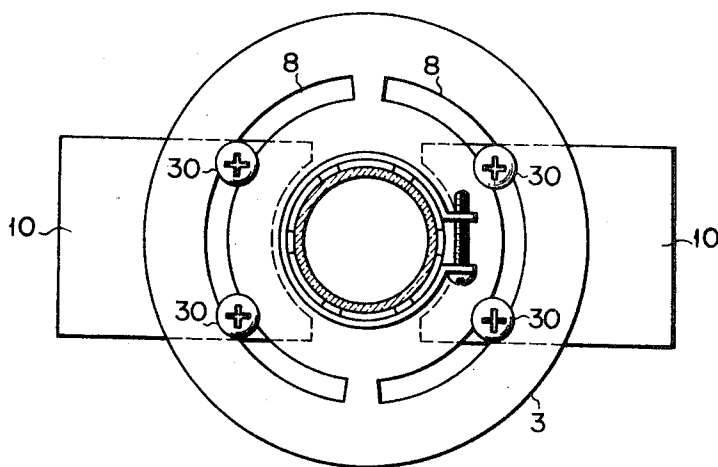


FIG. 4



MAGNETIC CONVERGENCE DEVICE FOR USE IN AN IN-LINE TYPE COLOR CATHODE RAY TUBE

This invention relates to a magnetic convergence device for use in an in-line type color cathode ray tube and more particularly to a magnetic convergence device having first and second individually and mechanically adjustable magnetic convergence units.

An in-line type color cathode ray tube has recently come into use as a color cathode ray tube. The in-line type tube generally has three electron guns arranged in linear relationship, and the electron beams emitted from the guns are directed to a fluorescent screen through the neck portion of said tube maintaining the in-line arrangement of said electron guns. Among these beams, the central beam is usually for a green color and the two side beams are for red and blue colors. To present a clear and proper color picture over the entire area of the screen, it is necessary for the three electron beams convergently to impinge on a given small area of the screen. For this purpose, a dynamic convergence means and a static convergence means cooperating therewith are generally provided on the outer surface of the neck portion in connection with the red and blue color electron beams so as to electrically and magnetically adjust their directions. Further, the red and blue color electron beams should be deflected individually all over the fluorescent screen so as to obtain a good beam convergence, but none of the conventional convergence devices has succeeded in effecting proper deflection.

Accordingly, it is an object of this invention to provide a magnetic convergence device for use in an in-line type color cathode ray tube capable of adjusting the convergence of multiple electron beams accurately and uniformly.

In accordance with this invention, the above-mentioned object can be achieved by providing a magnetic convergence device for use in an in-line type color cathode ray tube comprising a nonmagnetic mounting plate having first and second arcuate slits and a plurality of split pieces being clamped by a clamping means so as to fix said mounting plate on the outer surface of the neck portion of said cathode ray tube; first and second magnetic convergence units positioned on one surface of said mounting plate; means for adjustably fitting said magnetic convergence units to permit their displacement along said arcuate slits, each of said magnetic convergence units having a nonmagnetic frame, a dynamic convergence electromagnet including an E-shaped core and two disc-shaped permanent magnets associated with the electromagnet.

The present invention can be more fully understood from the following detailed description when taken in connection with the accompanying drawings, in which:

FIG. 1 is a side view of a magnetic convergence device mounted on the outer surface of the neck portion of an in-line type color cathode ray tube according to an embodiment of this invention;

FIG. 2 is a plan view taken along line II—II of FIG. 1;

FIG. 3 is a plan view taken along line III—III of FIG. 1; and

FIG. 4 is a plan view of another embodiment of the invention.

Referring to FIGS. 1 to 3 of the accompanying drawings, there is disposed a disc-shaped nonmagnetic mounting plate 3 on the outer surface of a neck portion

1 of an in-line type color cathode ray tube 2. The mounting plate 3 has a bore 4 provided at the center into which the neck portion 1 is inserted, and a plurality of, for example, six split pieces 5 formed integrally with the mounting plate 3 and extending from the inner surface of the bore 4. There is provided a clamping means consisting of a clamping band 6 and a bolt 7 for clamping the split pieces 5 to the neck portion 1. First and second arcuate slits 8 are formed in the mounting plate 3 in concentric relationship with the bore 4.

On one surface of the mounting plate 3 facing an electron gun assembly (not shown) disposed at one end part of the neck portion 1 are positioned first and second arcuate racks 9, which have a curvature corresponding to that of the racks, 8 and a width slightly larger than that of the slits 9. On the other surface of the mounting plate 3 facing a fluorescent screen (not shown) of the cathode ray tube 2 are positioned first and second magnetic convergence units 10, which are connected to the arcuate racks 9 by means of screws 11 passing through the arcuate slits 8. Thus, the arcuate racks 9 and magnetic convergence units 10 are so fitted to the mounting plate 3 as to slide through arcuate slits 8.

Each of the magnetic convergence units 10 comprises a nonmagnetic rectangular frame 12 having a bottom plate 13 connected to the arcuate rack 9, a dynamic convergence electromagnet including an E-shaped core 14 and dynamic convergence coils 15 wound thereon, and two disc-shaped permanent magnets 16 positioned between the cross-piece of the E-shaped core 14 and frame 12. The magnets 16 are pressed against the cross-piece of the core 14 by compression coil springs 17.

The electron gun assembly of the in-line type color cathode ray tube 2 has three linearly arranged electron guns and consequently the emitted three electron beams 18, 19 and 20 respectively corresponding to red, green and blue colors are also linearly disposed and further separated by magnetic shield plates 21 and 22 so as to prevent interaction between the magnetic fields applied to the electron beams 18 to 20. The beams, in particular the beams 18 and 20, are therefore independently adjustable and their convergence can be controlled by the magnetic convergence units 10, which create dynamic and static fluxes from the free ends of the E-shaped cores 14 for deflecting the beams 18 and 20.

First and second pinion 23 are geared to the arcuate racks 9. Each of the pinions 23 is fixed to one end of a shaft 24 rotatably mounted on a holder 25 formed on the surface of the mounting plate 3. At the other end of the shaft 24 is provided an adjusting wheel 26 for rotating the pinion 23.

The peripheral portion of one surface of the adjusting wheels 26 is provided with a scale 27 for indicating the rotating position of the magnetic convergence units 10 on the mounting plate 3.

In FIGS. 1 to 3, three electron beams 18 to 20 emitted from the linearly arranged three electron guns travel through the neck portion 1 and are deflected in the deflection device 28 mounted on the outer surface of the funnel portion 29 of the color cathode ray tube 2 so as to convergently impinge on the fluorescent screen. In the neck portion 1 the red and blue beams 18

and 20 are magnetically subjected to deflection by the magnetic convergence units. The magnetic convergence is achieved using a dynamic convergence flux obtained by applying an alternating current to the coils 15 and a static convergence flux obtained by adjusting the arrangement of the magnetic poles of the two disc-shaped permanent magnets 16. According to this embodiment, the magnetic convergence is further achieved by mechanically displacing the magnetic convergence units 10 along the arcuate slits 8 through rotation of the adjusting wheels 26.

In the magnetic convergence device of FIG. 4, the magnetic convergence units 10 are fitted to the mounting plate 3 by screws 30 passing through the slits 8. The diameter of the screw head is larger than the width of the slit 8 and the diameter of the threaded portion of the screw 30 passing through the slit 8 is slightly smaller than the width of the slit 8. Therefore, when all of the screws 30 are loosened, the magnetic convergence units 10 can be easily displaced along the arcuate slits 8 so as to precisely deflect the electron beams 18 and 20. The other elements of the embodiment of FIG. 4 are operated in the same manner as those of FIG. 1 and description thereof is omitted.

What we claim is:

1. A magnetic convergence device for use in an in-line type color cathode ray tube comprising a nonmagnetic mounting plate having first and second arcuate slits and a plurality of split pieces being clamped by a clamping means so as to fix said mounting plate on the outer surface of the neck portion of said cathode ray tube; first and second magnetic convergence units posi-

tioned on one surface of said mounting plate; and means for adjustably fitting said magnetic convergence units to permit their displacement along said arcuate slits, each of said magnetic convergence units having a nonmagnetic frame, a dynamic convergence electromagnet including an E-shaped core and two disc-shaped permanent magnets associated with said electromagnet.

2. A magnetic convergence device as claimed in claim 1 wherein said means for adjustably fitting said magnetic convergence units comprise first and second arcuate racks positioned on the other surface of said mounting plate; connecting means for connecting a pair of arcuate racks to a pair of magnetic convergence units through said arcuate slits; first and second pinions geared to said arcuate racks and fixed to one end of first and second shafts rotatably disposed on said mounting plate; and first and second adjusting wheels fixed to the other end of said shafts.

3. A magnetic convergence device as claimed in claim 1 wherein said means for adjustably fitting said magnetic convergence units comprises a plurality of screws for fixing said magnetic convergence units to said mounting plate through said arcuate slits, the diameter of the head of the screw being larger than the width of the arcuate slit.

4. A magnetic convergence device as claimed in claim 2 wherein said adjusting wheel is graduated on the periphery to indicate the rotating position of said magnetic convergence units on said mounting plate.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,727,159 Dated April 10, 1973

Inventor(s) Shigeo TAKENAKA et al

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

Column 1, between lines 36 and 37 insert heading
--Summary of the Invention--;

Column 1, line 46, before "means" insert --and--;

Column 2, line 7, change "consisting of" to --which
comprises--;

Column 2, line 17, change "9" to --8--;

Column 2, line 51, change "pinion" to --pinions--;

Column 4, line 2, change "fitting" to --mounting--;

Column 4, line 3, after "units" insert --on said
mounting plate--;

Column 4, line 10, change "fitting" to --mounting--;

Column 4, line 11, change "comprise" to --comprises--;

Column 4, line 22, change "fitting" to --mounting--;

Column 4, line 26, change "the" (second occurrence)
to --each--.

Signed and sealed this 18th day of December 1973.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents

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