Sept. 4, 1962 W. KLEIN 3,052,808

BEAM CENTERING DEVICE FOR TRAVELLING WAVE TUBES

Filed May 25, 1960

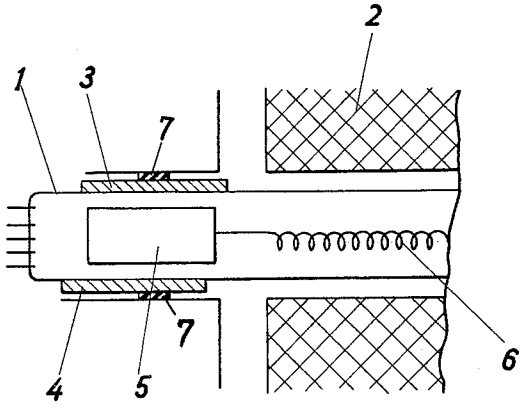


Fig. 1

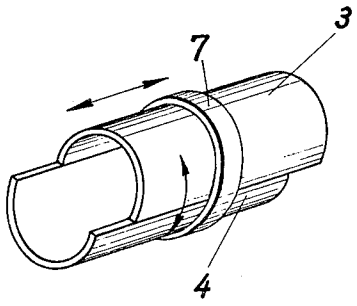


Fig. 2

INVENTOR
Werner Klein

BY George K. Spencer

ATTORNEY

United States Patent Office

3,052,808

Patented Sept. 4, 1962

3,052,808
BEAM CENTERING DEVICE FOR TRAVELLING WAVE TUBES

Werner Klein, Herrlingen, Germany, assignor to Telefunken G.m.b.H., Berlin, Germany

Filed May 25, 1960, Ser. No. 31,751
Claims priority, application Germany June 11, 1959
4 Claims. (Cl. 313—84)

The present invention relates to a correction arrangement for electron beam tubes in which an electron beam emitted from an electron gun is focused through further electrodes with the aid of magnetic fields, these further electrodes comprising, in particular, travelling wave tube elements.

In travelling wave systems which work on the principle of the interaction between an electron beam and a delay line, it is generally customary to introduce the electron beam emitted from an electron gun into a delay line by means of a magnetic focussing arrangement and then to propagate the beam over a relatively long path. It is important, in such tubes, to prevent impingement of the electron beam on the delay line insofar as possible and, thus, it is necessary to make the axis of the focussing arrangement coincide exactly with the geometric axis of the delay line. It is, therefore, necessary that the electron beam be shot into the delay line in a carefully controlled manner, dependent usually upon features of physical construction of the parts which are mutually positioned in such a manner, that the axis of the electron gun coincides as precisely as possible with the axis of the delay line. The results are not always sufficiently accurate because the positioning of parts can be carried out only within practicable limits, i.e., practical manufacturing tolerances. Therefore, it is desirable to provide means by which the effect of structural inaccuracies can be corrected after the electron beam tube has been built.

Various types of such correcting arrangements have already been known. For instance, it is already known to provide a ferro-magnetic disk in the region of the electron gun, this disk having an eccentric opening through which the beam projects. By the interaction of this rotatably arranged disk and the magnetic field, it is possible to correct the entrance positioning of the electron beam into a subsequent electrode. However, in such an arrangement, the degree of eccentricity is already fixed by the position of the opening in the disk, so that, while the direction of the eccentricity of the field distribution can be changed, the degree of the field disturbance cannot be changed.

Another known arrangement consists of an annularly symmetrical tiltable pole shoe which can, for example, have a cylindrical form and be mounted even with the beam producing system. Such an arrangement allows the degree of eccentricity as well as the direction of the eccentricity to be changed at will within a certain limit, but such an arrangement impairs the focussing action to a substantial degree. This is true because a sufficient amount of space must be left free between the magnetic focussing means and the cylinder, in order to allow the pole shoe to tilt. Consequently, a stronger magnetic focussing field is needed.

Yet another known focussing arrangement comprises the mounting of small coils by means of which auxiliary fields are produced in the region of the electron beam system. In such an arrangement, the amount of eccentricity can be varied by adjustment of the current through the coils. The disadvantage of such an arrangement is that additional regulatable sources of voltage must be provided, which reduces the overall efficiency of the apparatus.

The object of the present invention thus resides in the

provision of a correcting arrangement for electron beam tubes in which an electron beam leaving the electron gun is introduced into subsequent electrodes, particularly in travelling wave tubes, by means of a magnetic field, which arrangement avoids the above-discussed disadvantages.

According to the present invention, a split sleeve is provided which is arranged in the vicinity of the electron gun, this sleeve preferably forming a cylinder which closely surrounds the tube. The sleeve is split axially into sleeve portions which are made of ferromagnetic material, and these sleeve portions are axially as well as rotationally adjustably movable.

Additional objects and advantages of the present invention will become apparent upon consideration of the following description when taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a fragmentary diagrammatical sectional view of one embodiment of the present invention.

FIGURE 2 is a simplified perspective view of a part of the present invention.

Referring in detail to the drawings, FIGURE 1 shows part of the travelling wave tube 1, which tube extends into a focussing arrangement 2. This tube is surrounded by the split sleeve portions 3 and 4 of equal length in the vicinity of the electron gun 5. By suitable positioning of the two sleeve portions relative to each other and to the focussing arrangement 2, the electron beam leaving the electron beam gun 5 can be made to enter exactly coaxially into the delay line 6, said delay line being fashioned as a helix. According to the present invention, the two sleeve portions can be produced, for example, by sawing a cylindrical tube to provide the shape shown in FIGURE 2. The two sleeve portions 3 and 4 can be held on the tube by a band 7 providing a frictional support in such a manner, that they can be rotated together, and that each sleeve portion can be moved independently of the other in the axial direction, as shown by the arrows.

If desired, the correction arrangement can consist of more than two sleeve portions, each of which is axially movable independently of the other portions.

It will be understood that the above description of the present invention is susceptible to various modifications, changes and adaptations, and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.

I claim:

1. A correcting device for an electron beam tube for precisely centering an electron beam emitted by an electron gun and focussed by a magnetic field into subsequent electrodes disposed approximately coaxially with the gun, said device being located in the vicinity of the electron gun and comprising axially split sleeve portions of ferromagnetic material encompassing the tube and mutually mating to form a cylinder, said sleeve portions being individually selectively positionable axially of the tube and collectively positionable annularly of the tube.

2. In a correction device as set forth in claim 1, said cylinder comprising a plurality of partially-cylindrical sleeve portions.

3. In a correction device as set forth in claim 1, said cylinder comprising two semi-cylindrical sleeve portions.

4. In a correction device as set forth in claim 1, all of said sleeve portions being of the same overall length.

References Cited in the file of this patent

UNITED STATES PATENTS

2,188,579	Schlesinger	Jan. 30, 1940
2,431,077	Poch	Nov. 18, 1947
2,442,975	Grundmann	June 8, 1948
2,828,434	Klein et al.	Mar. 25, 1958