June 22, 1943. H. ZIEBOLZ 2,322,556

ELECTRONIC RELAY

Filed April 22, 1942

Fig. 1

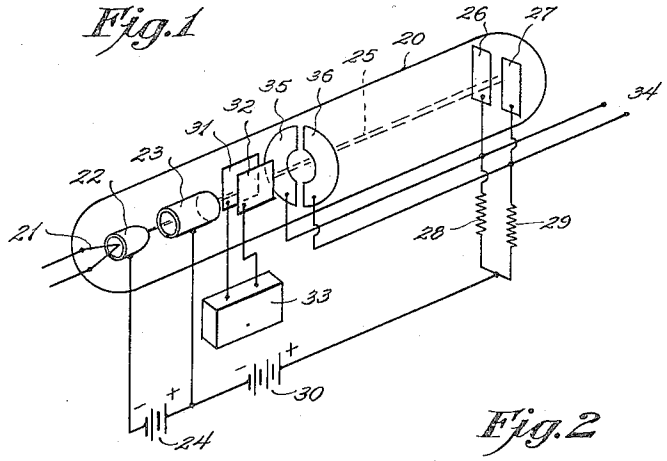


Fig. 2

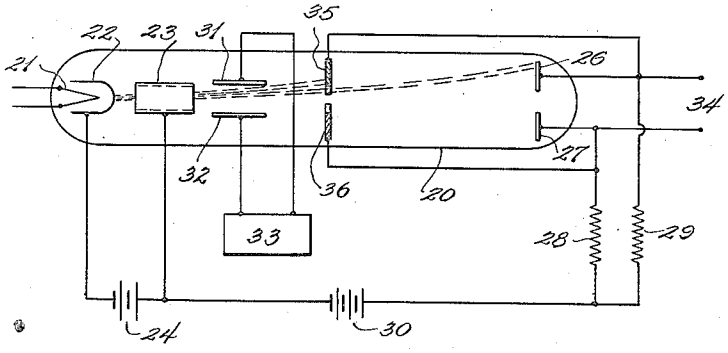
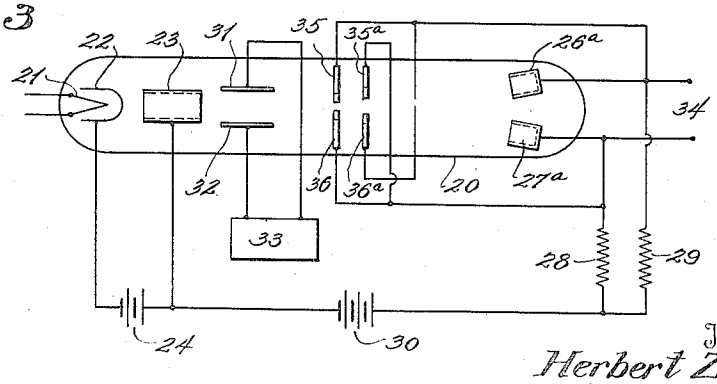


Fig. 3



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ELECTRONIC RELAY

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3 Claims. (Cl. 250—151)

This invention relates to electronic relays of the cathode ray tube type.

In electronic relays of the cathode ray type, excessive deflection of the electron beam may carry the beam beyond the outer edges of the beam targets or anodes and result in improper operation of the relay. One object of the present invention is to provide interceptor plates within the relay tube for intercepting the electron beam when the beam is deflected through an angle sufficient to carry it beyond the outer edge of the anodes. These interceptor plates are connected to the anodes on the same side of the beam and therefore function as auxiliary anodes.

The invention is illustrated in the accompanying drawing in which

Figure 1 is a diagrammatic perspective view showing one construction of a cathode ray tube embodying my invention;

Figure 2 is a plan view of the tube shown in Figure 1, the interceptor plates being shown in section along a horizontal plane; and

Figure 3 is a diagrammatic view showing a cathode ray relay provided with a second pair of deflector plates for neutralizing the deflecting action of the first set of deflector plates on the electron beam.

Referring to the drawing, the electron tube is provided with an insulating envelope 20 which encloses other elements of the tube. The internal construction of the tube may vary, but in the construction illustrated, a filament 21, heated from a suitable source of current, heats cathode 22 to cause emission of electrons therefrom. These electrons are accelerated and focused into a beam by a concentrating and accelerating electrode 23 which is maintained at a positive potential with respect to cathode 22 by a suitable source of current represented by the battery 24. The electron beam 25 is normally directed midway between a pair of anodes 26 and 27 positioned in the opposite end of the tube. These anodes are connected through a pair of coupling resistances 28 and 29 to the positive terminal of a suitable source of current represented by the battery 30, the negative terminal of which is connected to the positive terminal of source 24. Suitable means are provided for deflecting the beam 25 from its normal position to impinge in varying amounts upon anodes 26 and 27. The deflection of the beam is controlled in accordance with a signal or variation which is to be relayed or repeated or amplified. The deflecting means may assume different forms as is well understood in the art, but for the purpose of illustration, I have shown a pair of deflecting plates 31 and 32 which are charged from the signal source 33. It will be understood that deflection of the beam by the potential variations in the source 33 will produce corresponding potential variations in the output circuit 34 connected across the two anodes 26 and 27.

As the electron beam is deflected from its normal position towards one of the anodes, the amount of current drawn by the anode from the source 30 will increase with increasing deflection of the beam until the entire beam is impinged upon the anode. If the deflection increases so that part of the beam falls beyond the outer edge of the anode, the current will decrease, and if the beam is entirely deflected beyond the outer edge of the anode, the anode current will fall to zero. For the purpose of preventing loss of electrons from the beam passing beyond the outer edge of the anodes, I provide two interceptor plates 35 and 36 arranged in a plane transversely of the electron beam and preferably adjacent the deflecting means. These plates are separated at their inner edges and are preferably cut away at the center of the inner edge to allow the electron beam to freely pass through the central opening when the beam is operating through a normal deflection range. If the deflection becomes excessive, a portion of the beam is intercepted by the interceptor plate as shown in Figure 2 where a portion of the beam is being intercepted by the plate 35. By properly locating the interceptor plates, no electrons are permitted to pass beyond the outer edges of the anodes 26 and 27. Furthermore, interceptor plate 35 and 36 are connected to the anodes on the same side of the beam, that is, they are connected to anodes 26 and 27 respectively. These connections cause the interceptor plates to function as auxiliary anodes and prevent a decrease in anode current when the beam deflection becomes excessive. By providing the interceptor plates as described above, it is possible to construct the cathode ray relay with relatively small anode plates and to thereby restrict the size of the tube and avoid improper operation by reason of excessive deflection.

Since deflector plates 35 and 36 are connected to the anodes 26 and 27, these plates will exert a certain deflection action on the electron beam in a negative direction with respect to the plates 31 and 32. In case it is desired to eliminate this deflecting action of the interceptor plates, a second set of interceptor plates 35*a* and 36*a* may be provided as shown in Figure 3 but connected to op-

posite anodes. The second set of plates 35a and 36a are arranged fairly close to plates 35 and 36 but are positioned so that they do not intercept electrons from the electron beam, the interceptor action being preformed by plates 35 and 36.

In Figure 3 I have also illustrated a different construction for the anodes. Here the anodes, instead of being plate elements as show in Figures 1 and 2, are formed of cup-like elements with their open ends directed towards the cathode 22 and positioned so that as the beam is deflected towards one of the anodes, the electrons from the beam fall within the inside of the cup. This form of anode greatly reduces the interaction between the two anodes when the beam has sufficient velocity to produce secondary emission from the anodes. The secondary emission and other secondary effects remain substantially confined within the cup shapes and are not transmitted to the adjacent anode.

It will be obvious to those skilled in the art that the interceptor plates may have straight inner edges instead of curved edges as shown in Figure 1, or it may have other shapes of edges. It is also obvious that the invention is not limited to the use of any particular deflecting means, and deflecting coils may be employed instead of deflecting plates 31 and 32.

The relay described herein is capable of a wide variety of uses as will be apparent to those skilled in the art.

What is claimed is:

1. An electronic translating device comprising, means for producing an electronic beam, a pair of main anodes mounted on opposite sides of the path of said beam, means adjacent said path for deflecting said beam relative to said anodes and being capable of deflecting said beam beyond the outer boundaries of said anodes, a pair of interceptor anodes positioned on opposite sides of said path in front of said main anodes to intercept said beam when deflected beyond the outer boundaries of said main anodes, and an electrical connection connecting each interceptor anode with the corresponding main anode on the same side of the beam.

2. An electronic translating device according to claim 1 and including a second pair of interceptor anodes positioned on opposite sides of said path to the rear of said first pair of interceptor anodes, and a connection from each of said second interceptor anodes to the main anode on the opposite side of said beam, whereby said second pair of interceptor anodes counteracts the deflecting action of the first pair of interceptor anodes on said electronic beam.

3. An electronic translating device according to claim 1 and including a second pair of interceptor anodes positioned on opposite sides of said path to the rear of said first pair of interceptor anodes, and a connection from each of said second interceptor anodes to the main anode on the opposite side of said beam, said second pair of interceptor anodes being shielded against interception of said beam by said first pair of interceptor anodes to counteract deflecting action of said first pair of interceptor anodes on said electronic beam.

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