June 2, 1964 A. R. DAVIS 3,135,938

PEAKING BALLAST COMPRISING INDUCTIVE MEANS HAVING NONMAGNETIC GAPS IN FLUX PATHS

Original Filed March 9, 1956

Fig. 1.

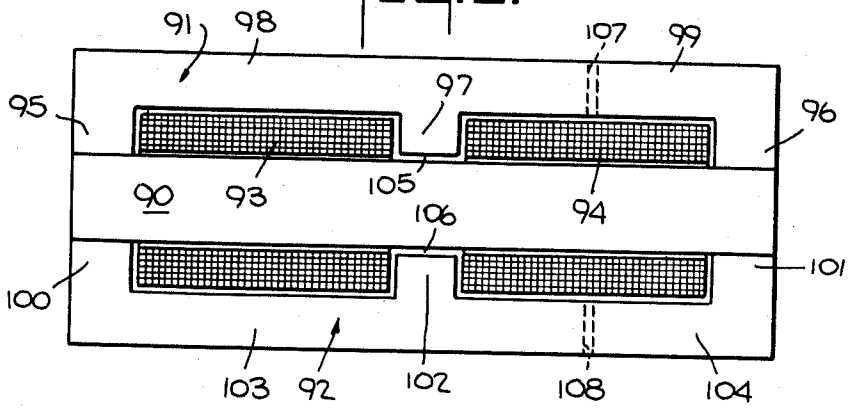


Fig. 2.

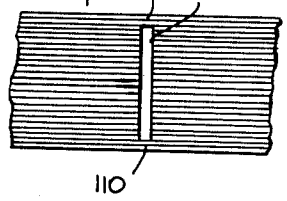
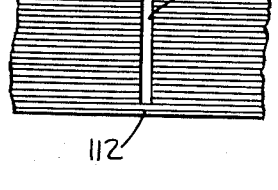


Fig. 3.



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PEAKING BALLAST COMPRISING INDUCTIVE MEANS HAVING NONMAGNETIC GAPS IN FLUX PATHS

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Original application Mar. 9, 1956, Ser. No. 570,515, now Patent No. 2,956,249, dated Oct. 11, 1960. Divided and this application Sept. 27, 1960, Ser. No. 58,727

1 Claim. (Cl. 336—165)

This invention relates to ballasts for dimming fluorescent lamps.

This is a division of my copending application Serial No. 570,515, filed March 9, 1956, now Patent No. 2,956,249, granted October 11, 1960.

An object of the invention is to provide ballast means that will ignite a fluorescent lamp over a range of intensities of illuminations.

Another object of the invention is to provide an inductive means to vary the intensity of illumination of a fluorescent lamp over a wide range.

Another object of the invention is to provide a ballast for fluorescent type lamps that produces a sharp voltage pulse for igniting the lamp over a wide range of intensities of illumination.

A further object of the invention is to provide an inductive current limiting means that will ignite a fluorescent lamp at very low intensities of illumination with low R.M.S. voltages.

Other and further objects of the invention will be apparent from the following description taken in connection with the drawings in which:

FIG. 1 is a side view of a ballast; and

FIGS. 2 and 3 are fragmentary top and bottom views respectively of the ballast illustrating the nonmagnetic gaps in the side legs.

In FIGS. 1, 2 and 3 an embodiment of the invention is shown in which the magnetic flux paths of the reactor winding have a discontinuity to produce a change in flux characteristic. The ballast has a laminated center portion or member 90 and E-shaped portions 91, 92 on opposite sides thereof to provide parallel magnetic paths for the fluxes of the main winding 93 and reactor winding 94. The E-shaped portion 91 has legs 95 and 96 and an intermediate leg 97. The end leg 95 and intermediate leg 97 are coupled by a side leg 98, and the end leg 96 and intermediate leg 97 are coupled by a side leg 99. The E-shaped portion 92 has end legs 100 and 101 and an intermediate leg 102. The end leg 100 and the intermediate leg 102 are connected by a side leg 103, and a side leg 104. The end legs 96, 101, side legs 99, 104 and intermediate legs 97, 102 form parallel flux paths for the reactor winding 94. A flux path for the main winding and the reactor winding is provided through the center portion 90, end legs 95, 100, side legs 98, 103, 99, 104 and end legs 96, 101.

The E-shaped portions and the center portion are clamped together by suitable clamping means (not shown) to hold the end legs 95, 100, 96, 101 in tight magnetic contact with the center portion 90. The intermediate legs 97, 102 are slightly spaced from the center portion 90 to form air gaps 105, 106. In the flux paths for the reactor winding 94, a discontinuity is provided such as the slits or air gaps 107, 108 in the side legs 99, 104, respectively. On each end of the gap 107 are laminations 109, 110, and at each end of gap 108 are laminations 111, 112. The initial flux passing through the side legs 99, 104 thread through the laminations 109, 110, 111 and 112. These laminations provide a low reluctance for the initial flux provided by the main winding 93. On saturation of these laminations, the flux path is determined by the reluctance of the air gaps 107, 108. Since these gaps are wider and have a higher reluctance than the gaps 105, 106, the main portion of the subsequent increase in flux of the main winding 93 passes through the legs 97, 102. Some of the flux passes through the gaps 107, 108 and the center portion 90 to induce voltage in the reactor winding additive to the input voltage for providing the required illuminating voltage. Thus, initially there is a flux change through the reactor winding 94 creating a voltage therein. But on saturation of the laminations 109, 110, 111, 112, this flux change ceases and the flux passes through the gaps 105, 106. On passage of arc current through the winding 94, the flux created by arc current must pass through the air gaps 107, 108. For this reason the saturation characteristics of the flux path through the side legs 99, 104 will be different from the flux of the reactor cores of the embodiment shown in FIGS. 1 through 4 of my Patent No. 2,956,249. The air gaps 107, 108 are turned to reduce the rate of saturation of the reactor core. This characteristic is another desirable feature imparted to the ballast.

As in the other embodiments described in the parent Patent No. 2,956,249 the intensity of illumination may be varied over a range of 500 to 1.

It is thus seen from the foregoing description that by inserting a discontinuity in the magnetic path coupling the main winding and reactor winding so that the rate of change of flux is abruptly altered during the flux cycle of the transformer winding and preferably during the initial stages, a peaking voltage may be induced in the reactor winding. This voltage should have maximum value in the order of 400 volts so that the lamp will be ignited at the low intensity of illumination.

The above-described ballast is compact in size and inexpensive to manufacture.

Various modifications and changes may be made without departing from the scope of the invention as set forth in the appended claim.

I claim:

A ballast comprising a reactor winding, a main winding, a ferromagnetic core having a center member with said reactor winding and said main winding wound thereon, E-shaped core members on the sides of said center member with intermediate legs between said windings and end legs at each end of said windings and side legs interconnecting said end and intermediate legs to complete the magnetic path of the flux of said windings, non-magnetic gaps between said intermediate legs and said center member, non-magnetic gaps in said side legs adjacent said reactor winding, low flux capacity steel laminations bridging said gaps in said side legs to provide flux paths having low capacity low initial reluctance to induce a high voltage peak in said reactor winding, and said intermediate legs adjacent said main winding carrying the remaining portion of the flux of said main winding.

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