Oct. 10, 1950 T. S. BJÖRKLUND 2,524,754

UNITARY MAGNETIC CORE AND CONDENSER

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FIG. 1

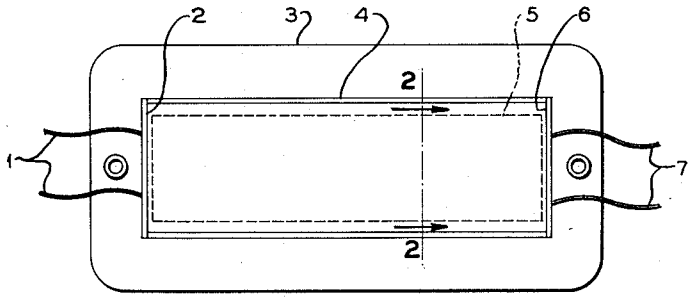


FIG. 2

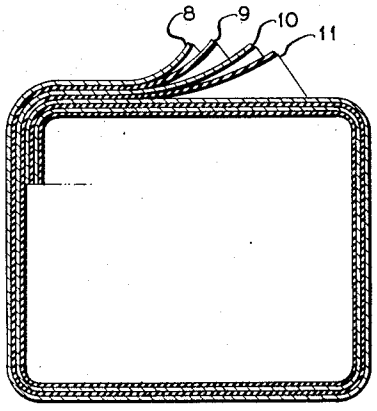
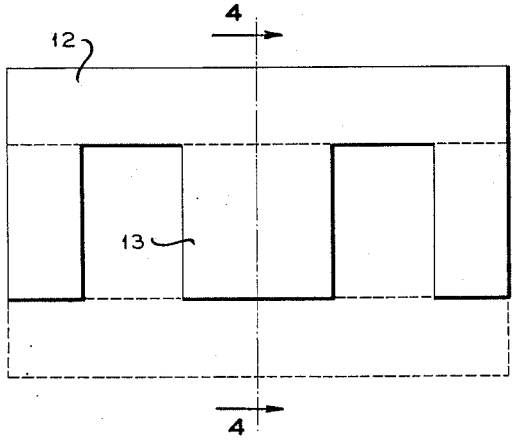


FIG. 3



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FIG. 4

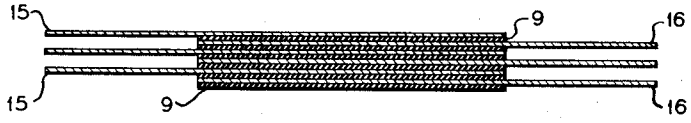


FIG. 5

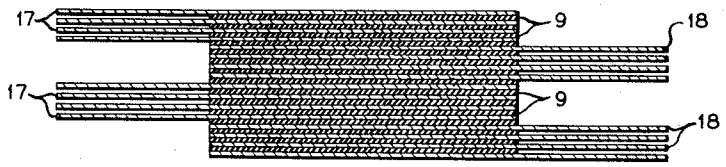


FIG. 6

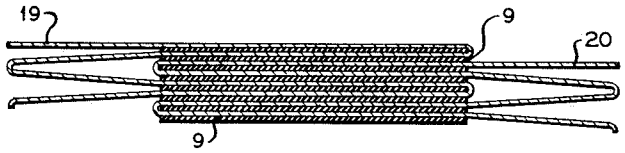


FIG. 7

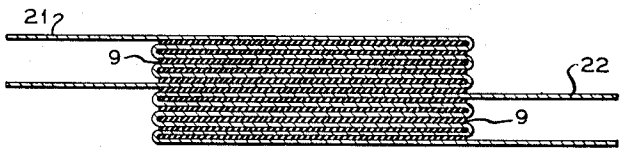
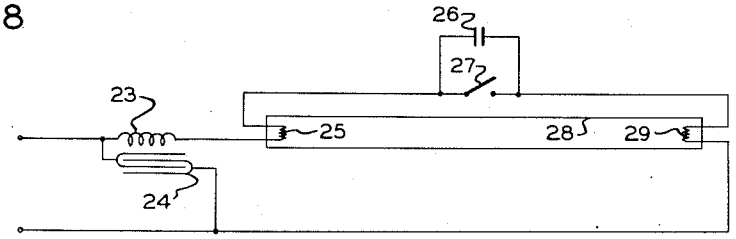


FIG. 8



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UNITED STATES PATENT OFFICE

2,524,754

UNITARY MAGNETIC CORE AND CONDENSER

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5 Claims. (Cl. 175—357)

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This invention relates to ballasts for electric discharge lamp circuits.

Ballasts for the purpose specified have heretofore been constructed as chokes or transformers providing the discharge lamp circuit with the necessary series impedance as inductive reactance elements. However, it is often an advantage or even a necessity to have a capacitive reactance included in such supply circuits. In circuit arrangements for fluorescent lamps, for instance, the introduction of condensers has been proposed as means of improving the power factor during the operation.

The object of this invention is to provide a novel form of a ballast structure in which a capacitive unit designed to correct the power factor of the lamp circuit is incorporated with the inductive unit of the ballast, the capacitive unit being built up of foils of a magnetic material electrically insulated from each other and forming electrodes of a condenser, and the inductive unit being wound upon said condenser. When more than two foils are used they are divided into two groups forming both the electrodes of the condenser.

This construction possesses the advantage that the power factor correction and the stabilization of a lamp circuit is established by means of a single unit, with consequent simplification of the lamp fittings.

The invention is illustrated by a few examples shown in the accompanying drawing.

Figure 1 shows a choke designed according to the invention.

Figure 2 shows, on a larger scale, a transverse sectional view taken on the line 2—2 of Figure 1, of the core for such a choke.

Figure 3 shows schematically a shell transformer designed according to the invention.

Figure 4 is a transverse sectional view, taken on the line 4—4 of Figure 3, and illustrating schematically a core formation for the transformer.

Figures 5, 6 and 7, are transverse sectional views, similar to Figure 4, illustrating the formation of differently designed cores.

Figure 8 shows a circuit arrangement for a fluorescent lamp with a choke designed according to the invention.

The choke according to Figure 1 consists of a

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frame 3 of stamped transformer sheets fastened by rivets, for instance, into which frame an iron core 5 designed according to the invention is fitted. Around the core 5 there is the winding 4 of the choke, and the leading-in wires of the winding are denoted 7. The air gap of the choke is determined by the insulating discs 2 and 6 interposed between the core 5 and the ends of the frame 3. The leading-in wires of the condenser electrodes included in the core 5 are denoted 1.

As shown in Figure 2, the iron core 5 may be produced by winding two iron foils 8 and 10 of suitable thinness while inserting insulating sheets 9 and 11, which may be of paper, for instance, into a core of the shape desired, in the figure shown with a square section.

The transformer shown in Figure 3 is provided, in known manner, with a central leg 13 and is arranged without any air gap. The core is built up of E-shaped sections 12 and 14 piled alternately on one another in such a way that the prongs of one section cover those of the other section. Figures 4–7 show different ways of building up this core, all of which are practicable in constructing the core 5 shown in Figure 1. The constructions are shown with insulating sheets 9 interposed between the iron foils. The condenser layers, or at least one side of each layer, can have, instead, an insulating coat covering the side completely or partially.

In Figure 4 the layer parts 15 and 16 forming the respective condenser electrodes are piled up alternately in such a way that the prongs of the respective E sections cover one another while the transverse pieces of the sections stand out to each side of the transformer. By means of a rivet or the like these transverse pieces may be so interconnected as to form, on each side, an electrode of the condenser.

Particularly where thin foils are used it may be found expedient to join the sections, as shown in Figure 5, into partial packs 17 and 18, to be alternately piled up as indicated above.

Figure 6 shows how to build up the core shown in Figure 3 of two foils, conveniently stamped, which are folded up into the pack desired. Especially if thin foils are used it may be found expedient to fold them up, as shown in Figure 7, into partial packs 21 and 22 to be alternately piled on each other as shown in Figure 5.

It is not necessary to have the transverse pieces of the sections standing out beyond the prongs of the sections as shown in Figures 4–7; the respective layer parts may as well cover one another completely. Where designs according to Figures 4, 5 and 7 are concerned the layer parts may conveniently be provided with salient flaps for purposes of electric interconnection. Partial packs, piled or folded, may also be used for designs of wound cores like that shown in Figure 2.

In the circuit arrangement shown in Figure 8 for an electric discharge tube, which in this example is a fluorescent lamp, the electrodes **25** and **29** of the discharge tube are connected to the current source across a choke, of which the winding is denoted **23** and the core **24**. The core is designed according to the invention as a condenser arranged parallelly to the tube and so dimensioned that the desired improvement of the cos φ value is obtained during the operation of the tube. In a specimen circuit arrangement tested the choke was made of two wound layers of about 0.009 mm. thickness. Investigations have shown that the foils are to be made as thin as possible and that for power factor correction they preferably may be below this thickness. The electrodes **25** and **29** of the tube are shown preheatable at the start by means of a circuit parallel to the discharge path of the tube **28** and including a thermal relay **27** with a condenser **26** connected in parallel to it for the regulation of the function of the relay **27**. The choke included in the circuit arrangement may be reconnectable, in known manner, to function as a transformer and thus admit operation of the tube at different voltages.

What I claim is:

1. A ballast for electric discharge lamp circuits comprising at least one inductive unit wound on a leg of a closed core structure consisting of a frame of a magnetic material, said leg part of the core structure being built up of a plurality of interfolded thin foil strips of magnetic material electrically insulated from each other and forming electrodes of a condenser as a capacitive unit incorporated with the ballast and designed to correct the power factor of the lamp circuit.

2. A ballast for electric discharge lamp circuits comprising an inductive unit wound on a leg of a closed core structure consisting of a frame of a magnetic material, said leg crossing the frame between two opposite sides thereof as a magnetic bridge built up of a plurality of interfolded thin foil strips of magnetic material electrically insulated from each other and forming electrodes of a condenser as a capacitive unit incorporated with the ballast and designed to correct the power factor of the lamp circuit.

3. A ballast for electric discharge lamp circuits comprising at least one inductive unit wound on a leg of a closed core structure consisting of a frame of a magnetic material, said core structure being entirely built up of a plurality of interfolded thin foil strips of magnetic material electrically insulated from each other and forming electrodes of a condenser as a capacitive unit incorporated with the ballast and designed to correct the power factor of the lamp circuit.

4. A ballast for electric discharge lamp circuits comprising at least one inductive unit wound on a leg of a closed core structure consisting of a frame of a magnetic material, at least said leg part of the core structure being built up of a plurality of interfolded thin foil strips of magnetic material electrically insulated from each other and forming electrodes of a condenser as a capacitive unit incorporated with the ballast and designed to correct the power factor of the lamp circuit, the thickness of said foils of magnetic material not exceeding 0.009 mm.

5. A ballast for electric discharge lamp circuits comprising at least one inductive unit wound on a leg of a closed core structure consisting of a frame of a magnetic material, at least said leg part of the core structure being built up of more than two interfolded thin foil strips of magnetic material divided into groups insulated from each other and forming electrodes of a condenser as a capacitive unit incorporated with the ballast and designed to correct the power factor of the lamp circuit.

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