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THERMIONIC VALVES

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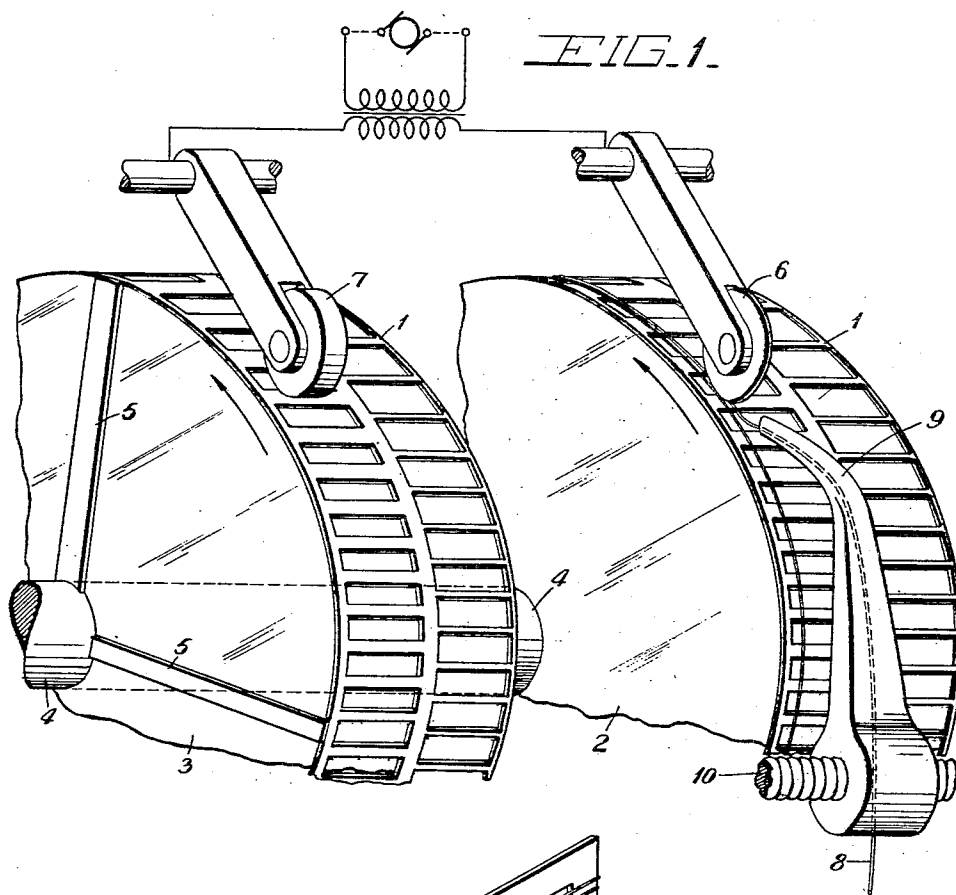
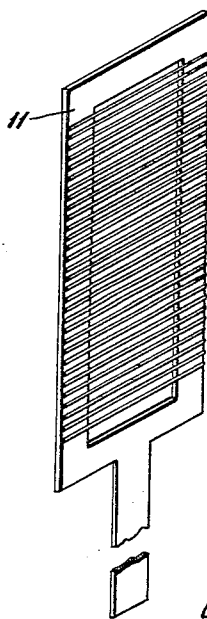


FIG. 2.



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THERMIONIC VALVES

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3 Claims. (Cl. 29—25.14)

The present invention concerns improvements in or relating to the construction of grids as employed in thermionic valves. Usually grids are formed by winding wire round two spaced parallel rods of nickel or like metal at a regular pitch, welding or swaging the wire to each rod at the points of contact, cutting the rods to the desired length and removing any turns in excess of those required.

The filament is threaded between the wires of the grid and the smaller the valve the more difficult the operation becomes. It has been proposed to cut away the wire on one side of the rod as this not only facilitates the locating of the filament with respect to the grid but it also enables multigrid valves of small size to be constructed with greater ease. Such grid elements are conveniently referred to as "half-grids."

One object of the present invention is the construction of grids without the necessity of the grid being handled or at any rate not often.

Another object is the construction of half grids in larger quantities at a time than are possible by existing methods.

Yet another object is the construction of a grid which is rigid whereby instability of structure and/or microphonic noises of the valve in use are avoided.

According to one feature of the invention grids consisting of side members having wire welded or swaged across one side only are characterised in that a series of side members are supported in a drum like formation while wire is wound on the drum, a welding operation or swaging operation being caused to secure the wire at every crossing of a side member, the individual grids being formed by cutting off appropriate pairs of adjacent side members by a guillotine or like operation.

According to another feature of the present invention the wire is welded or swaged in position across openings of a metal strip and subsequently individual half-grids are cut from the strip by a stamping or guillotine operation acting midway on the dividing strip separating adjacent openings.

According to yet another feature of the invention a plurality of frames, having openings therein, which may form a part of a continuous strip are supported on the circumference of a polygonal or cylindrical drum in such a way that the metal sides of the frames rest on metal parts of the drum. Wire or wires are then wound round the drum at a regular or any desired pitch, while a welding terminal or swaging tool is applied to the points where the wire crosses the metal sides of the frame so as to secure the wires to opposite sides of each frame. The half-grids are then formed by separating the frames from each other by a guillotine or like operation.

According to a fourth feature of the invention, a half-grid is formed from a stamping having a hole therein across which spaced wires are secured by welding or swaging at opposite sides of said opening.

Obviously the desired result could be obtained in different ways without departing from the spirit of the invention, for instance, a metal strip with openings as described provides side members for supporting the wire forming the grid. The metal strip could be simulated by mounting rods or strips in a drum like manner so as to be supported at the ends to form a kind of squirrel cage with the rods or strips in pairs round the periphery, the wire for the grid could be wound on the cage thus formed as described and welded at each point where the

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wire crossed a rod or strip. To form the grids all that is necessary is to release the ends of the rods or strips which could be held together in a continuous strip and the individual grids could be cut off by a guillotine operation as before. The rods or strips could be fed in for each winding operation parallel to the axis of the drum, or laid on the drum in the form of a band or strip.

The invention will be better understood by referring to one example of carrying it into effect described with reference to the accompanying drawings.

Figure 1 shows diagrammatically the apparatus for carrying out the method of the invention.

Figure 2 shows in perspective a finished grid.

A strip of metal 1 such as nickel or nickel alloy has rectangular holes punched therein at regular intervals, the space between the holes being just sufficient as to form adjacent sides for two frames for a half-grid. An extension tag for the grid is also provided on the metal strip.

The drum may be 3" in diameter and each individual frame may be half an inch or so high, while the openings may be $\frac{3}{8}$ " wide and $\frac{3}{16}$ " across and the sides of each frame may be $\frac{1}{32}$ " making $\frac{1}{16}$ " between adjacent openings.

Drum 2 is provided of conducting material and a drum 3 of insulating material, the two drums being joined by a conducting shaft 4.

A length of strip 1 equal in length to the circumference of the drum is clipped or otherwise secured round the drum 2. An identical strip is secured in an identical angular position on the curved surface of the drum 3.

The strip 1 on the drum 3 is put in electrical connection with the shaft 4 for example by means of metal webs 5.

The shaft 4 is supported on suitable bearings so as to be rotatable. Adjacent the periphery of drum 2 is a welding point which may take the form of a rotatable disc 6 with a thin edge. A similar disc 7 is provided for the drum 3 where it acts as a contact maker and breaker for the welding circuit. The welding circuit is arranged to be completed from mains supply via disc 6 and the strip 1 on the drum 2 then via the drum 2 to the shaft 4, from shaft 4 via the webs 5 to the strip 1 on the drum 3 and thence, when the disc 7 is in contact with the strip 1, back to battery. The wire 8 to form the grid is fed from a coil through an arm 9 on a lead screw 10 mounted close to the drum 2. The lead screw 10 is rotated with the drum so as to cause the wire to move parallel to the axis of the drum a distance equal to the pitch required between successive wires on the grid. Consequently as the drum rotates if the disc is also moved axially in the same way as the lead screw the rotation of the drum either by hand or by machine will cause the wire to be wound along the strip in a number of convolutions spaced an appropriate pitch apart and furthermore the wire as it passes over each metal part dividing the opening will be welded to such metal part by completion of the welding circuit via the corresponding metal part of the strip on the drum 3. When the desired number of turns of the drum are completed, the strip will be removed from the drum and guillotined or otherwise cut midway between each metal division so that half-grids 11 (Figure 2) are produced each having a rectangular frame portion with an opening covered with regularly spaced wire. It will be noted that the welding should be such as to secure the wire for the full width of a dividing strip so as to ensure that when the dividing strip is cut all the grid wires will be secured at their ends to both halves of the split dividing strip.

One advantage of such grids is that they can be flattened or folded over into a U-shaped or any intermediate shaped section and can be placed in close proximity to a filament as with half grids: the necessity of threading the filament between the turns of the grid wire is avoided.

The drum could be formed with a cylindrical periphery or it could be polygonal.

The drum 2 is not necessarily made entirely of conducting material, the curved surface only may be conducting and linked to the shaft 4 by conducting webs 5 similar to those provided on the drums 3.

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The method of electrical connections shown is of course, not the only one possible. Instead of interconnecting the metal strips 1 via the shaft 4 it is possible to have two interconnected brushes running on the edge or centre of respective strips where there are no discontinuities.

Alternatively, as previously mentioned, the strip might be replaced by rods similar to those used at present, the rods being positioned between opposite sides of the drum in pairs and the wire welded or possibly swaged on to both rods of a pair so that when the drum has rotated sufficiently there are a number of frames consisting of two spaced rods with wires secured to one side which can be released from the drum and separated by cutting the wires between the rods of each pair.

I claim:

1. A method of manufacturing grids for thermionic valves from a strip of metal provided with successive rectangular openings having their longer dimension at right angles to the length of the strip, comprising laying a plurality of wires at equally spaced intervals across the openings in said strip in a direction parallel to the length of the strip, welding the wires to the strip on each side of the individual openings, and dividing the strip between successive openings to produce individual grid frames.

2. A method of manufacturing grids for thermionic valves from a strip of metal provided with two sets of staggered rectangular openings each having their longer dimension at right angles to the length of the strip, comprising laying a plurality of wires at equally spaced intervals across one set of openings in said strip in a direction parallel to the length of the strip, welding the

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wires to the strip on each side of the individual openings, cutting the strip in a direction parallel to its length through the set of openings to which no wires are welded, and dividing the strip between successive openings to which wires are welded so as to produce individual grid frames provided with supporting tags.

3. A method of manufacturing grids for thermionic valves comprising fitting around the circumference of a drum a strip of metal provided with successive rectangular openings having their longer dimension at right angles to the length of the strip, laying a wire in successive turns around the strip on the drum so as to pass across said openings, welding the wire to the strip on each side of the individual openings, removing the strip from the drum, and dividing the strip between successive openings to produce individual grid frames.

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