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METHOD OF MANUFACTURING ELECTRONIC TUBES

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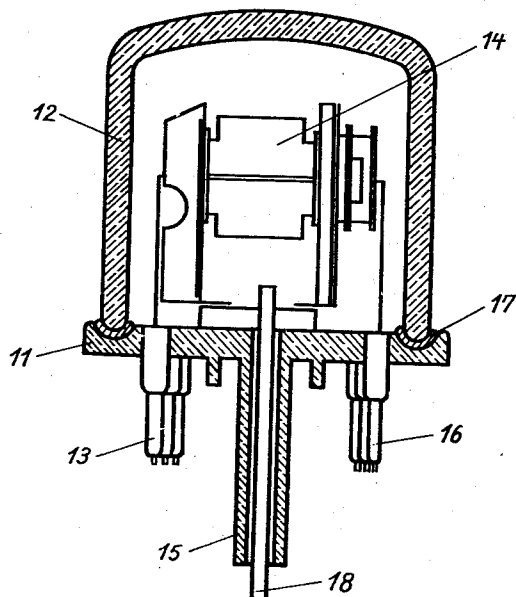
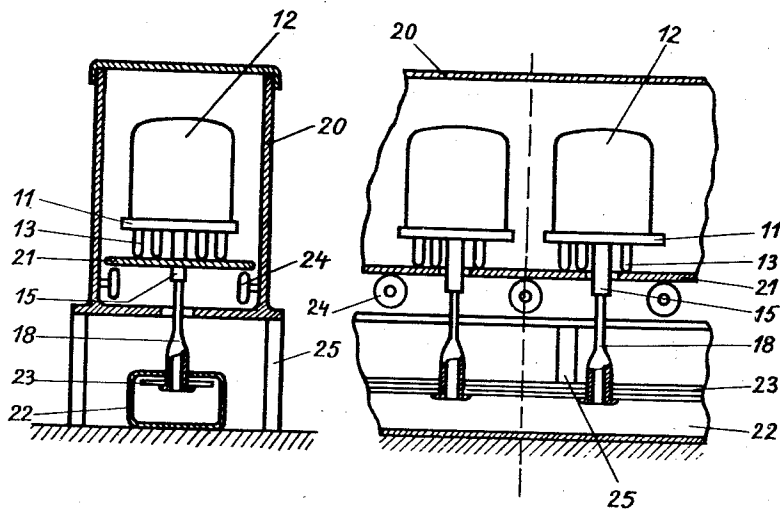


Fig. 2

Fig. 3



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METHOD OF MANUFACTURING ELECTRONIC TUBES

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4 Claims. (Cl. 250—27.5)

The present invention relates to the manufacture of electronic tubes consisting of a base supporting the electrodes and a cover, both made of a ceramic material (like porcelain or glass) and being assembled by a seal of melted glass enamel.

In carrying out this process a difficulty arises by the fact that by heating the tube in free air or in an oxidising atmosphere the electrodes are damaged while in a neutral or reducing atmosphere the enamel is reduced and loses its solidity.

It is the object of the present invention to overcome the above difficulty by keeping, during the time the tube is heated for melting the enamel, the outside of the tube in an oxidising, its inside in a reducing atmosphere.

In the accompanying drawing

Fig. 1 is a longitudinal section of a tube according to the invention, whilst

Fig. 2 shows a cross-section and Fig. 3 a longitudinal section of a furnace as used for carrying out the invention.

Referring to Fig. 1, 11 is the base carrying the electrode system 14, sealed leads-in 13 and 16 and the exhaust tube 15. A circular groove 17 of the base is filled with enamel (flint glass) which is preferably melted down before the electrode system is mounted. The edge of the cover 12 fits the groove. In order to assemble base and cover the tube is entirely heated until the enamel is melted. According to the invention during the time the tube is hot a stream of a protective gas is led into the tube by means of a fine tubule 18 which is introduced through the exhaust tube 15.

The protective gas consists preferably of nitrogen which is carefully freed from oxygen and is mixed with a few percents of hydrogen.

For manufacturing such tubes in bulk according to the invention two different ways are practicable.

The simplest way is to provide several furnaces each of which is charged with a large number of tubes, in each tube being introduced a tubule 18 for leading in the protective gas. Each furnace is slowly heated and kept hot until the enamel is melted, and then cooled down slowly in order to avoid cracking of the tubes. The furnaces are operated at different phases so that one furnace may be charged and then another one be discharged whilst the remaining ones are in the heating or cooling period. Thus the heating energy as well as the manipulation are equally distributed over the time.

The second way consists in using an elongated furnace through which the tubes are conveyed by

a metal belt conducted with slow speed along the furnace. In Figs. 2 and 3 20 is the furnace, 21 the belt, 12 one of the tubes and 18 the tubule for blowing in the protecting gas. These tubules are fixed on a second belt 23 which moves in a channel 22 at the same speed as 21 and tightens the longitudinal slit of channel 22. The channel is filled with said gas under moderate pressure which penetrates into the tubes thru the tubules 18 whilst the outside of the tubes is in free air.

I claim:

1. A method of manufacturing an electronic tube consisting of a base carrying the electrodes and a cover, both made of insulating material, comprising the steps of filling an annular groove in the upper side of said base with enamel, putting said cover upon said base whereby the edge of said cover fits said groove, conducting into said tube a stream of a gas protecting said electrodes against oxidation whilst the outside of said tube is kept in an oxidising atmosphere, and heating said tube until base and cover are sealed by the melted enamel, said gas being conducted into the tube by means of a fine tubule introduced through the pump shaft of said base.

2. A method of manufacturing electronic tubes each consisting of a base carrying the electrodes and a cover, both made of insulating material, comprising the steps of filling an annular groove in the upper side of said base with enamel, putting said cover upon said base whereby the edge of said cover fits said groove, conducting into said tube a stream of a gas protecting said electrodes against oxidation whilst the outside of said tube is kept in an oxidising atmosphere, and heating said tube until base and cover are sealed by the melted enamel, said gas being conducted into the tube by means of a fine tubule introduced through the pump shaft of said base, said heating being executed by putting a series of said tubes over said tubules, said tubules being supported by an endless metallic strip moving through a heated furnace, whilst said protection gas is led to said tubules by means of a channel placed below said furnace.

3. A method of manufacturing electronic tubes each consisting of a base carrying the electrodes and a cover, both made of insulating material, comprising the steps of filling an annular groove in the upper side of said base with enamel, putting said cover upon said base whereby the edge of said cover fits said groove, conducting through said tube a stream of a gas protecting said electrodes against oxidation whilst the outside of

said tube is kept in an oxidising atmosphere, and heating said tube until base and cover are sealed by the melted enamel, said gas being conducted into the tube by means of a fine tubule introduced through the pump shaft of said base, said heating being executed by putting a series of said tubes over said tubules, said tubules being supported by an endless metallic strip moving through a heated furnace, whilst said protecting gas is led to said tubules by means of a channel placed below said furnace, only the middle part of said furnace being heated.

4. A method of manufacturing electronic tubes each consisting of a base carrying the electrodes and a cover, both made of insulating material, comprising the steps of filling an annular groove

in the upper side of said base with enamel, putting said cover upon said socket whereby the edge of said cover fits said groove, conducting into said tube a stream of a gas protecting said electrodes against oxidation whilst the outside of said tube is kept in an oxidising atmosphere, and heating said tube until base and cover are sealed by the melted enamel, said gas being conducted into the tube by means of a fine tubule introduced through the pump shaft of said base, said heating being executed by placing a large number of such tubes into one of several furnaces and heating and cooling said furnace slowly in different phases.

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