March 26, 1957 C. E. MARRS 2,786,444

CATHODE SPRAY RACK TO ELIMINATE COATING TAPER

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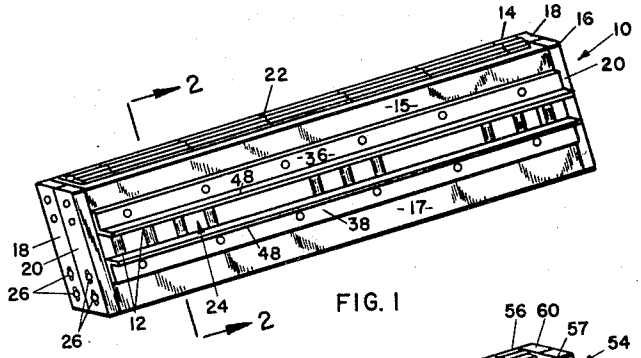

FIG. 1

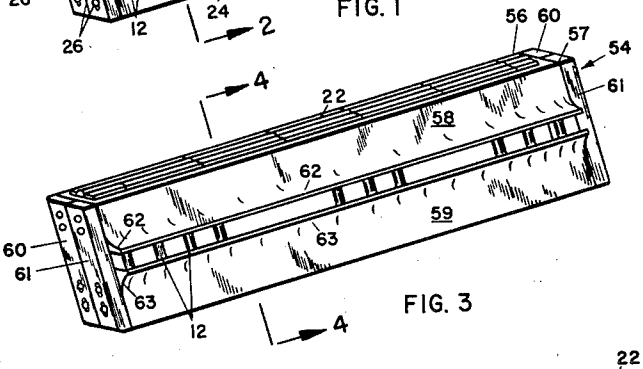

FIG. 3

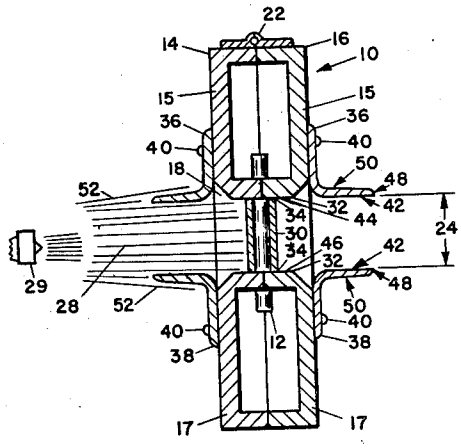

FIG. 2

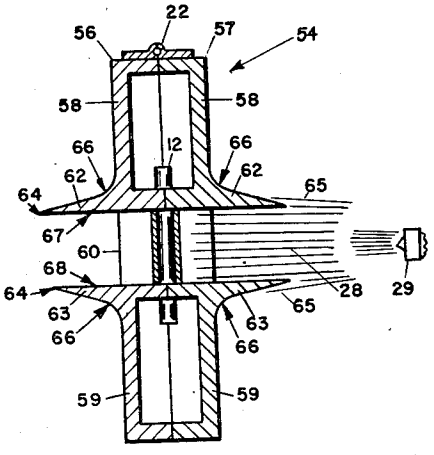

FIG. 4

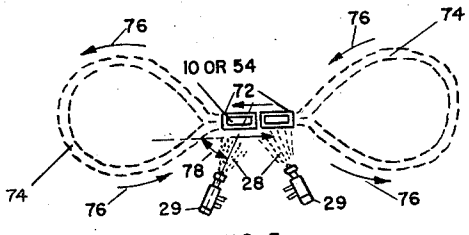

FIG. 5

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CATHODE SPRAY RACK TO ELIMINATE COATING TAPER

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5 Claims. (Cl. 118—503)

The present invention relates to coating apparatus and more particularly to a workholder for supporting a plurality of electronic cathodes or other rod like articles being coated and to means associated with the aforesaid workholder for accurately assuring uniformity of the coating band imparted to the articles.

Heretofore considerable difficulty has been encountered in the spray-coating of cathodes and other rod-like articles in that it has been virtually impossible to obtain well-defined or uniform coating bands on such articles. That is to say, the coating bands that have been obtained when utilizing conventional spray racks or workholders have evidenced a decided tapering adjacent the ends of the coating bands. In the case of cathodes utilized in electronic discharge devices, the aforesaid coating band taper has frequently resulted in low emissivity particularly from the ends of such cathodes, thereby causing a considerable number of rejects or shrinkage of electronic tubes manufactured with such cathodes. The cause of the aforementioned coating taper is due to turbulence in the streamline of the coating spray caused by corners or other portions of the workholder adjacent the extremities of the coating band. Various expedients have hitherto been advanced for reducing the turbulence. For an example, it has been well-known to taper or round-off the corners or portions of the spray rack or workholder adjacent the extremities of the coating band imparted to the cathodes or other rod-like articles. Although such expedients have improved the consistency of the coating band to a limited extent, these tapered or rounded off portions tend to direct the coating spray toward the central portions of the coating band, thereby preserving an undesirable tapering of the material comprising the coating band.

Accordingly, an object of the present invention is the provision of means for spraying a uniform, non-tapering coating band on cathodes or other rod-like articles.

Another object of the invention is the provision of a spray rack or workholder for the aforesaid cathodes or other rod-like articles, said workholder having a means attached thereto or formed integrally therewith for minimizing or eliminating entirely the turbulence in the streamline of the coating spray adjacent the extremities of the coating band.

Additional objects and advantages of the instant invention will be made apparent during the forthcoming description of exemplary forms thereof, said description being taken in conjunction with the accompanying drawings wherein:

Fig. 1 is a left front perspective view of one illustrative form of workholder constructed in accordance with the principles of the present invention.

Fig. 2 is a sectional view taken along the reference lines 2—2 of Fig. 1.

Fig. 3 is a left front perspective view of another illustrative form of workholder constructed in accordance with the teachings of this invention.

Fig. 4 is a sectional view taken along lines 4—4 of Fig. 3, and

Fig. 5 is a schematic view illustrating one form of apparatus utilized for coating cathodes or other rod-like articles being supported by a workholder constructed in accordance with the invention.

Referring now more particularly to Figs. 1 and 2, the exemplary form of the invention illustrated therein comprises a workholder 10 adapted for supporting a plurality of cathodes or other rod-like articles 12. The workholder 10 includes a pair of clamping members 14 and 16, respectively. Each one of the clamping members 14 or 16 is provided with upper and lower clamping bars 15 and 17, respectively, maintained in spaced relationship by means of the cross braces 18 and 20. The clamping members 14 and 16 are hingedly connected by means of hinge 22 disposed along the upper joint of the workholder 10, and are secured in the operating position by suitable fastening means (not shown) disposed at the bottom of workholder 10. It will be appreciated that the opening 24, as defined by the clamping bars 15 and 17, is adjusted in accordance with the desired length of coating band 30 to be imparted to the cathode 12 or other rod-like articles, by means of the bolts and slots associated with the cross-braces 18 and 20 and indicated generally by the reference character 26.

In order to impart a uniform coating band 30 to each of the cathodes 12, means are provided for eliminating the turbulence in the coating spray 28 issuing from the spray gun 29, which turbulence is caused by portions of the workholder or spray rack, for an example, the corners 32 adjacent the extremities 34 of the coating band 30 (Fig. 2). The turbulence reducing means are formed such that little or no turbulence in the streamline of the spray 28 occurs adjacent the coating band 30 particularly in the immediate vicinity of the extremities 34 thereof.

One form of turbulence reducing means includes the upper and lower pairs of L-shaped brackets 36 and 38, respectively, attached to the workholder 10 by suitable fastening means, for an example, the bolts 40, in a manner such that a face 42 of each of said brackets is preferably perpendicularly disposed relative to the cathodes 12 and lies in a plane defined by the extremities 34 of the coating band 30 and the inner portions 44 and 46 of the upper and lower clamping bars 15 and 17, respectively. For the purpose of spraying the cathodes 12 from either side of the workholder 10 the brackets 36 and 38 are individually mounted on both sides of the workholder 10. The brackets 36 and 38 are preferably constructed of relatively thin material, and to further minimize distortion in the streamline occurring at the leading edges 48 (Fig. 2), the latter are desirably sharpened as by tapering the surface 50 of each L-shaped bracket 36 or 38. With the aforedescribed arrangement it will be appreciated that those portions of the spray streamline indicated generally by the reference character 52, which are not substantially parallel to the body of the coating spray 28 and which therefore tend to increase the turbulence normally induced by the corners 34 of the workholder 10 are delimited by the sharpened edges 48 of the L-shaped brackets 36 or 38, as better shown in Fig. 2. It will be appreciated that spray-guns 29 (Figs. 2 and 4) are at a relatively greater distance from workholders 10 or 54 than shown, for purposes of illustration, in the drawings and are diminished in scale relative to the said workholder.

Referring now more particularly to Figs. 3 and 4 of the drawings: Another exemplary form of the invention illustrated therein comprises the workholder 54 having a pair of clamping members 56 and 57, respectively, adapted to support a plurality of cathodes 12 in the manner described heretofore in connection with Figs. 1

and 2. Each of the clamping members 56 or 57 includes upper and lower clamping bars 53 and 59 adjustably maintained in spaced relationship by the adjustable cross-braces 60 and 61. Formed integrally with each one of the upper and lower clamping bars 58 or 59 is a turbulence reducing or spray delimiting means comprising the flanges 62 or 63, respectively. Each of the flanges 62 or 63 is tapered to a relatively sharp leading edge 64 (Fig. 4) by means of the concave portion 66 for the purpose of eliminating or minimizing the turbulence in the streamline of the spray 28 and for delimiting or eliminating the substantially non-parallel portions 65 of the spray 28, as described heretofore with reference to Figs. 1 and 2. In order that a uniform coating band may be imparted to the cathodes 12, the integral flanges 62 and 63 are each provided with a planar surface 67 or 68, respectively, disposed preferably normal to the coating band 30 and adjoining the extremities 32 thereof. However, each of the planar surfaces 67 or 68 must be arranged such that it is substantially parallel to the direction of the spray 28.

Obviously, the cathodes supported by the aforedescribed workholder 10 or 54 may be sprayed from either side of said workholders at an angle thereto, but preferably normal to the cathodes 12, provided that the spray 28 is substantially parallel to the plane surfaces 67 and 68 of the flanges 62 or 63 (Fig. 4) or to the planar surfaces 41 and 42 of the L-shaped brackets 36 and 38, respectively (Fig. 2).

One arrangement for spraying emissive material onto the cathodes 12 supported by either of the workholders 10 or 54 is illustrated schematically in Fig. 5. The apparatus shown therein comprises a pair of spray guns 29 disposed in a manner such that spray 28 is directed substantially parallel to the aforesaid planar surfaces of the brackets 36 and 38 or the flanges 62 and 63 of the respective workholders 10 or 54 supported on the carriages 72. Carriages 72 are moved around the track 74 in the direction indicated by the arrows 76 by means of an endless chain and suitable driving mechanism (not shown). With this arrangement it will be apparent that each side of the workholder 10 or 54 is exposed to the coating spray 28 issuing from the spray guns 29. The angular disposition 78 of the spray 28 relative to the workholders 10 or 54 assures that all exposed portions of the cathodes 12 are coated uniformly.

Although the invention has been described in connection with applying an emissive coating to cathodes of electron discharge devices, it is readily apparent that the workholders constructed in accordance with the present invention can be utilized with other rod like or tubular articles requiring a non-tapering, well defined coating band of a variety of coating materials.

Numerous modifications will occur to those skilled in the art without departing from the spirit and scope of the present invention, as defined in the appended claims.

Accordingly, what is claimed as new is:

1. A workholder adapted for supporting a plurality of elongated articles being spray coated, said workholder comprising clamping means for clamping a plurality of said articles adjacent the ends thereof and in spaced relationship of said articles one to another; an opening in said clamping means disposed intermediate the ends of said articles, said opening being arranged to define an extremity of the coating being imparted to each of said articles; and a spray delimiting means affixed to at least one side of said clamping means adjacent said extremity, said means having a flat surface arranged substantially parallel to the stream of coating spray contacting said article and the geometric projection of said surface toward said articles substantially intersecting said extremity.

2. A workholder adapted for supporting a plurality of elongated articles being spray coated, said workholder comprising clamping means for clamping a plurality of said articles adjacent the ends thereof and in spaced relationship of said articles one to another; an opening in said clamping means disposed intermediate the ends of said articles, said opening being arranged to define an extremity of the coating being imparted to each of said articles; and a spray delimiting means affixed to at least one side of said clamping means adjacent said extremity, said means having a flat surface arranged normally of said articles and the geometric projection of said surface toward said articles being normal to said articles and, substantially, intersecting said extremity.

3. A workholder adapted for supporting a plurality of elongated articles being spray coated, said workholder comprising clamping means for clamping a plurality of said articles adjacent the ends thereof and in spaced relationship of said articles one to another; an opening in said clamping means disposed intermediate the ends of said articles, said opening being arranged to define first and second extremities of the coating band being imparted to each of said articles; and individual spray delimiting means affixed to at least one side of said clamping means adjacent said first and second extremites, respectively, of said coating band, said delimiting means each having a flat surface arranged substantially parallel to the stream of coating spray contacting said articles, said flat surfaces being arranged in parallel relationship one to another and respectively lying in planes which, individually, substantially intersect said first and second extremities if said coating band.

4. A workholder adapted for supporting a plurality of elongated articles being spray coated, said workholder comprising clamping means for clamping a plurality of said articles adjacent the ends thereof and in spaced relationship of said articles one to another; an opening in said clamping means disposed intermediate the ends of said articles, said opening being arranged to define first and second extremities of the coating band being imparted to each of said articles; individual spray delimiting projections affixed to at least one side of said clamping means adjacent said first and second extremities, respectively, of said coating band, said projections each being tapered to a leading edge spacedly removed from said articles and each having a flat portion arranged normally of said articles, and adjoining said leading edge, said flat portions respectively lying in planes individually adjoining said first and second extremities of said coating band and individually, substantially, intersecting said extremities.

5. A workholder adapted for supporting a plurality of elongated articles being spray coated, said workholder comprising clamping means for clamping a plurality of said articles adjacent the ends thereof and in spaced relationship of said articles one to another; an opening in said clamping means disposed intermediate the ends of said articles, said opening being arranged to define first and second extremities of the coating band being imparted to each of said articles; individual projections arranged on at least one side of said clamping means and being formed integrally with said clamping means adjacent said first and second extremities, said projections each comprising a concave surface and an opposing planar surface adjoining said concave surface at a leading edge spacedly removed from said articles, said planar surfaces when individually geometrically projected substantially intersecting said first and second extremities of said coating band.

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