

May 23, 1961

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2,984,941

METHOD OF AND APPARATUS FOR MANUFACTURING
FACE PLATES OF CATHODE RAY TUBES

Filed May 8, 1957

3 Sheets-Sheet 1

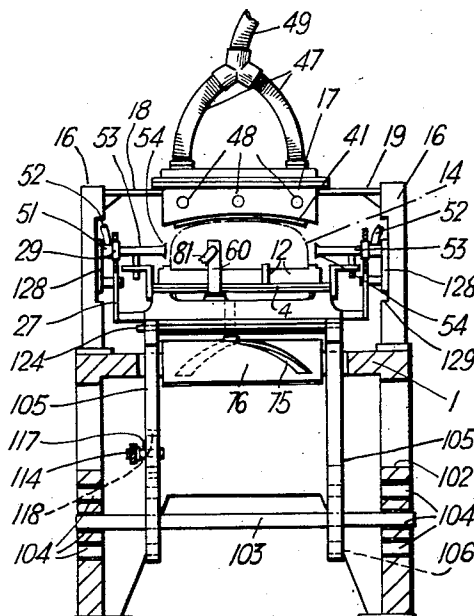
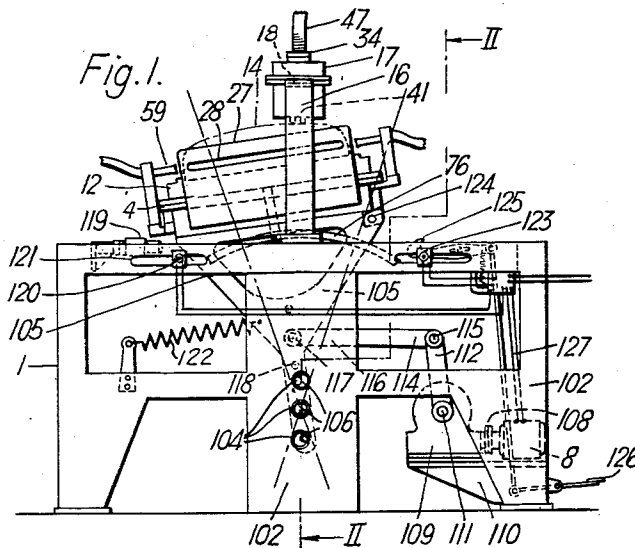


Fig. 2.

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Fig. 3.

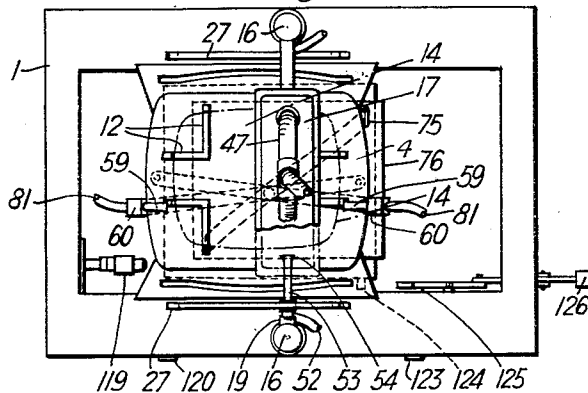
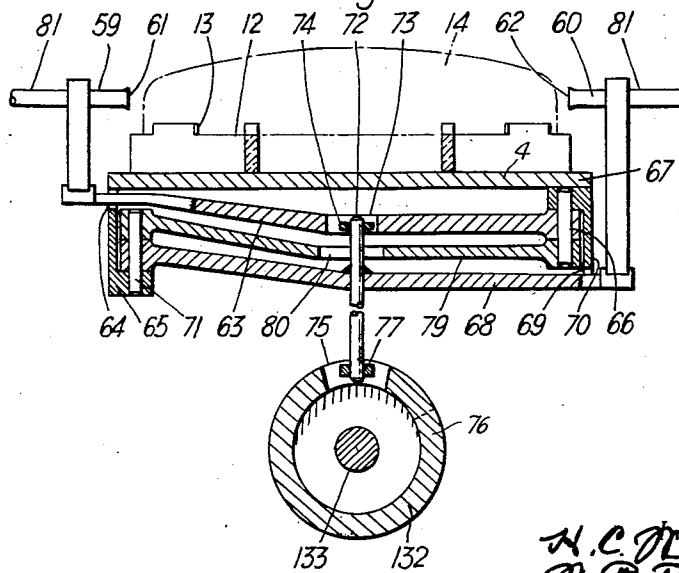


Fig. 7.



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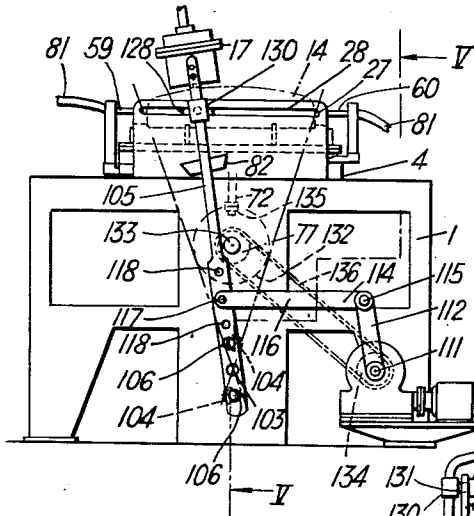


Fig. 4.

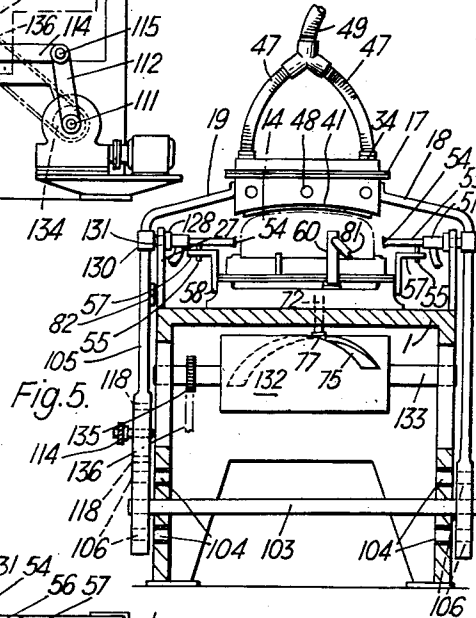


Fig. 5.

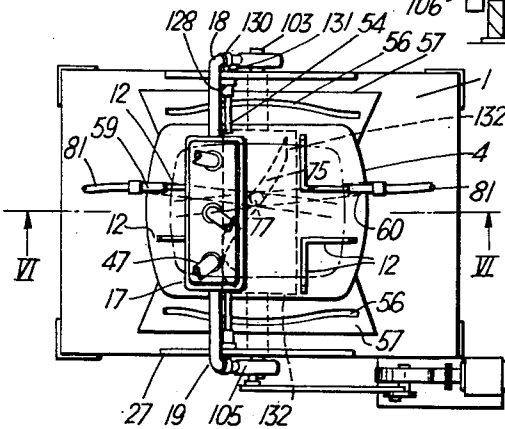


Fig. 6.

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2,984,941

METHOD OF AND APPARATUS FOR MANUFACTURING FACE PLATES OF CATHODE RAY TUBES

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Filed May 8, 1957, Ser. No. 657,910

Claims priority, application Great Britain May 9, 1956

12 Claims. (Cl. 49—58)

This invention relates to improvements in the methods of and apparatus for the manufacture of faceplates for cathode-ray tubes for example such as are employed in television receivers.

In the manufacture of cathode-ray tubes for television receivers the faceplate and the envelope thereof are made separately and then they are welded together; the faceplate is pressed out from a measured quantity of glass charged to a mould, its final shape having a face which is usually convex and flanges curved sharply away from the face. Such moulded faceplates have faults, flow lines and mould marks on their faces, which adversely affect the optical qualities of the faceplate and have hitherto been removed by grinding and polishing which in view of the shape of the faceplates, is a difficult operation taking time to carry out; and the outer surfaces of the flanges possess a projecting beading corresponding to the joint in the mould, which is usually a straight beading at a constant distance above the lower edge of the flange, and it is desirable to remove or round off this beading.

The main object of the present invention is to provide a method of and apparatus for manufacturing such faceplates so that they possess fire finished faces free of faults, flow lines and mould marks or other imperfections of the surface.

This invention employs the novel principle of applying a gaseous heating medium to the faces of the faceplates to soften them sufficiently to melt out the irregularities of the surfaces of the faces of faceplates and to disperse the faults without melting the main body of the glass which would then sag and become useless as a faceplate. Thus the faces of the faceplates when cooled after such surface melting treatment will have a fire finish free of faults, flow lines and mould marks or scratches.

For successful operation of this fire finishing treatment it is essential to heat the face of the faceplate for a short time only and to heat the whole surface substantially uniformly as otherwise the finished faceplate would still suffer distortion or would still retain surface imperfections.

According to the present invention a method of fire finishing the outer face of a faceplate of a cathode-ray tube is characterised by supporting a faceplate on a support element, effecting relative movement between the faceplate supported on said support element and an element constituting the origin of a gaseous heating medium projected towards the faceplate, at least one of the elements being moved in an arcuate path of which the curvature corresponds to the curvature of the outer face of the faceplate so as to maintain substantially constant the distance between the origin of the curtain and the face of the faceplate and to maintain the curtain substantially normal to the outer face of the faceplate, the breadth of the curtain being such that during the relative movement the whole of the useful arc of the face of the faceplate is uniformly heat treated.

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Preferably the faceplate is oscillated beneath a fixed curtain origin about an axis substantially coincident with the centre of the curvature of the faceplate, in the direction of the oscillatory movement, the amplitude of the oscillations being such that during each full one-way movement the whole of the useful arc of the face of the faceplate will be passed beneath the curtain origin and uniformly heat treated.

Alternatively the faceplate is fixed and the curtain origin is oscillated about an axis substantially coincident with the centre of curvature of the faceplate in the direction of the oscillatory movement, the amplitude of the oscillations being such that during each full one-way movement the curtain will impinge on and uniformly heat-treat the whole of the useful arc of the face of the faceplate.

The flanges of the faceplate may be fire finished and for this purpose jets of gaseous heating medium are presented to the side or end flanges or both the side and end flanges of the faceplate, each jet being maintained during the oscillatory movement at substantially a constant distance from the flange to which it is presented and the relative movement between each jet and the flange to which it is presented is in a substantially straight line so that the whole length of each flange to which a jet is presented is fire finished.

The invention also comprehends apparatus for fire finishing the curved outer faces of such faceplates, such apparatus comprising in combination a mount being a support element for a faceplate, a burner structure, having one or a number of apertures disposed across the entire breadth of the mount and in spaced relation to the mount to present a curtain element formed of a gaseous heating medium to the outer face of a faceplate on the mount, and means for effecting oscillatory movement of at least one of the elements in a direction at right angles to the curtain element and in an arcuate path of which the curvature corresponds to the curvature of the outer face of the faceplate, the distance between the apertures and the face of the faceplate being maintained substantially constant and the amplitude of the oscillations being such that during each full one-way movement the whole of the useful arc of the face of the faceplate is uniformly heat-treated.

Preferably the mount is oscillatable beneath a fixed burner about an axis substantially coincident with the centre of the curvature of the face of the faceplate on the mount in the direction of the oscillatory movement.

Alternatively the mount is fixed and the burner is oscillatable over the face of the faceplate on the mount about an axis substantially coincident with the centre of the curvature of the face of the faceplate in the direction of the oscillatory movement.

The apparatus may be constructed for fire finishing also the side and end flanges or both the side and the end flanges of the faceplate at the same time as fire finishing the face of the faceplate. To this end burners are disposed to project jets of a gaseous heating medium onto the side flanges or the end flanges or both the side and end flanges of the faceplate, each burner being so mounted that during each oscillatory movement it is maintained at a substantially constant distance from the flange onto which it projects a jet and the relative movement between each burner and the flange onto which it projects a jet is in a substantially straight line so that the whole length of each flange onto which a jet is projected will be fire finished.

In order that the invention may be more clearly understood two preferred embodiments thereof will now be described, by way of example, with reference to the accompanying diagrammatic drawings, in which:

Fig. 1 shows in side elevation a machine for fire polish-

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ing faceplates of cathode ray tubes having an oscillatable mount for a faceplate capable of being moved to and fro under a burner secured on the machine frame or base transversely to the direction of movement of the mount;

Fig. 2 is a cross-section through the machine along the line II—II of Figure 1 looking in the direction of the arrows;

Fig. 3 is a plan of the machine shown in Figures 1 and 2;

Fig. 4 is a side elevation similar to Figure 1, showing another construction of machine having a mount for a faceplate secured in the frame or base of the machine beneath a burner mounted for oscillation in the machine frame or base and capable of being moved to and fro over the mount;

Fig. 5 is a cross-section through the machine along the line V—V of Figure 4 looking in the direction of the arrows;

Fig. 6 is a plan of the machine shown in Figures 4 and 5; and

Fig. 7 is a partial transverse section of the mount shown in Figures 1-3 and Figures 4-6, but taken on the line VI—VI of Figure 6 and showing the roller 132 of Figures 4-6.

In the drawings like references designate the same parts of the machine.

Referring to Figures 1 to 3 and Figure 7 of the drawings the machine comprises a supporting frame structure or base 1 having side frame 102 in which a shaft 103 is journaled in bearings 104 and carries two vertical spaced arms 105, shown in the form of yokes, having secured on their upper ends, a mount 4 intended to receive a faceplate, the shaft 103 being connected to a drive mechanism which is operable to oscillate the mount to and fro through the vertical plane about the axis of the shaft 103.

Locating members consisting of plates 12 which are L-shaped in plan and secured edge-on to the top of the mount, the upper edges of each plate 12 being cut away as at 13 (seen more clearly in Figure 7) to form a cradle into which the faceplate 14, shown in chain dotted lines, can be placed so as to be accurately disposed on the mount.

A hollow pillar 16 is mounted on the base 1 to each side of the mount vertically over the shaft 103 at the mid-point of the to and fro oscillatory movement of the mount and a burner 17, hereinafter fully described, is mounted on brackets 18, 19 (Fig. 6) supported on the pillars 16.

In Figures 1 and 2 three spaced apertures 106 are provided in each yoke 105, while similarly spaced bearings 104 are disposed one above the other in the side frames 102; these apertures 106 are spaced vertically in the yokes 105 so that the radius of oscillation of the mount can be adjusted with respect to the burner 17 whereby faceplates of different radii of curvature of useful face can be fire finished in the machine.

The shaft 103 is disposed in the base 1 vertically below the fixed burner 17 at such a distance that the faceplate on the mount will be moved to and fro beneath the burner at a constant distance therefrom, this distance being determined by the height of the plates 12. The positions of the apertures 106 and bearings 104 through which the shaft passes determine the radius of curvature of the path of movement of the mount. The amplitude of movement of the yokes 105 is such that during each complete movement of the faceplate beneath the burner in one direction, the curtains of flame from the burners will impinge on and melt the face of the faceplate to fire finish it over the whole useful arc of the face of the faceplate.

Any suitable device may be provided to oscillate the yokes 105 and with them the mount 4 about the shaft 103. In one suitable construction a motor 8 (Figure 1) is directly coupled to a worm shaft 108 of a worm

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reduction gear box 109 and the motor 8 and the gear box 109 are mounted by brackets 110 on the frame 1. A worm wheel shaft 111, driven from the gear box 109, carries an arm 112 to which one end of a connecting rod 114 is coupled by a hinge pin 115; the other end 116 of the connecting rod 114 is coupled to the yoke 105 by a hinge pin 117, journaled in an aperture 118 in the yoke.

Thus the mount is moved with constant linear velocity irrespective of the sizes of faceplate on the mount, and accordingly for all radii and amplitudes of swing of the yoke 105. When the radius of swing of the yoke 105 is changed to suit a change in the size and radius of the face of the faceplate to be processed, the pin 117 must be moved with respect to the arm 105 and a number of apertures 118 are provided for this purpose. When energized the motor 8 runs at constant angular velocity and so the arm 112 will be moved with constant angular velocity through the gear box 109; to impart a linear velocity to the mount, which is constant throughout movement of the mount, the yoke 105 must swing with constant angular velocity, which is achieved if the distance between the centre of the pin 117 and the centre of the operative bearing 104 equals the radius of the arm 112; and the length of the arm 114 between centres of the pin 115 and aperture 106 equals the distance between the axes of the shafts 103 and 111; this causes the mount to move with a linear velocity proportional to the radius of its swing instead of the required invariable linear velocity, but since the angle of swing of the yoke 105 is small, sufficiently accurate mount movement can be achieved by selecting each position of the pin 117 in the yoke 105 so that as its distance from the axis of swing, i.e. of the shaft 103 increases, the amount of increase is greater than that which is in proportion to the corresponding increase in radii of swing.

Since the faceplates may be loaded and unloaded at each end of the full one-way movement of the yoke 105, it is necessary to hold the mount stationary at each end of its full one-way movement, and therefore in addition to a reversing switch (not shown) for the motor 8, limit switches must be provided on the base 1 and secured thereto in an adjustable manner to suit the various sizes of faceplates. As shown in Fig. 1, the yoke 105 is swung to the left and back to the right by the motor 8, a buffer 119 being provided on the left hand side of the frame to cushion the final movement of the mount; the buffer 119 is adjustable in position to suit varying travel of the mount according to the size of faceplate being treated. A limit switch 120 is adjustably secured in a slot 121 in the base 1 so that when the mount approaches the left end of its run and engages the buffer 119, the motor 8 will be de-energised either by the yoke 105 or by the mount 4 striking the switch 120. An adjustable limit switch 123 similar to the switch 120 is provided at the right end of travel of the mount. Alternatively the motor 8 is arranged to run continuously and, instead of the limit switches 120, 123, trips may be provided and disposed to disconnect and reconnect the arm 112 and the shaft 111 through a suitable friction clutch. A spring 122 is secured between the base 1 and the yoke 105 to hold the yoke at the left end position of the mount. A latch pin 124 is provided on the mount and disposed so that at the end of the full movement of the yoke 105 to the right, the pin 124 will engage behind a spring controlled latch 125 adjustably pivoted to the frame 1, to suit various lengths of one-way movement of the mount, and operated by a foot pedal 126 through a rod 127.

It is also desirable to fire finish the side and end flanges of the faceplate as well as its face, but for this purpose burners projecting flames on the flanges should engage the flanges along a straight path thereover, so the burner mechanism includes means for such movement although the faceplate is moved in an arcuate path.

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Secured to each side of the mount 4 in spaced relation thereto is a vertical cam plate 27 having a longitudinal slot 28 therein. A burner bracket 51 (Figure 2) is mounted on a slide 128 slidably arranged in each pillar 16, and extends horizontally through the slot 28 of the contiguous cam plate 27 so that as the mount is moved to and fro in the base 1, the burner bracket 51 will be raised and lowered on the pillar 16 by a roller follower 29 which is threaded onto the bracket 51 and moves in the slot 28, the shape of the slots 28 being such that as the mount is oscillated in the base 1 the slides will move vertically to maintain the burners 54 on the brackets 51 opposite the beads on the flanges.

The burner 17 is constructed as described in United States copending application Serial No. 657,970, filed May 8, 1957, and as indicated in the drawings has at its lower end two jets 41 spaced apart in the direction of movement of mount so as to provide two linear jets extending across the burner from which, when the gaseous mixture issuing therefrom is ignited, a pair of curtains of flame is projected. The jets 41, which may be rows of holes or of other suitable construction, may be angularly disposed to each other so as to cause the curtains of flame to converge. Alternatively, a single jet 41 may be employed as will be understood. The lower part 32 of the burner casing and the jets 41 are curved so that the jets are concentric with the profile of the faceplate on the mount. The gaseous mixture is supplied to inlets 34 in the top of the burner casing through a conduit 49 which feeds flexible pipes 47.

The slides 128 are shown as sliding in the pillars 16, the pillars having cut away portions 129. The burner bracket 51 is secured to the slide through the portion 129 which is of such a size as not to interfere with the raising and lowering of the slide. Alternatively the slides 128 may slide on the outer surface of the pillars 16. This mechanism is provided on each side of the mount.

Gaseous mixture is supplied through flexible tubing 52 to burners 53 mounted one on each bracket 51 and the burners 53 are disposed with their jets 54 at the requisite distance from the longitudinal side flanges of the faceplates, and at such a height that the flame from them impinge on the beading thereon corresponding to the joint in the mould, the slots 28 ensuring the constant height of the burners from the base of the side flange of the faceplate as the mount oscillates in the base 1.

Referring to Figures 4, 5 and 6 these show a machine similar in construction to that shown in Figures 1, 2 and 3 except that the mount 4 is secured on the base 1 and the burner 17 is secured at its ends by the brackets 18, 19 to the upper ends of the yoke 105 to oscillate to and fro over the top of the faceplate 14.

The gaseous mixture is supplied to the inlets 34 of the burners through the pipes 47 which are connected through the conduit 49 to a suitable source of gaseous mixture supply. The slides 128 are each slidably disposed in a slot 28 in the cam plate 27 secured to the stationary mount 4 and a cross head 130 pivoted by pins 131 to the slide is slidably mounted in each yoke 105 so that as the yokes 105 carrying the burner 17, oscillate to and fro over a faceplate on the mount the slides 128 will be constrained to follow a straight path opposite the side flanges of the faceplate and at a constant distance above the lower edge thereof.

As in the machine shown in Figures 1, 2 and 3 the machine shown in Figures 4, 5 and 6 operates so that when the burner moves to and fro past the mount the jets 41 are maintained at a constant distance from the face of the faceplate on the mount. This is achieved by the mechanism shown in Figures 4 and 5, which is similar to the mechanism shown in Figures 1-3; in this mechanism the yokes 105 are moved to and fro by the motor 8 through the worm shaft 108, the worm wheel shaft 111, the arm 112, the hinge pin 115 and the con-

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necting rod 114 the outer end 116 of which is coupled to the yoke 105 by a hinge pin 117. The axis of swing of the shaft 103 is coincident with the centre of curvature of the face of a faceplate on the mount so that the jets 41 on the burner 17 will always move at a constant distance from the face of the faceplate on the mount. The shaft 103 can be journaled in one of three bearings 104 and the pin 117 of the rod 114 may be passed through any one of apertures 106 in the yokes 105 so that the jets 41 are disposed at a predetermined distance from the face of a faceplate on the mount, and since the arm 112 is parallel to the yoke 105 and the rod 114 is parallel to the line through the axes of rotation of the shafts 103 and 108, the yoke 105 and hence the burner 17 will move with a substantially linear velocity over the faceplate.

Where the faceplates have curved longitudinal sides, the jets 54 of the burners 53 as shown in Figures 2 and 4 are axially slidably mounted in the brackets 51 and a pin 55 extends from each burner 53 into a cam slot 56 (Figure 6) on a horizontal portion 57 of a cam plate 58 secured to the mount 4. Thus as the mount or burner moves with respect to the burner or mount respectively the burner jets 54 are maintained at a constant distance from the side flanges of the faceplate on the mount. Interchangeable cam-plates 58 may be provided to suit the various curvatures of the side flanges of the various faceplates to be treated.

For fire finishing the end flanges of the faceplates on the mount, end burners 59, 60 (Figure 6) are disposed on the mount, to travel therewith in the construction shown in Figures 1 and 2, and to be moved transversely of the mount with their jets 61, 62 (Figure 6) respectively at a constant distance from the end flanges of the faceplate, and at such a height that the flames from them impinge on the beading corresponding to the joint in the mould.

Referring to Figure 7 the burner 59 is mounted on a lever 63 passing through a slot 64 in the upper part of the transverse wall 65 of one end of the mount, the lever 63 being pivoted at the other end of the mount on a pin 66 secured in the wall 70 of the mount. The other burner 60 is secured to the free end of a lever 68 which extends through a slot 69 in the lower part of the other transverse wall 70 of the mount and extends beneath the mount and is pivoted on a pin 71 secured in the wall 65. At mid-length of the lever 68 a pin 72 is secured and extends into a slot 73 in the lever 63 the sides of which are engaged by a roller 74 on the pin 72. The lower end of the pin 72 extends downwardly into a slot 75 in a cam-plate 76, the sides of which slot 75 are engaged by a roller 77 on the pin 72, the slot 75 being cut in the camplate 76 obliquely to the mount. Interchangeable slotted cam-plates 76 may be provided in which the length and obliquity of the slot are varied to suit the various sizes of faceplates to be treated. The slot 75 may have end sections parallel to the direction of relative movement between the mount and the burner so that the burners 59, 60 do not move far enough to foul the burners 53 when the mount reaches the ends of its movement (Figure 5). A bracing member 79 may be provided as shown in Figure 7 connecting the pins 66, 71, this member having a slot 80 transversely of the mount and of such dimensions as to allow free movement of the pin 72 therethrough during the full travel of the mount 4 as will be described.

The gaseous mixture is supplied to the burners 59, 60 through flexible pipes 81.

In the machine shown in Figures 1, 2 and 3 the cam plate 76 is arcuate, with the centre of its radius of curvature at the axis of rotation of the shaft 103 so that as the mount is oscillated the roller 77 will always move in the slot 75. In the machine shown in Figures 4, 5 and 6 the slot 75 is disposed in the circumferential sur-

face of a roller 132 journaled at its ends 133 in the sides of the base 1 and rotated by the yokes 105 through sprockets 134, 135 over which an endless chain 136 passes, the movement of the roller 132 being in timed relation to the movement of the yokes 105 so that as the burner 17 oscillates over the faceplate on the mount the roller 132 will rotate at a speed whereby the roller 77 will move to and fro across the mount to traverse the burners across the end flanges of the faceplate.

The gaseous mixture supplied to all the burners may be a mixture of any suitable combustible gas such as coal gas with air and/or oxygen. One or both of the yokes 105 may be provided with a cam face 82 (Figure 4) at each side thereof disposed to engage a lever (not shown) connected to cocks in the pipes supplying the gaseous mixture to all the burners, whereby at the end of the movement of the mount the supply of such mixture is reduced to a minimum to avoid waste, the lever being returned to the full mixture supply position by a spring (not shown) when the yoke 105, on movement of the mount moves out of contact with the levers, but the construction of these levers, cocks and springs forms no part of the present invention and is therefore not further described herein.

The plates 12 can be removed and replaced by other plates of different sizes to locate faceplates of various dimensions, so that the faces of the faceplates are disposed at the desired distance below the burner, which remains substantially constant for all sizes of faceplates. The brackets 18, 19 may be provided with members by which their height and thus the height of the burner above the base 1 may be adjusted to enable faceplates of various sizes to be fire-finished on the mount. The shaft 103 could be replaced by a pair of trunnions movable from one pair of apertures 106 and bearings 104 to another.

In operation a faceplate is moulded in a normal mould from a measured quantity of glass fed thereto and while still hot, e.g. at about 450° C., it is brought to the fire finishing apparatus. In the machine shown in Figures 1, 2 and 3 the faceplate is positioned on the mount at one end of its travel on the yokes 105 and located between the parts 13 of the plates 12 thereon. The motor 8 is then energized and causes the mount to travel with the faceplate at uniform speed beneath the jets 41 of the burner 17 by partial rotation about the shaft 103. As the mount moves, the distance between the burner 17 and the faceplate face is such as to maintain the flame curtain projected from the burner 17, which impinges on the surface of the faceplate, at a substantially constant distance from the face of the faceplate 14. At the same time the flame jets of the burners 53 impinge on the side flanges of the faceplate while the burners 59, 60 traverse the end flanges of the faceplate so that their jets impinge on those flanges.

It will thus be seen that as the mount performs its full one-way movement in each oscillation the whole face of the faceplate and the beaded portions of the flanges of the faceplate will be heated by the curtains of flame and the flame jets impinging thereon, all the flames being substantially normal to the surfaces of the faceplate which they strike, and maintained at a substantially constant distance therefrom.

It is important that the flames will impinge on the glass for only sufficient time and with the burners maintained substantially at a predetermined distance from the glass surfaces, to ensure that only the surfaces are melted to effect a fire finish without softening the main body of the glass, which would cause it to sag. Thus the speed of travel of the mount 4 must be adjusted according to the flame temperature. It has been found that satisfactory results are achieved by moving the mount or the burner 17 at approximately one inch every 2½ seconds where the jet apertures in the burner 17 are about ¾ inch from the surfaces of the glass and the

two curtain flames for the face of the faceplate impinge on the glass ¼-½ inch apart, the actual curtain of flame from each burner jet 41 being about 0.04 of an inch wide, this being the width of each slot 41.

It will be understood that the operation of the machine shown in Figures 4, 5 and 6 will be similar to that described with reference to Figures 1, 2 and 3 but the burner will oscillate over the stationary faceplate on the fixed mount, the movement of the burners 53 being effected by the crossheads 130 while the burners 59, 60 are moved by rotation of the roller 132.

After this fire finishing treatment in the above described apparatus, the faceplates are still at a high temperature, and they are then removed from the mount and placed in a lehr for the normal annealing treatment.

It will be seen that with apparatus according to the invention the surfaces of the convex face and of the flanges of the faceplate are melted without softening the main body of the glass itself and thus the surfaces of the glass flow sufficiently to remove faults and irregularities such as flow lines and mould marks and scratches thereby producing fire finished uniform surfaces without distorting the main body of the glass.

While the invention has been described with reference to the manufacture of television cathode-ray tube faceplates it will be understood that it may be employed in the manufacture of any similar bowl-shaped glass articles and the term "television cathode-ray tube" used herein is to be interpreted as including such similar articles.

We claim:

1. A method of fire finishing the useful arc of the arcuate outer face of a faceplate of a cathode-ray tube characterised by supporting the faceplate outer face uppermost and generally horizontally on a supporting element, projecting a ribbon-like curtain element of gaseous heating medium downwards towards the supported faceplate, effecting movement substantially at right angles to the curtain of at least one of said elements in an arcuate path the curvature of which corresponds to the curvature of the outer face of the faceplate while maintaining substantially constant the distance between the origin of the entire curtain and the face of the faceplate and maintaining the curtain substantially normal to the face of the faceplate, the breadth of the curtain and the rate and extent of movement of said one element being such that during said movement the whole of the useful arc of the arcuate face of the faceplate is uniformly heated without melting the main body of the faceplate and the arcuate face of the faceplate is thereby fire finished.

2. A method of fire finishing the useful arc of the arcuate outer face of a faceplate of a cathode-ray tube characterised by supporting the faceplate outer face uppermost and generally horizontal on a support, projecting from a fixed curtain origin a curtain of gaseous heating medium towards the outer face of the supported faceplate, and oscillating said faceplate support beneath said curtain origin about an axis substantially coincident with the centre of the curvature of said faceplate in the direction of the oscillatory movement, the amplitude of the oscillations being so adjusted that during each full one-way movement the whole of the useful arc of the face of the faceplate will be passed beneath the curtain origin and uniformly fire finished.

3. A method of fire finishing the arcuate outer face of a faceplate of a cathode-ray tube characterized by supporting the faceplate outer face uppermost and generally horizontal on a fixed support, projecting from a curtain origin a curtain of gaseous heating medium towards the outer face of the supported faceplate, and oscillating said curtain origin about an axis substantially coincident with the centre of the curvature of the faceplate in the direction of the oscillatory movement, the amplitude of the oscillations being so adjusted that during

each full one-way movement the curtain will impinge on and uniformly fire finish the whole of the useful arc of the face of the faceplate.

4. A method according to claim 1 wherein jets of gaseous heating medium are presented to the side or end flanges or both the side and end flanges of the faceplate, while maintaining each jet during the said movement at substantially a constant distance from the flange to which it is presented and the relative movement between each jet and the flange to which it is presented is in a substantially straight line of sufficient extent that the whole length of each flange to which a jet is presented is fire finished.

5. Apparatus for fire finishing the useful arc of the generally arcuate outer face of a molded faceplate of a cathode-ray tube comprising in combination a fixed support, an oscillatory support, a mount element carried on one of said supports for presenting for treatment the generally arcuate face of a faceplate, a burner element carried on the other of said supports and disposed in overlying and spaced relationship to and conformed, in a direction perpendicularly transverse to the direction of oscillation of the oscillatory support, to the contour of a generally arcuate face of a faceplate and having at least one aperture extending in said transverse direction across the entire width of the faceplate to present a curtain of gaseous heating medium to the face of the faceplate, said oscillatory support carrying the element carried thereby through a course in the direction of oscillation conforming to said face of said faceplate, and means on said apparatus for effecting relative oscillatory movement of at least one of said elements in a direction at right angles to the burner structure aperture and in an arcuate path corresponding to the face of the faceplate, the distance between the apertures and the face of the faceplate being maintained substantially constant and the amplitude of the oscillations of said oscillatory support being such that during each full one-way oscillatory movement the whole of the useful arc of the face of the faceplate is uniformly fire finished.

6. Apparatus as in claim 5 wherein the burner element is carried on said fixed support.

7. Apparatus as in claim 5 wherein the mount element is carried on said fixed support.

8. Apparatus according to claim 5, characterised by the provision of burners disposed to project jets of a gaseous heating medium onto at least one pair of opposing pairs of side and end flanges of the faceplate on said mount, and of means to mount each of the last-mentioned burners on said apparatus so that during each oscillatory movement it is maintained at a substantially constant distance from the flange onto which it projects a jet and the relative movement between each burner and the flange onto which it projects a jet is in a substantially straight line of sufficient extent that the whole length of each flange onto which a jet is projected will be fire finished.

9. Apparatus for fire finishing the useful arc of the arcuate outer faces of faceplates of cathode-ray tubes comprising in combination a pair of arms pivotally mounted one at each side of the apparatus, a mount being a support element for a faceplate, an elongated burner for projecting a curtain element of gaseous heating medium, one of said elements being fixed and the other of said elements being mounted on said arms, said burner being disposed at a greater distance from the pivotal mounting of said arms than a faceplate supported on said mount, and means for oscillating said arms about said pivotal mounting in a direction substantially at right angles to said curtain at a uniform rate to effect rela-

tive movement between said burner and the faceplate on said mount, the breadth of said burner and the extent of said oscillatory movement being such that during said oscillatory movement the whole of the useful arc of said face of said faceplate is uniformly fire finished.

10. Apparatus for fire finishing the arcuate outer faces of moulded faceplates of cathode-ray tubes comprising in combination a mount being a support element for a faceplate, a burner structure having at least one aperture disposed across the entire width of the mount and in spaced relation to the mount to present a curtain element of gaseous heating medium to the face of a faceplate on the mount, and means for effecting relative oscillatory movement of at least one of said elements in a direction at right angles to the curtain and in an arcuate path corresponding to the face of the faceplate, the distance between the apertures and the face of the faceplate being maintained substantially constant and the amplitude of the oscillations being such that during each full one-way movement the whole of the useful arc of the face of the faceplate is uniformly fire finished, a burner for fire finishing each end flange of the faceplate on the mount, each burner being mounted on a lever pivoted to the opposite end of the mount, the two levers being interconnected at their central portions by a pin the lower end of which enters an oblique cam slot such that during said oscillatory movement said pin will ride in said slot and the levers will be moved to traverse said end burners across the ends of the faceplate on the mount at a constant distance from said ends.

11. Apparatus according to claim 9 characterised by side burner elements disposed one on each side of the apparatus, said side burner elements having jets movable towards and away from the side flanges of a faceplate on the mount, and a pin associated with each side burner element, said pin riding in a cam slot in a cam element associated with said mount, one of said elements being movable with respect to the other during and in phase with said oscillatory movement such that the side burner elements will be maintained at a constant distance from said faceplate side flanges and the whole length of said side flanges will be fire finished by the gaseous heating medium projected from said jets.

12. Apparatus according to claim 9 characterised in that a burner is provided for fire finishing each end flange of the faceplate on the mount, each burner being mounted on a lever pivoted to the opposite end of the mount, the two levers being interconnected at their central portions by a pin the lower end of which enters an oblique cam slot such that during said oscillatory movement said pin will ride in said slot and the levers will be moved to traverse said end burners across the ends of the faceplate on the mount at a constant distance from said ends, said oblique cam slot having end portions parallel to the direction of said oscillatory movement whereby the movement of the end flange burner jets with respect to the mount will not cause said burner jets to foul a faceplate on the mount.

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