

**June 10, 1952**

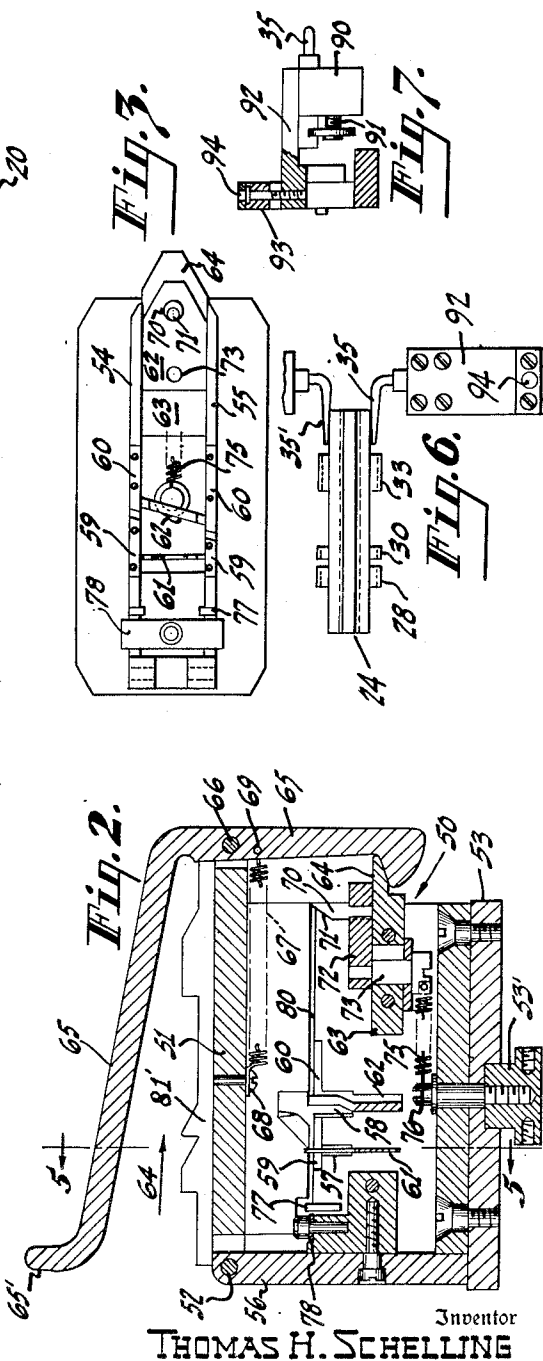
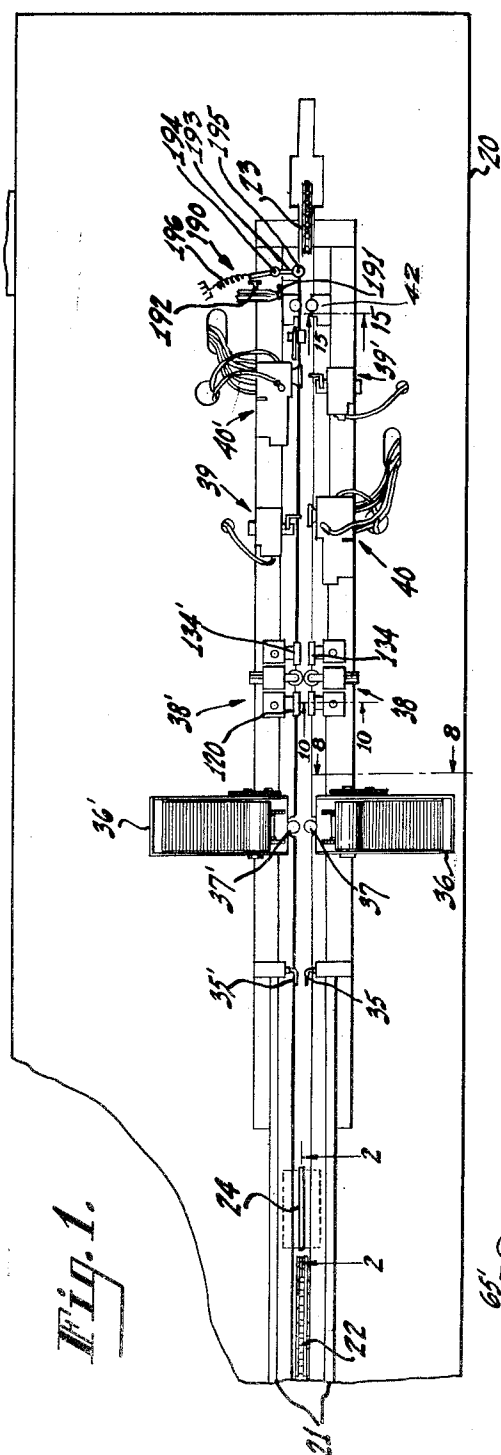
T. H. SCHELLING

**2,600,076**

# AUTOMATIC ELECTRODE STRUCTURE ASSEMBLING MEANS

Filed May 29, 1950

3 Sheets-Sheet 1



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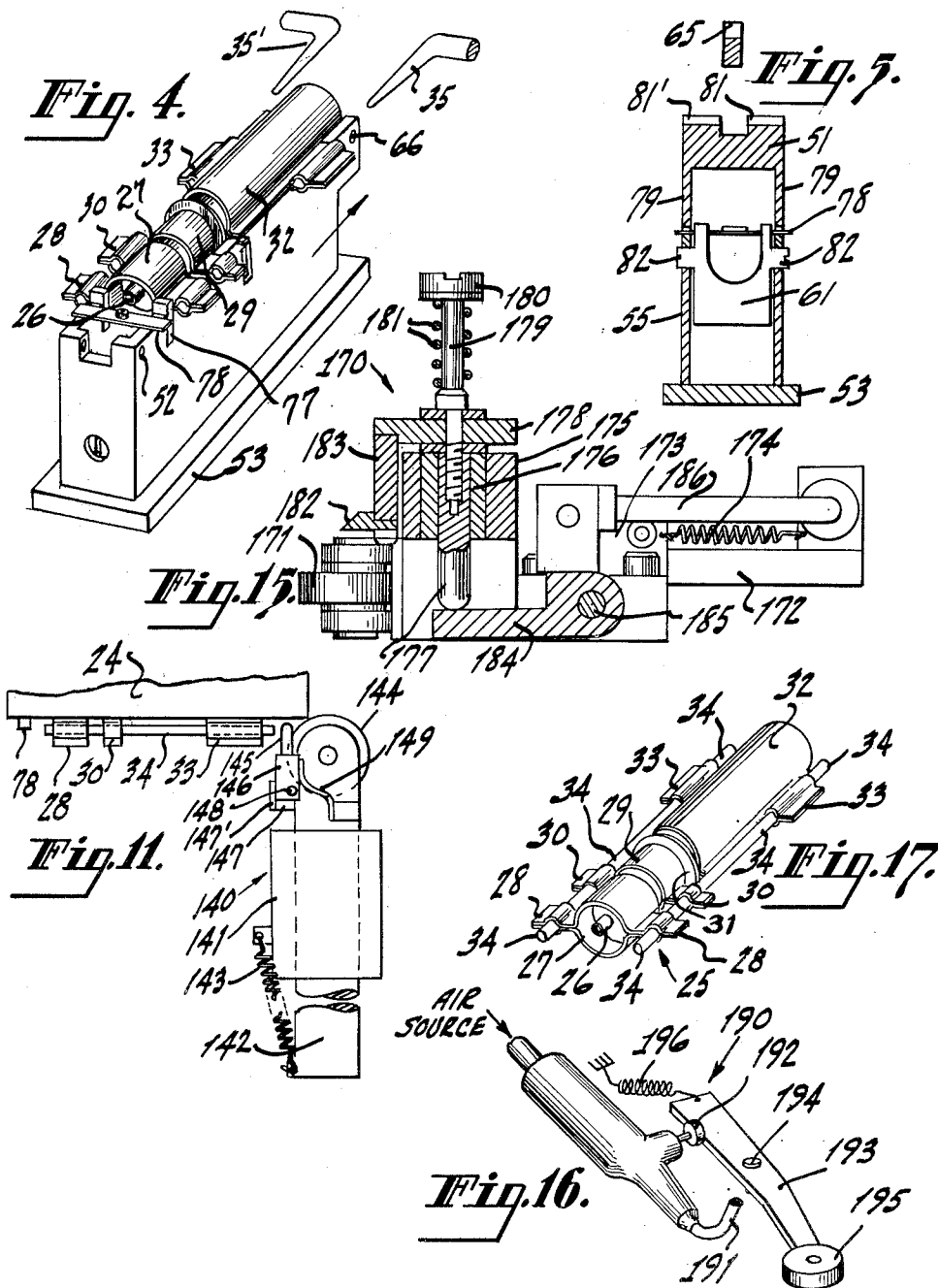
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## AUTOMATIC ELECTRODE STRUCTURE ASSEMBLING MEANS

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3 Sheets-Sheet 2



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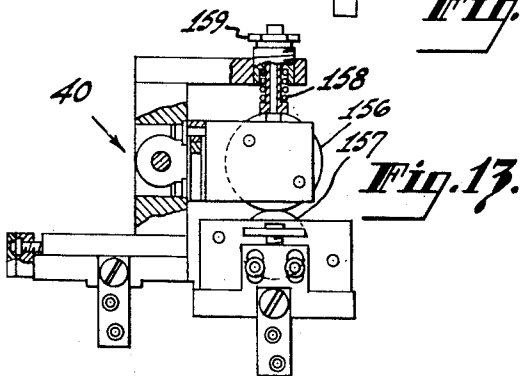
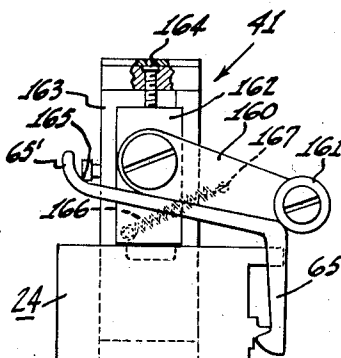
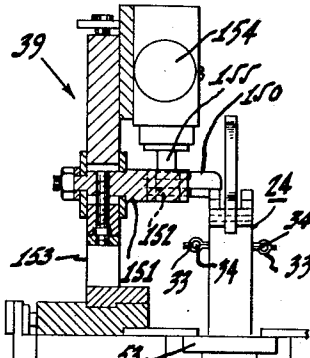
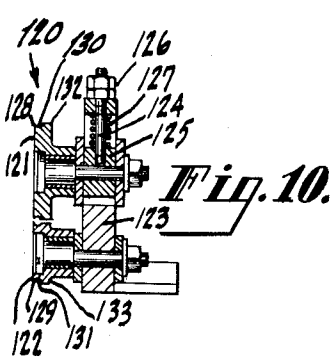
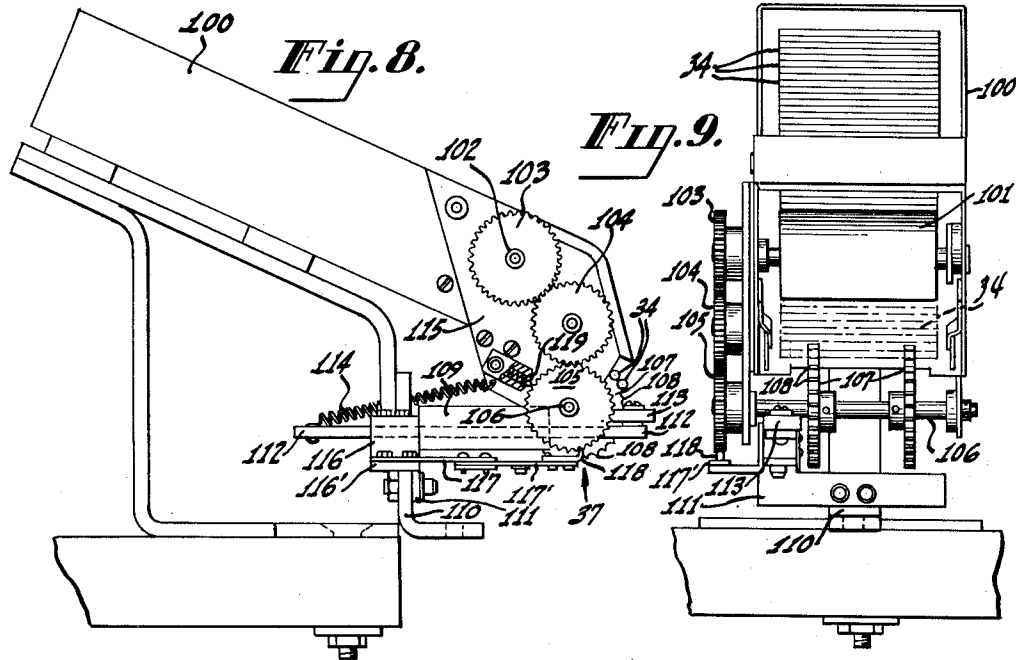
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AUTOMATIC ELECTRODE STRUCTURE ASSEMBLING MEANS

Filed May 29, 1950

3 Sheets-Sheet 3



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## UNITED STATES PATENT OFFICE

2,600,076

AUTOMATIC ELECTRODE STRUCTURE  
ASSEMBLING MEANSThomas H. Schelling, Lancaster, Pa., assignor to  
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Application May 29, 1950, Serial No. 165,041

14 Claims. (Cl. 219—4)

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One embodiment of this invention relates to apparatus for automatically assembling electron discharge devices and more particularly, though not exclusively, to apparatus for automatically assembling and connecting the elements forming the unitary sub-assembly of a cathode ray tube commonly referred to as the electron gun structure.

One conventional gun structure utilized in cathode ray tubes comprises a cathode which is the source of a beam of electrons. A control grid is used to density modulate the electron beam. A second or screen grid accelerates the electron beam. An anode is also provided which further accelerates the beam of electrons and together with the second grid provides preliminary focusing of the beam. The two grids and the anode are substantially cylindrical and each is provided with radially extending alined ears. Insulators in the form of ceramic rods interconnect the alined ears and rigidly connect the two grids and anode in accurately spaced array. The cathode is mounted coaxially within the control grid and welded thereto forming a cathode-grid sub-assembly.

Heretofore, the gun structure was assembled by hand. This operation required a large number of operators and equipment for them. This, in turn, was extremely costly in the amount of space and labor required. Furthermore, the number of defective parts which had to be rejected represented a substantial per cent of the total manufactured and was an important factor in the cost of the completed gun structure.

Therefore, a principal object of this invention is the provision of apparatus for automatically alining and assembling parts of an electron discharge device.

A further object is the provision of such apparatus for automatically alining and assembling the gun structure of a cathode ray tube.

Another object is the provision of such apparatus which automatically alines and welds the component parts of the gun structure and ejects the assembled gun structure.

Other objects include the provision of a novel carrier for receiving the elements or parts of the gun structure; means for opening and closing the ears of the two grids and anode; means for actuating the welding mechanism; and means for ejecting the completed assembly. Still other objects will appear as the nature of this invention is more fully understood.

In accordance with one embodiment of this invention an endless chain is provided which travels between the rails of a guide track. Carriers or assembly members are carried by the chain along the rails. Each carrier has compartments therein for the cathode-grid assembly, second grid and anode which are placed there-

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in manually or by other suitable means. The ears of the cathode-grid assembly, second grid and anode extend laterally outward of the carrier and are clamped in place between the carrier receiver and cover. As the loaded carriers travel along the rails the following operations are automatically performed. The ears are opened or spread apart. Then a ceramic rod is fed between the ears on each side of the carrier. The ceramic rods are then alined and the ears closed or pinched together to lock the same. Welders are actuated through switch means by cam surfaces on the carriers which weld the ears to complete the assembly of the gun structure. The gun structure is then loosened in the carrier and finally ejected therefrom and the carriers are returned to the loading station.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims. The invention itself will best be understood by reference to the following description taken in connection with the accompanying drawing in which:

Figure 1 is a plan view of an apparatus constructed in accordance with my invention;

Figure 2 is a sectional view along the line 2—2 of Figure 1;

Figure 3 is a plan view of the assembly member or carrier shown in Figure 2 with the cover removed;

Figure 4 is a perspective view partially broken away for convenience showing the work pieces to be assembled positioned in the assembly member or carrier;

Figure 5 is a sectional view through the line 5—5 of Figure 2;

Figure 6 is a plan view of the spreading prongs, partially broken away, about to engage the work;

Figure 7 is an elevational view partially in section of one of the spreading prongs;

Figure 8 is a sectional view through the line 8—8 of Figure 1 showing one of the feed hoppers in side elevation;

Figure 9 is a front elevational view of the hopper shown in Figure 8;

Figure 10 is a sectional view along the line 10—10 of Figure 1;

Figure 11 is a plan view of the alining means;

Figure 12 is an elevational view partially in section of one of the welding actuators;

Figure 13 is an elevational view partially in section of one set of welding electrodes;

Figure 14 is an elevational view of the carrier opening means;

Figure 15 is a sectional view through the line 15—15 of Figure 1;

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Figure 16 is a plan view of the ejector means; and

Figure 17 is a perspective view of an electron gun assembly which the apparatus illustrated is specifically designed to assemble.

Referring now to the drawing and to Figure 1, in particular, it will be seen that the apparatus is mounted on a suitable base 20 which supports guide rails 21, endless type chain 22, and sprockets 23 (only one being shown) driven by a motor (not shown). Assembly member or carrier 24, of which there may be one or more as desired, is propelled by chain 22 and may be connected thereto as will be pointed out. These form essentially the means provided for transporting the members to be assembled through the apparatus.

It may be well to state here that in the present illustrative disclosure, the apparatus is shown as employed for assembling the parts of an electron gun; that is, an electron gun the members of which are provided with ears that are interconnected by ceramic insulating rods.

While the invention finds particular applicability to this use, it is to be understood that the present disclosure is by way of exemplification only. In the present instance, the apparatus is constructed to assemble the electrodes or members of an electron gun of the character just described. It is, of course, obvious that the apparatus may be employed to assemble electrode structures other than of the type here described.

The electron gun structure herein referred to comprises, Figure 17, a cathode-grid assembly 25 which includes a cathode 26 insulated and supported from control grid 27 having opposed outwardly extending portions forming ears 28 on each side. Screen grid 29 follows next and also is provided with opposed outwardly extending portions or ears 30. Screen grid 29 in this instance is also provided with an outwardly flaring collar 31. Next is provided an anode 32 having a similar cylindrical shape and also having opposed outwardly extending portions forming ears 33. These members, cathode-grid 25, screen grid 28 and anode 32 are rigidly held in insulated accurately spaced relation by ceramic rods 34 which extend on each side between the aligned sets of opposed ears. The ears are closed or locked around the rods and welded in place to complete the assembly insofar as the present apparatus is concerned.

Members 25, 28 and 32 are manually loaded into assembly member or carrier 24 with ears 28, 30 and 33 extending laterally outward of the carrier and aligned on each side. The members are carried by the carrier along rails 21 past prongs 35, 35' which constitute a preferred means for separating or spreading the opposed ears of each of the members. The carrier in its travel then passes between a pair of hoppers 36, 36' and engages feed actuators 37, 37'; one being associated with each of the feed hoppers 36, 36' which constitute the means for feeding connecting members or rods 34 into place between the opposed sets of aligned ears.

At 38 and 38' is shown the preferred means for aligning connecting members or rods 34 with respect to the other members of the electron gun and also closing or locking the opposed ears.

Assembly member or carrier 24 next comes into the welding position where each of the opposed ears 28, 30 and 33 are connected by welding the same. Preferably, the ears on one side of the electron gun are welded and then the

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ears on the other side since this has proved desirable from the standpoint of avoiding deformation of gun structure during the welding operation. However, it is obvious that, if desired, the ears on both sides may be welded simultaneously. As will be more fully pointed out welding actuator 39 forms the switch means for contacting cam surfaces on assembly member or carrier 24 to actuate the associated welder 40 as each set of opposed ears 28, 30 and 33, on that side in turn passes through the welding position between the welding electrodes. Welding actuator 39' and welder 40' perform the same operation with respect to the ears on the other side of the electron gun.

At 41 is shown the preferred means for opening assembly member or carrier 24 and throwing back the cover and includes a pivotally mounted lever which engages an arm of a cover latch as will be more fully pointed out. The assembled electron gun is then loosened in the assembly member or carrier 24 and ejected therefrom by means of ejector 42 when the same is actuated by carrier 24. The carrier is then returned to the initial loading position.

Referring now to Figures 2, 3, 4 and 5, assembly member or carrier 24 is seen to comprise receiver 50 and cover 51 hingedly connected to the receiver by pin 52. Receiver 50 has a base 53, side walls 54, 55 and rear end wall 56. A block 53' connected to base 53 provides a convenient connection to the roller link chain. The front end of receiver 50 is conveniently left open as will be seen. Both of the side walls 54, 55 have accurately located apertures or slots 57 and 58 formed therein and closed or partially closed by retainers 59 and 60 respectively. Partitions or spacers 61, 62 are each mounted between the side walls and extend transversely thereof. Each of the partitions or spacers 61, 62 is provided with projecting tabs 62 (Figure 5) each of which seats loosely in the corresponding slots 57, 58. Slots 57, 58 are sufficiently larger in the horizontal or longitudinal dimension of carrier 24, arrow 64, so as to permit substantial longitudinal movement of partitions or spacers 61, 62 with respect to the carrier.

Extending between side walls 54, 55 and supported therefrom is a platform or support member 63 having a projecting nose portion 64. A latch 65, pivoted at 66 engages nose portion 64 in its closed position. Coil spring 67, anchored at 68 to cover 51 and to latch 65 at 69 serves to normally retain the latch in its closed position. Retainer 70 is in the form of a post having a camming surface at 71. Retainer 70 is connected to support 72 having a pin 73 extending through elongated aperture 74 formed in platform 63 which forms a slideway for support 72 and its pin 73. A spring 75 is connected to pin 73 and anchored at 76 and serves to urge pin 73, support 72 and retainer 70 inwardly toward partitions 61, 62.

Stops 77 are set in recesses formed in each of the sidewalls 54, 55 adjacent the rear thereof. The stops project above and inwardly of the sidewalls as shown. When members 27, 29 and 32 are seated in the extensible compartments formed in carrier 24, retainer 70 engages the end of anode member 32 and urges it rearwardly against partition 62. Partition 62 is, in turn, thereby urged against screen grid member 29. Member 29 is then seen to be urged against partition 61 which, in turn, presses against cathode-grid assembly or member 27. Member

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27 is finally brought firmly against stops 77. It is apparent, therefore, that the members to be assembled are accurately spaced in the extensible compartments formed between stops 77, partitions 61, 62 and retainer 70.

Locator 78 is positioned so as to rest on side walls 54, 55 and extend outwardly thereof and serves to aline ceramic rods 34 when, as will be seen, they are forced to their rear-most position between ears 28, 30 and 33.

As most clearly seen in Figure 2, when cover latch 65 engages portion 64, sufficient clearance remains between side portions 79 of cover 51 and side walls 54, 55 as indicated at 80, to permit the outwardly extending portions of the members being assembled to pass therebetween and be clamped between them.

On the upper surface of cover 51, as viewed in Figure 5, are provided cams 81, 81' which as will be seen, are engaged by the welding actuator. As is apparent in Figure 5 there are two parallel rows of cams on the embodiment being described, each cam corresponding to one of the portions to be welded.

Referring now to Figures 6 and 7, it is seen that prongs 35, 35' are each adjustably mounted. As clearly shown, prong 35 is supported from support member 90 which by means of screw 91 is adjustable horizontally toward and away from the path of carrier 24. Support member 90 is in turn supported from member 92 which is adjustably mounted for vertical movement on support bracket 93 by screw 94. When properly located by adjusting screws 91, 94, prong 35 is positioned to pass between each of the opposed ears 33, 30 and 28 (Figure 6) and spread them apart as carrier 24 passes. Prong 35' is similarly mounted on the opposite side of rails 21.

Feed hoppers 36, 36' one of which is shown in detail in Figures 8 and 9, are each identical but diametrically opposite. Chute 100 forms a receptacle for ceramic rods 34 and have a rotatably mounted roller 101 which permits only one layer of ceramic rods to pass below the same between it and the floor of chute 100. Roller 101 is mounted on shaft 102 mounted in bushings in the side walls of the chute. As shown in Figure 8, one end of shaft 102 extends through the side walls of chute 100. Gear 103 is connected to the projecting end of shaft 102 and is rotatable therewith. Gear wheel 104 meshes with gear wheel 103 and also with gear wheel 105; gear wheels 104, 105 also being rotatably mounted. Gear wheel 105 is mounted on shaft 106 which also carries feed wheels 107. Wheels 107 have teeth 108 which are in alinement and which are shaped to receive and carry ceramic rods 34. One of the ceramic rods is picked up and carried by each pair of alined teeth 108 on wheels 107. It will be seen that as wheels 107 are rotated in the clockwise direction of Figure 8, the ceramic rods are picked up one by one and carried over into position to be dropped between the opened ears projecting on each side of carrier 24.

To actuate the feed mechanism a slide box 109 is supported from chute supporting member 110 by means of bracket 111. Shaft 112 is slidably mounted in slide box 109 and extends there-through. Roller 113 is rotatably mounted on the front end of shaft 112. Spring 114 is connected to the other end of shaft 112 and also to plate 115 supported on the side wall of chute 110. Spring 114 continuously urges shaft 112 and roller 113 to their forward position. Flanged bracket 116 is connected to shaft 112 and by abutting the

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rear end of slide box 109 limits the forward travel of shaft 112. A strap 117 is connected to the lower laterally extending flange 116' of bracket 116 and is positioned in alinement with gear wheel 105. At least a portion 117' of strap 117 is of spring steel and carries a dog 118 which engages the teeth of gear wheel 105. Spring loaded detent 119 also engages gear wheel 105 and prevents accidental rotation of the same.

As pointed out previously, the feed actuator 37 engages the side wall of carrier 24 as the latter passes along rails 21 and is cammed rearward or away from carrier 24. The rearward travel of the feed actuator which includes rollers 113 and shaft 116 is adjusted so that feed wheels 107 will be rotated a single pitch when gear wheel 105 is rotated by dog 118. The rearward movement of dog 118 rotates gear wheel 105 as pointed out. Since gear wheels 105, 104 and 103 are in mesh, this motion is transmitted to shaft 102 and roller 101.

It is, therefore, apparent that as carrier 24 passes between hoppers 36, 36' a ceramic rod 34 is fed between the ears which extend outwardly on each side of the carrier. The carrier then passes between members 38, 38' which function to aline the ceramic rods and close the ears. The closing and locking means is seen to include two sets of rollers, each set including a roller assembly 120 on each side of the rail 21. The arrangement of each roller assembly 120 is substantially the same and, therefore, only one is shown in Figure 10 and will be described. Upper and lower rollers 121, 122 are rotatably mounted on support 123 which is rigidly affixed to base 20. The upper portion of support 123 has a slot or slideway in which upper roller 121 is adjustably mounted. Threaded screw 124 is in threaded engagement with member 125 which is, in turn, connected to roller 121. Lock nuts 126 permit adjustment of the effective length of screw 124. Spring 127 is compressed between the top portion of support 123 and member 125 and urges the latter as well as upper roller 121 downwardly toward roller 122. Rollers 121 and 122 have alined peripheral rims 128, 129, grooves 130, 131 and lands 132, 133. As shown in Figure 10, lands 132, 133 are spaced to just permit the thickness of the outer flat portions of ears 28, 30 and 33 (Figure 17) to pass therebetween. Grooves 130, 131 permit the curved portions of the ears with the ceramic rods 34 between them to pass. Rim portions 128, 129 are also spaced just far enough to allow the double thickness of metal to pass between and engage the ears just inwardly of the curved portions.

As pointed out above, the remaining roller assemblies 120', 134, 134' are substantially identical. The spacing between rollers 121 and 122 of roller assemblies 120 and 120' are identical. Similarly the spacing between the upper and lower rollers 121, 122 of roller assemblies 134, 134' are also identical. However, I preferably vary the spacing of the rollers of one set of roller assemblies from the other set of roller assemblies. Thus, the minimum spacing between the rollers of roller assemblies 120, 121' is set so that the ears will just hold the ceramic rods. This permits alinement or location of the same as will be seen. On the other hand, the spacing between the rollers of assemblies 134, 134' is set so that the opposed ears are squeezed together sufficiently to lock them without damaging the ceramic rods.

In between the two sets of rollers, carrier 24

engages the ceramic rod locating and alining means 140, 140', each of which is mounted on base 20 on opposite sides of rail 21. Alining means 140, 140' are identical in construction with the exception that they are diametrically opposite. As seen in Figure 11, alining means 140 includes a slide box 141 with shaft 142 slidably mounted therein. Spring 143, connected to one end of shaft 142 and slide box 141, serves to bias shaft 142 and urge the same toward its forward position. At the other or forward end of shaft 142 is rotatably mounted roller 144. Aliner 145 is in the form of a short rod connected to block 146 which is pivotally connected to bracket 147 by means of pin 148. Bracket 147 is connected to and carried by shaft 142. Also mounted on shaft 142 is spring 149 which biases block 146 against an upwardly projecting portion 147' of bracket 147.

With shaft 142 in its forward position, aliner 145 is positioned to engage the leading end of one of the ceramic rods 34. When so engaged, the ceramic rod is pushed rearward between the opposed ears 28, 30 and 33 until the trailing end of the ceramic rod comes in contact with locator 78. When the rearward motion of the ceramic rod with respect to the ears is thus arrested, the forward motion of carrier 24 is then imparted to the aliner 147 and block 146 is pivoted against spring 149. When carrier 24 comes in contact with roller 144, the roller and shaft 142 are cammed rearward carrying aliner 145 out of the path of rods 34 and the projecting ears.

As pointed out above, carrier 24 then passes between the second set of roller assemblies 134, 134'. The ears are then in readiness for welding and the carrier then passes in succession between welding actuator 39, welder 40 and welding actuator 39', welder 40'. The two welding actuators and welders are substantially identical but oppositely disposed along rail 21.

Referring now to Figures 12 and 13, welding actuator 39 is seen to comprise an L-shaped lever 150 having a depending portion for engaging cams 81 on carrier 24. Lever 150 is pivotally connected to support 151 by means of pin 152. As shown in Figure 12, support 151 is mounted on bracket 153 in such manner as to permit horizontal and vertical adjustment thereof. Micro-switch 154 is also adjustably supported on bracket 153. Switch button or lever 155 is spring biased and continually urged against a portion of L-shaped lever 150.

Welder 40 is seen to comprise a pair of wheel-type welding electrodes 156, 157, each of which is adjustably mounted so as to properly engage the work which passes therebetween. One of the wheel-type welding electrodes, as for example, electrode 156 is movably mounted and biased by a spring 158, the tension of which may be readily adjusted by nut 159. The mounting of the electrodes may be varied as desired. However, it is important that at least one of the electrodes be spring biased in such manner that the tension may be readily adjusted. Fluid cooling means may also be provided in order to avoid excessive heating.

Lever 150 is so positioned that it engages one of the cams 81 and actuates micro-switch 154 only when one of the outer projections of ears 28, 30 and 33 is passing between the welding electrodes. Since micro-switch 154 is connected in series between the source of welding power (not shown) and the electrodes closing of the switch serves to actuate the welding operation. As the carrier 24 passes between an actuator 39 and welder 40,

lever 150 is cammed upward by each of the cams 81. Thus, as shown in Figure 2, since there are three such cams, the welder is actuated three times and for a period corresponding to the dwell of each of the cams. It is apparent from Figures 2 and 17 that the length of the dwell of each of the cam's surfaces is in relation to the length of the corresponding projecting portions to be welded. Preferably the dwell of each cam is of such length that the leading and trailing edges of the portions to be welded are not welded thereby avoiding the spattering of metal.

Actuator 39' and welder 40' are similar to the actuator and welder just described and the same operation takes place with respect to projecting portions on the opposed side of carrier 24.

The carrier next passes the cover opening means 41. As most clearly seen in Figure 14, the opening means includes a pivotally mounted arm 160 carrying a rotatably mounted roller 161 at one end. Arm 160 is rotatably mounted on slide 162 which is, in turn, mounted in support 163. Adjusting screws 164, 165 threaded through support 163 permit adjustment of slide 162 so as to accurately position roller 161 in the path of the arm of latch 65. Spring 166 is anchored at one end to slide 162 and at the other end to arm 160 and bias the arm downward so as to bring stop pin 167 against the side of support 163 and thereby limit the downward travel of roller 161.

As shown latch 65 has a tang portion 65' which is bent upwardly. As carrier 24 passes opening means 41, roller 161 engages latch 65 and depresses the elongated portion thereof. Latch 65 pivots about its pin 66 and clears nose portion 64 (Figure 2). As the carrier continues in motion, roller 161 comes up against tang portion 65'. Since cover 51 is pivotally mounted, it is thrown open when the tang portion 65' comes in contact with roller 161. It is to be noted that spring 166 is sufficiently tensioned to prevent roller 161 from riding up over the tang portion which escapes by passing under roller 161 as the cover is thrown open.

The means for ejecting the assembled work is indicated at 42 in Figure 1. In the embodiment shown, this is seen to include a pair of opposed extractors 170, 170', one of which is shown in Figure 15. As is apparent from Figure 1, each of the extractors has an actuator which comprises roller 171 rotatably mounted on shaft 172. Shaft 172 is slidably mounted in slide 173 and biased by spring 174 connected thereto and to slide 173. Housing 175 is bored to receive a pair of slide blocks 176 to each of which is connected a depending pin 177. Plate 178 is rigidly connected to each of the slide blocks 176 and has an aperture through which rod 179 extends. As shown, rod 179 extends above plate 177 and has a head 180 at its upper end. Spring 181 is compressed between head 179 and plate 178 which is thereby biased downwardly. The side of plate 178 toward rail 21 overhangs housing 175 and has connected thereto extractor lip 182 by means of connector 183. Bent-tail dog 184 is L-shaped in cross section and pivots at 185. As shown in Figure 15, one end of dog 184 extends below pins 177; both of which being aligned as viewed. The other arm of dog 184 is joined to the end of shaft 172 by means of connector 186.

As clearly apparent extractor lip 182 is positioned above roller 171 thus being free to travel upward when actuated. When carrier 24 passes between the extractors 170, 170', they are both actuated as follows. Roller 171 engages the side of

carrier 24 and together with shaft 172 is cammed rearward or away from rail 21. Connector 186 being connected to shaft 172 moves to the rear with the same and causes dog 184 to rotate about its pivot. This forces pins 177, housing 176 and plate 178 upward compressing spring 181. Extractor lip 182 is normally positioned to underlie the projecting ears 28, 30 and 33 when roller 171 contacts the side of carrier 24. Thus, when extractor lip 182 travels upward with plate 178, the lip comes in contact with the projecting ears and raises the assembled work from its seat in the carrier. Referring once again to Figure 2, the extractor lips of each of the extractors 170, 170' travel upwardly a sufficient distance to raise the assembled work above cam 71 on retainer 70 (Figure 2). As was previously pointed out, retainer 70 is biased by spring 75 and therefore moves back toward its normal position as soon as the work is raised above cam 71. Therefore, when carrier 24 progresses beyond the extractors it is impossible for the work to fall back into its seat in the carrier and merely rest loosely thereon.

Referring to Figure 16, ejector 190 comprises jet 191 connected through air valve 192 to a source of compressed air (not shown). The ejector actuator comprises a lever 193 pivotally mounted at 194 and carrying roller 195 at one end. The other end of lever 193 bears against the spring loaded stem of air valve 192. Spring 196 is connected to the end of lever 193 and biases the same against the valve stem. The tension of spring 196 can be readily adjusted so that very little additional force is required to open valve 192. Roller 195 is positioned in the path of carrier 24 and so as to be engaged by a side thereof as the carrier passes. When so engaged, lever 193 is pivoted and opens air valve 192. The resulting air jet blows the assembled work piece into a cooling receptacle (not shown).

It is apparent from the foregoing that a novel apparatus for automatically assembling electrode structures has been provided which is highly efficient in operation and which materially reduces the cost of the assembled structure. It is further apparent that variations may be made in the apparatus shown as illustrative of the invention which will be within the scope of the appended claims.

#### I claim:

1. Apparatus for automatically assembling an electron gun having a plurality of members with ears joined by insulating rods, comprising, in combination, means for carrying said members in spaced relation along a predetermined path with the corresponding ears of said members alined, means responsive to said first mentioned means for feeding said rods to said ears, and means for locking said ears around said rods.

2. Apparatus for automatically assembling an electron gun having a plurality of members with ears joined by elongated insulating rods, comprising, in combination, carrier means including a carrier having a compartment for each of said members and carrying the same with the ears thereof alined and extending outwardly of the carrier, means actuated by said carrier means for feeding rods to said outwardly extending ears, means for alining said rods, and means actuated by said carrier for welding said ears around said rods.

3. Apparatus for automatically assembling an electrode structure having a plurality of members with ears joined by elongated rods, com-

prising, in combination, carrier means for transporting said members along a predetermined path including a carrier having a compartment for each of said members and carrying the same with the ears thereof alined and extending outwardly of each side of the carrier, means actuated by said carrier means for feeding rods to said outwardly extending ears, means including opposed rollers in the path of said ears for closing the same, and means actuated by said carrier for welding said ears.

4. Apparatus for automatically assembling an electrode structure having a plurality of members with ears joined by elongated rods, comprising, in combination, carrier means for transporting said members along a predetermined path including a carrier having a compartment for each of said members and carrying the same with the ears thereof alined and extending outwardly of the sides of the carrier, means for spreading said ears including a prong in the path of the ears on each side of said carrier, feed means including a retractable actuator on each side of said path and extending into the path of said carrier, means for alining said rods including a pivotally mounted aliner normally in the path of said ears and means extending into the path of said carrier for withdrawing said aliner from the path of said ears when actuated by said carrier, a pair of opposed rotatably mounted rollers on each side of said path, the path of said ears extending between the opposed rollers of one of said pairs, and means actuated by said carrier for welding said ears.

5. Apparatus for automatically assembling an electrode structure having a plurality of members with ears joined by elongated rods, comprising, in combination, carrier means for transporting said members along a predetermined path including a carrier having a compartment for each of said members and carrying the same with the ears thereof alined and extending outwardly of the sides of the carrier, a cover pivotally connected to said carrier, means for latching said cover including an elongated pivotally mounted latch arm, means for spreading said ears including a prong in the path of the ears on each side of said carrier, feed means including a retractable actuator on each side of said path and extending into the path of said carrier, means for alining said rods including a pivotally mounted aliner normally in the path of said ears and means extending into the path of said carrier for withdrawing said aliner from the path of said ears when actuated by said carrier, a pair of opposed rotatably mounted rollers on each side of said path, the path of said ears extending between the opposed rollers of one of said pairs, means actuated by said carrier for welding said ears, means in the path of said latch arm for pivoting the same and opening said cover, means actuated by said carrier means for unseating the assembled structure, and means actuated by said carrier means for ejecting said structure from said carrier.

6. An automatic assembling apparatus, comprising a carrier for receiving members having portions to be welded with said portions extending outwardly of the carrier, means for transporting said carrier along a predetermined path, means for welding said portions including an actuating lever and a switch actuated by said lever, said carrier having cams thereon

one for each of said portions, said actuating lever engaging one of said cams and actuating said switch when one of said portions is in welding position.

7. As an article of manufacture, a carrier, comprising a receiver, a cover hingedly connected to said receiver, at least one partition extending transversely of said receiver and movable longitudinally with respect to the same, retaining means also longitudinally movable in said receiver, resilient means urging said retaining means toward said partition, said partition and said retaining means forming extensible compartments in said receiver, and cam surfaces at least one for each of said compartments on said carrier.

8. As an article of manufacture, a carrier for receiving members in spaced relation having portions to be welded, comprising a receiver having a pair of side walls, a cover hingedly connected to said receiver and having side portions opposed to and spaced from said side walls, a pair of slots one formed in each of side walls, a partition having projecting tabs one sealed in each of said slots, said slots being substantially wider than the thickness of said tabs in the longitudinal direction of said carrier whereby said partition is longitudinally movable with respect to said carrier, a movably mounted retainer movable toward said partition and mounted between said side walls intermediate one end thereof and said partition, resilient means urging said retainer toward said partition, means intermediate the other end of said side walls and said partition, said last mentioned means, partition and retainer forming extensible compartments for receiving said members with the portions to be welded extending outwardly of the receiver between the side walls thereof and the side portions of said cover, and cam surfaces on said cover one corresponding to each of said portions to be welded.

9. As an article of manufacture, a carrier for receiving members in spaced relation having outwardly extending portions, comprising a receiver having a pair of side walls, a cover hingedly connected to said receiver, a partition extending transversely of said side walls and movably mounted with respect to the same, retaining means also movably mounted between said side walls, resilient means urging said retaining means toward said partition, and said partition and said retaining means forming extensible compartments for receiving said members with said portions thereof extending outwardly of the receiver.

10. As an article of manufacture, a carrier for receiving members in spaced relation having outwardly extending portions, comprising a receiver having a pair of side walls, a cover hingedly connected to said receiver, a partition extending transversely of said side walls and movably mounted with respect to the same, retaining means also movably mounted between said side walls, resilient means urging said retaining means toward said partition, said partition and said retaining means forming extensible compartments for receiving said members with said portions thereof extending outwardly of the receiver, and a locator extending outwardly of said carrier between said cover and receiver.

11. As an article of manufacture, a carrier for receiving members in spaced relation having outwardly extending portions, comprising a receiver having a pair of side walls, a cover hingedly con-

nected to said receiver, an elongated latch arm pivotally connected to said cover and having a portion extending transversely thereof for engaging an automatic opening device, a partition extending transversely of said side walls and movably mounted with respect to the same, retaining means also movably mounted between said side walls, resilient means urging said retaining means toward said partition, and said partition and said retaining means forming extensible compartments for receiving said members with said portions thereof extending outwardly of the receiver.

12. An automatic assembling machine, comprising an assembly member, means for moving said assembly member along a predetermined path, a feed hopper along said path adapted to feed elongated rods to said assembly member singly, said assembly member being adapted to carry members to be assembled into a unitary structure having outwardly extending aligned ears for receiving said rods, means in the path of said assembly member for aligning said rods, said means being retractably mounted and movable out of the path when engaged by said assembly member, welding means responsive to said assembly member for welding said ears, and means responsive to said assembly for unseating the assembled unitary structure.

13. An automatic assembling machine, comprising an assembly member, means for moving said assembly member along a predetermined path, a feed hopper along said path adapted to feed elongated rods to said assembly member singly, said assembly member being adapted to carry members to be assembled into a unitary structure having outwardly extending aligned ears for receiving said rods, means in the path of said assembly member for aligning said rods, said means being retractably mounted and movable out of the path when engaged by said assembly member, a pair of opposed rollers in the path of said ears, one of said rollers being movably mounted, resilient means urging said movable roller toward the other roller, the path of said ears extending between said opposed rollers, welding means responsive to said assembly member for welding said ears, and means responsive to said assembly for unseating the assembled unitary structure.

14. Apparatus for automatically assembling a plurality of members having projecting ears to be joined by elongated rods extending between the ears, comprising, in combination, carrier means including a carrier having compartments for each of said members and carrying the same along a predetermined path with the ears aligned and projecting outwardly of the carrier, means actuated by said carrier for feeding at least one rod into position between said projecting ears, means actuated by said carrier for connecting said ears around said rods and means for unseating the assembled structure, said last mentioned means further comprising an extractor lip normally adjacent the path of said ears and movable along a path which intercepts the path of said ears, a movably mounted shaft normally extending into the path of said carrier, resilient means urging said shaft into its normal position, and means connecting said shaft and said extractor lip for moving said lip when said shaft is moved out of its normal position.

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No references cited.