May 10, 1960 R. E. DEITRICK ET AL 2,935,962

TINNING APPARATUS

Filed Aug. 5, 1957 4 Sheets-Sheet 1

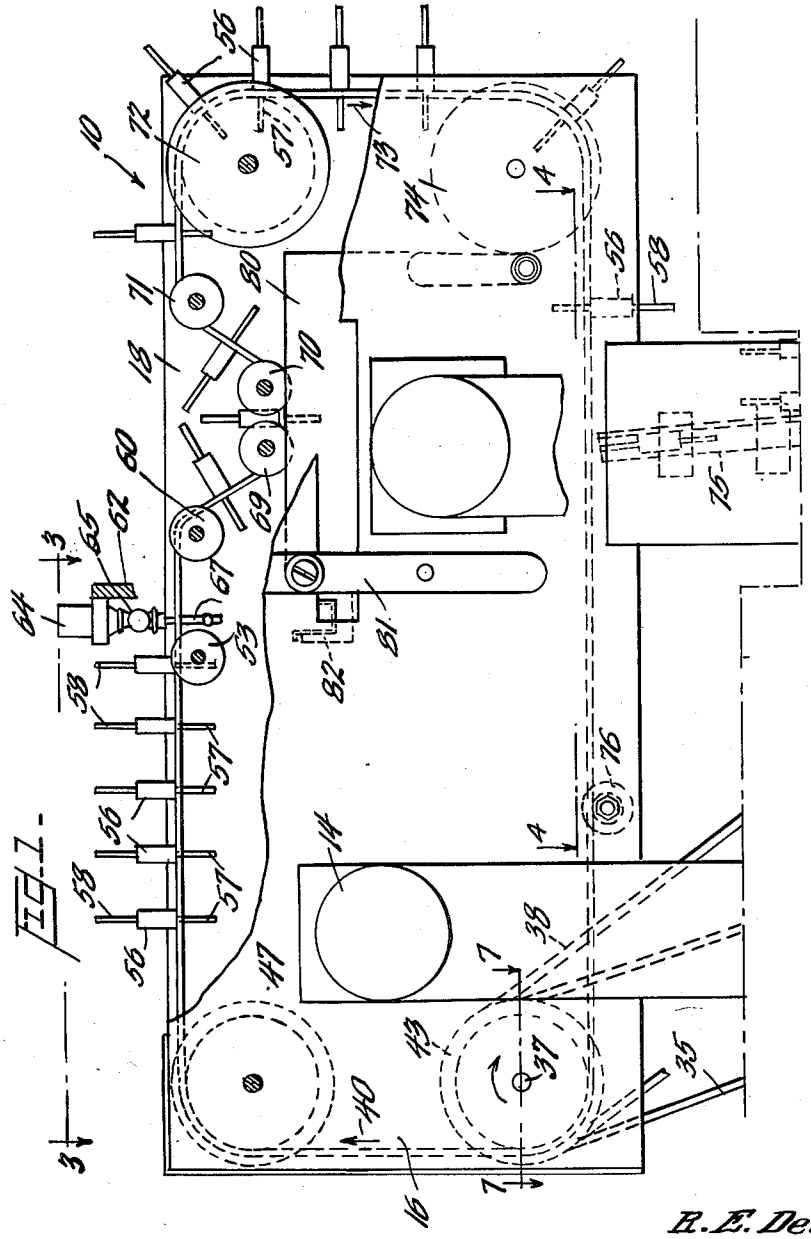


FIG. 1

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TINNING APPARATUS

Filed Aug. 5, 1957 4 Sheets-Sheet 2

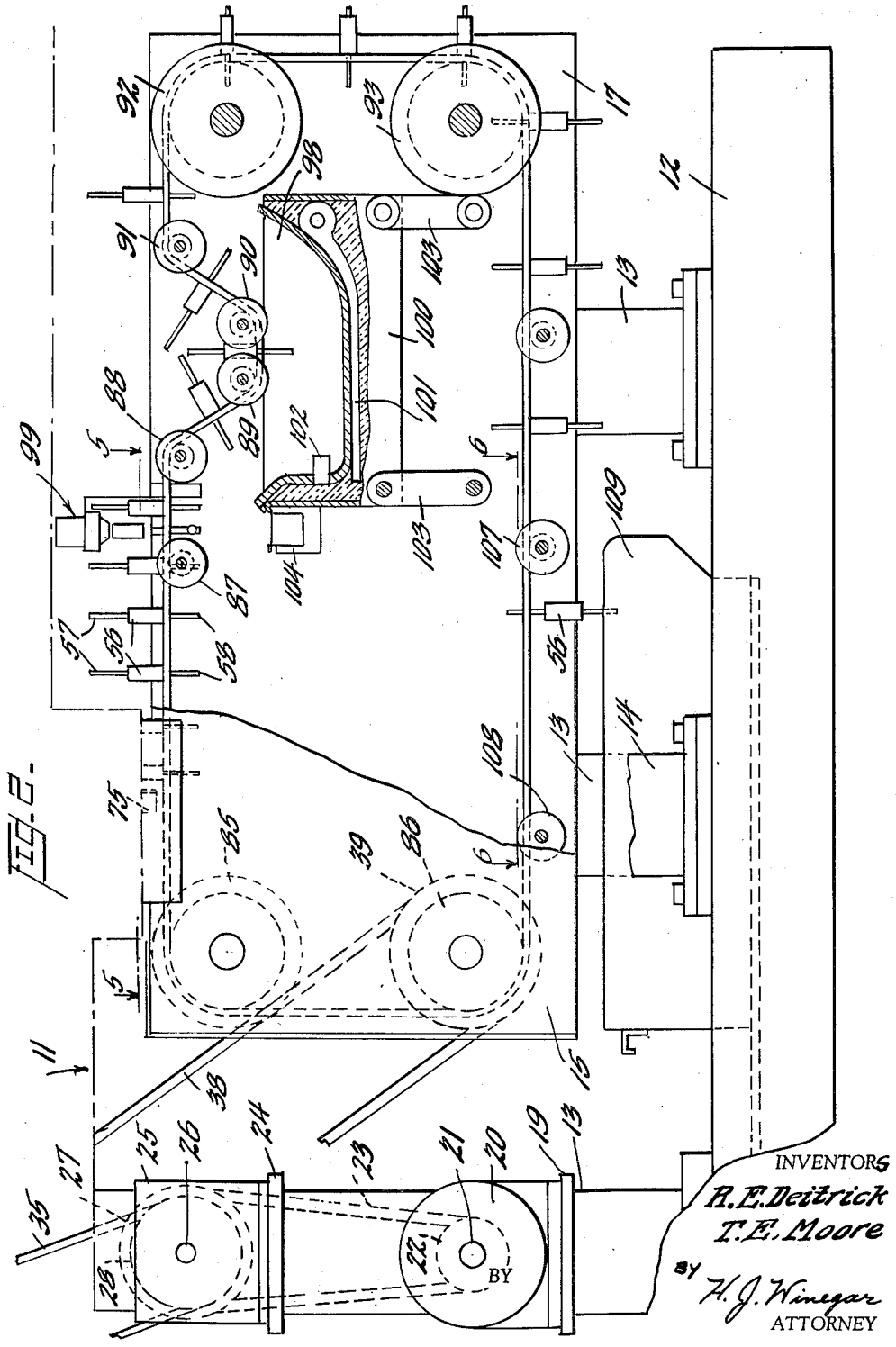


FIG. 2.

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TINNING APPARATUS

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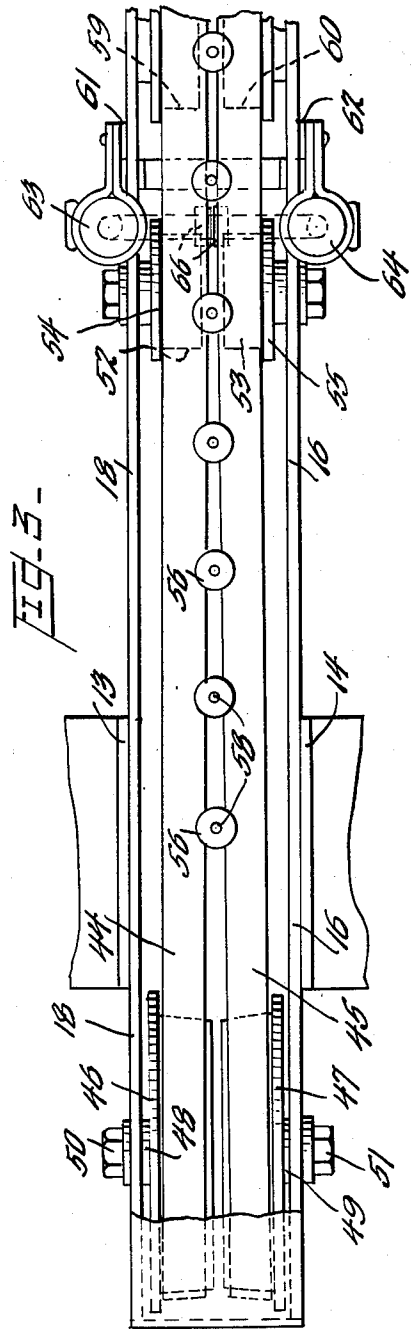


FIG. 3.

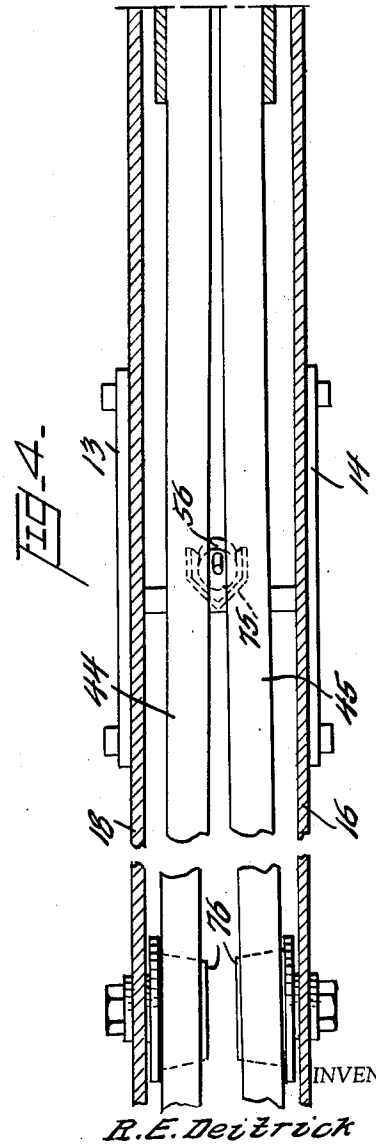


FIG. 4.

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TINNING APPARATUS

Filed Aug. 5, 1957 4 Sheets-Sheet 4

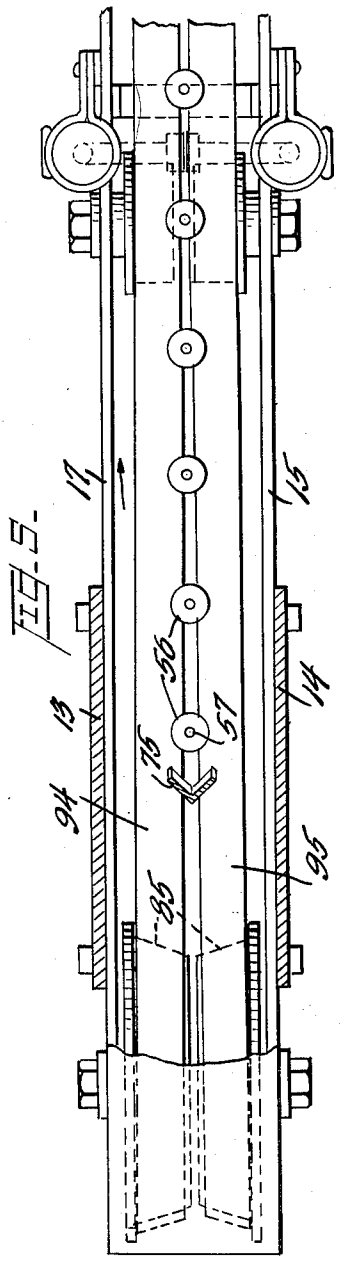


FIG-5.

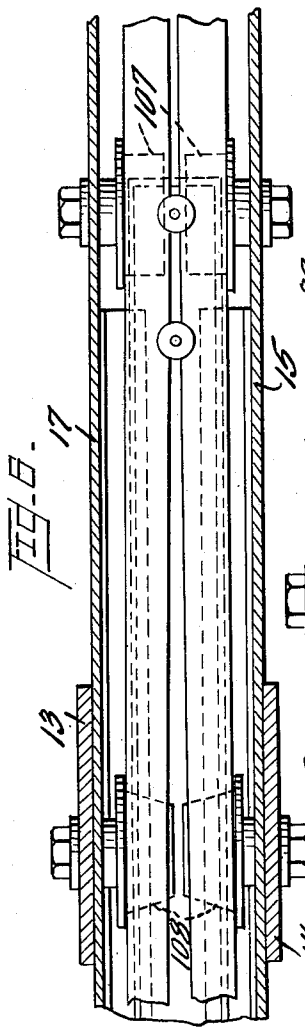


FIG-6.

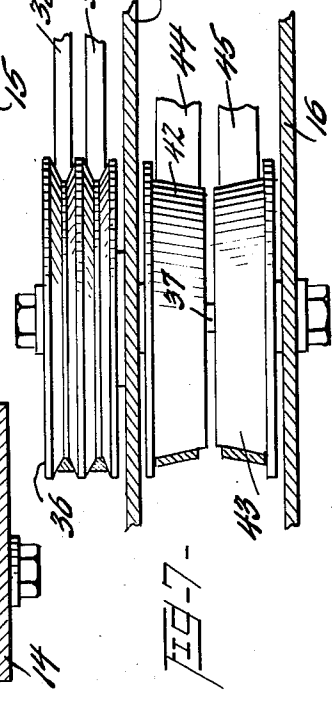


FIG-7.

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United States Patent Office 2,935,962 Patented May 10, 1960

2,935,962

TINNING APPARATUS

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Application August 5, 1957, Serial No. 676,166

4 Claims. (Cl. 118—74)

This invention relates to apparatus for coating articles, and more particularly to apparatus for tinning terminals extending from electrical components.

It is an object of the present invention to provide simple, novel, and efficient apparatus for coating articles.

Another object of the invention is to provide new and improved apparatus for tinning the terminals of electrical components.

A further object of the invention is to provide apparatus for expeditiously tinning terminals extending from opposite ends of electrical components.

Still another object of the invention is to provide novel apparatus for applying tin automatically to terminals projecting from opposite ends of small electrical components.

A coating apparatus illustrating certain features of the invention may comprise a pair of endless belts driven through predetermined courses and so guided in the courses that the edges of the pair of belts are held in edge-to-edge engagement. The belts are guided in close proximity to a bath of coating material while holding an article between them, and will carry a portion of the article into the bath of coating material.

A clear understanding of the invention may be had by reference to the following detailed description, when considered in conjunction with the accompanying drawings, wherein:

Figs. 1 and 2 when juxtaposed, show a side elevation partly broken away of an apparatus embodying the present invention;

Fig. 3 is a fragmentary plan view taken substantially along line 3—3 of Fig. 1;

Fig. 4 is a fragmentary horizontal sectional view taken substantially along line 4—4 of Fig. 1;

Fig. 5 is a fragmentary horizontal sectional view taken substantially along line 5—5 of Fig. 2;

Fig. 6 is a fragmentary horizontal section view taken along line 6—6 of Fig. 2; and

Fig. 7 is a fragmentary horizontal sectional view on an enlarged scale taken along line 7—7 of Fig. 1.

Referring now to the drawings, wherein like reference characters designate the same parts throughout the several views, the apparatus comprises an upper assembly 10 and a lower assembly 11. The lower assembly 11 includes a base 12 on which the entire apparatus is mounted. Extending upwardly from the base 12 are main support members 13 and 14. The members 13, three in number, are positioned at the rear of the base 12, and three members 14 are mounted at the front of the base 12. Only two of the members 14 are shown broken away in Fig. 2, but it will be understood that these members are aligned directly transversely of the base with the members 13. The members 14 serve to support a lower assembly front plate 15 and an upper assembly front plate 16. The members 13 support a lower assembly rear plate 17 and an upper assembly rear plate 18 with the front and rear plates supported in spaced apart relation. It should be noted that the upper assembly and lower assembly are not mounted directly one above the other but rather are staggered somewhat.

The left-hand pair of main support members 13 and 14 are suitably formed to receive a motor base 19 positioned between them. The base 19 has a motor 20 mounted upon it, a shaft 21 of which extends to the rear, as viewed in Fig. 2, through the main support member 13 and carries a pulley 22 for driving a V-belt 23. Also mounted between the support members 13 and 14 is a gear reducer platform 24 on which there is mounted a gear reducer 25, and a drive shaft 26 which has a pulley 27 mounted on it that receives the V-belt 23. The gear reducer 25 drives a pulley 28 which supplies driving power to various belts of the apparatus.

A V-belt 35 driven by the pulley 28 turns a pulley 36 positioned at the rear of the upper assembly rear plate 18. The pulley 36 is mounted on a shaft 37, which extends through both the upper assembly front and rear plates 16 and 18, respectively. The shaft 37 also carries another pulley 36 (Fig. 7) for driving a V-belt 38, which in turn drives a pulley 39 (Fig. 2).

Also mounted on the shaft 37 between the plates 16 and 18 are a pair of angularly faced, driving pulleys 42 and 43 (Fig. 7) over which pass a pair of endless belts 44 and 45. The belts 44 and 45 are driven in the direction indicated by the arrow 40 over a pair of angularly faced pulleys 46 and 47 (Fig. 3) mounted on shouldered stud shafts 48 and 49, respectively. The shafts 48 and 49 are fixed on the upper assembly front plate 16 and the upper assembly rear plate 18, respectively, by means of nuts 50 and 51. The pulleys 46 and 47 are mounted directly above the pulleys 42 and 43.

The belts 44 and 45, after passing over the pulleys 47 and 48, are directed to guide pulleys 52 and 53, which have annular shoulders 54 and 55, respectively. All of the guide pulleys for the belts 44 and 45 are mounted in the same manner as are the guide pulleys 46 and 47, some of the pulleys being smaller than the pulleys 46 and 47, as shown in the drawing. The belts 44 and 45 are urged toward each other by the shoulders 54 and 55. Electrical components, such as resistors 56 which have terminals 57 and 58 extending from opposite ends thereof, may be carried by the belts by placing the body of the resistors against the belts 44 and 45 in the position shown in Fig. 1 where the terminal 57 extends down between the two converging belts 44 and 45 and will be gripped and carried along by the belts. This face-to-face contact of the resistor body 56 with the surface of the belts 44 and 45 and the edge-to-edge gripping engagement of the terminal 57 by the belts 44 and 45 will firmly secure the resistor in a substantially perpendicular relationship with respect to the belts 44 and 45. The belts 44 and 45, after passing over the pulleys 52 and 53, are directed to similar pulleys 59 and 60.

Brackets 61 and 62 mounted on the upper assembly rear plate 18 and the upper assembly front plate 16, respectively, carry containers 63 and 64, respectively, holding a supply of fluxing compound. The fluxing compound is fed from the containers 63 and 64 under control of needle valves 65. Fluxing compound is fed from the containers through pipes 67 to felt-like pads 66 positioned in the path of the downwardly extending terminal 57 to wipe a coating of flux onto the terminal. The pulleys 42 and 43 and pulleys 46 and 47 have angular faces and are spaced apart a distance slightly greater than the distance the pulleys 52 and 53 and 59 and 60 are spaced apart. Thus the terminals 57 of a resistor 56 may be placed between the belts 44 and 45, and will be gripped by the belts as the belts move toward the pulleys 52 and 53 and will be firmly held by the belts.

After passing over the pulleys 59 and 60, the belts are directed downwardly and under two sets of pulleys

69 and 70, which are of the same configuration as the pulleys 59 and 60 and are spaced apart the same distance as the pulleys 59 and 60. The belts 44 and 45 are then directed upwardly over a set of pulleys 71, around a set of large pulleys 72 and then downwardly, as indicated by the arrow 73, to a set of large pulleys 74. The sets of pulleys 72 and 74 are larger than, but of the same general configuration as the set of pulleys 69 and 71. The pulleys 72 and 74 urge the belts 44 and 45 toward one another to grip the terminals 57 of the resistors 56 between them and carry the resistors 56 to a V-shaped chute 75. Just as the resistors 56 reach the chute 75, they are released from the grip of the belts 44 and 45 due to the action of the angularly faced rollers 76 positioned to the left (Fig. 4) of the chute 75. The angularly faced rollers 76 separate the belts sufficiently to cause the resistors to be discharged from the belts and to fall into the chute 75 which will direct them downwardly. The belts, after passing the rollers 76, continue to the pulleys 42 and 43, and will again follow the course previously described.

Directly below the sets of rollers 69 and 70, which are spaced far enough apart to permit the passage of resistors or other electrical components between the inner ends of their respective stud shafts, is a tank 80 for containing a supply of molten solder. The tank 80 is mounted on a bracket 81 positioned between the plates 16 and 18. The bracket 81 also serves to support a drip pan 82, which is directly below the pads 66 to catch any excess flux or overflow from tank 80 which might otherwise drip down into other portions of the apparatus.

In the lower assembly 11 there are provided a series of sets of pulleys 85, 86, 87, 88, 89, 90, 91, 92, and 93 which correspond to the sets of pulleys 42 and 43, 46 and 47, 52 and 53, 59 and 60, 69, 70, 71, 72 and 74. These pulleys serve to direct a pair of belts 94 and 95 in courses of substantially the same configuration as the courses of the belts 44 and 45 in the upper assembly 10. Pulleys 85 having angular faces spread the belts 94 and 95 apart in the region directly below the chute 75, whereby the terminal 57 of a resistor 56, which has been coated with tin in the upper assembly, will be permitted to drop between the belts 94 and 95, the resistor having been inverted in its passage around the pulleys 72 and 74.

In their passage from the set of pulleys 88 down and around the pulleys 89 and 90 and back up to the pulleys 91, the terminals 58 have flux applied to them by fluxing device 99 of exactly the same construction as the fluxing device described in connection with the upper assembly 10. The terminal 58 then will be dipped into a bath 98 of molten tin. The bath of molten tin 98 is carried in a suitable container 100, which is heated by a heating unit 101. The temperature of the molten solder in the bath 98 is controlled by a thermocouple 102 extending into the solder bath and connected by suitable wiring in a circuit which supplies current to the heating unit 101. The container 100 is mounted upon toggles 103, whereby it may be lowered from the position shown in Fig. 2 to facilitate the cleaning and refilling of the container. The container 100 has a drip pan 104 mounted thereon, which serves the same purpose in the lower assembly that the drip pan 82 serves in the upper assembly.

A resistor will thus be carried through the paths described and will have both of its terminals 57 and 58 tinned. The resistor will then be carried along after passing the set of pulleys 93 past sets of pulleys 106 and 107 and over a removable container 109. Above the removable container 109 there are provided angularly faced rollers 108, which separate the belts 94 and 95 to permit the resistor 56 to drop out of the grip of the belts into the container 109.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of the invention. Numerous other arrangements may be devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. Apparatus for tinning terminals of an electrical component having terminals extending from opposite ends of a body portion thereof, which apparatus comprises a tinning bath, a first pair of endless belts, drive means for said first pair of belts, means for guiding said first pair of belts in courses wherein they pass in close proximity to a bath of tinning material, means for holding said belts in edge-to-edge engagement to grip one terminal of an electrical component immediately adjacent to the body portion thereof so that one surface of said body portion coacts with supporting surfaces of said belts to maintain the main body portion in a position substantially perpendicular to said last mentioned surfaces of the belts with the extremity of the gripped terminal extending beyond the opposite surfaces of said belts whereby the extending terminal is tinned during movement of the component past the tinning bath, a first belt-separating means for urging said belts apart to discharge the component from the grip of said belts, a discharge chute adjacent to said first belt-separating means for directing the discharged components so that the untinned second terminals thereof extend downwardly, a second set of belts positioned to receive the untinned terminal therebetween in the same manner as the first pair of belts, a second tinning bath, drive means for said second set of belts, means for holding the edges of said second set of belts in edge-to-edge engagement to grip the second terminal in a manner similar to said first terminal, means for guiding said second pair of belts past the second tinning bath in which the second terminal is tinned, and a second belt-separating means for urging said second set of belts apart to discharge the terminal after said second terminal has been tinned.

2. Apparatus for tinning terminals of an electrical component having terminals extending from opposite ends of a central body portion, which apparatus comprises a tinning bath, a pair of endless belts, drive means for said belts, means for guiding said belts in courses wherein said belts pass in close proximity to the tinning bath, means for holding said belts in edge-to-edge gripping engagement with their corresponding broad surfaces in the same plane in each course to grip a terminal on the electrical component immediately adjacent to a flat surface on the central body portion thereof so that the said surface of the body portion coacts with broad surfaces of the belts to support and maintain the said body portion in a position substantially perpendicular to the broad surfaces of the belts, with the end portions of the gripped terminal extending beyond the opposite surfaces of the belt, whereby the terminal gripped by the belts is dipped into the tinning bath during the passage of the component past the bath, a flux applicator positioned in the path of the terminal immediately before the tinning bath for applying flux to the terminal, and means for urging said belts apart sufficiently to release the component from the grip of said belts.

3. Apparatus for tinning terminals of an electrical component having terminals extending from opposite ends of a central body portion, which apparatus comprises a first tinning bath, a first pair of endless belts of rectangular cross section, drive means for said first pair of belts, means for guiding the belts in a first course to receive electrical components, means for guiding the belts in a second course wherein said belts pass in close proximity to the tinning bath, means for holding said belts in edge-to-edge gripping engagement with corresponding flat surfaces thereof lying in a common plane in each course so as to grip a terminal of an electrical component immediately adjacent to the end on the central body portion thereof so that said end coacts with said corresponding coplanar surfaces of the belts to support and maintain the said body portion in a position substantially per-

pendicular to said last mentioned surfaces of the belts with the end portion of the gripped terminal extending beyond the opposite broad surfaces of the belts whereby the terminal gripped by the belts is dipped into the tinning bath during the passage of the component past the bath, means for guiding the belts in a third course to invert the component and orient the untinned terminal in a depending attitude, belt-separating means located along said third course for urging said belts apart to discharge the inverted component from the grip of said belts, a discharge chute adjacent to said first belt-separating means for directing the discharged component to a second set of belts positioned to receive the untinned terminal therebetween in the same manner as the first pair of belts, a second tinning bath, drive means for said second set of belts, means for holding the edges of said second set of belts in edge-to-edge engagement to grip the second terminal in a manner similar to said first terminal, and means for guiding said second pair of belts past the second tinning bath in which the second terminal is tinned.

4. Apparatus for tinning terminals of an electrical component having terminals extending from opposite ends of a central body portion, which apparatus comprises a first tinning bath, a first pair of endless belts of rectangular cross section, drive means for said first pair of belts, means for guiding said first pair of belts in a first course wherein they pass in close proximity to said tinning bath, means for holding said belts in edge-to-edge engagement to grip a first terminal of an electrical component immediately adjacent to the body portion thereof so that one surface of said body portion coacts with supporting surfaces of said belts to maintain the body portion in a position substantially perpendicular to said last mentioned surfaces of the belts with the extremity of the gripped

terminal extending beyond the opposite surfaces of said belts whereby the extending terminals are tinned during movement of the component past the tinning bath, a first flux applicator positioned in the path of the gripped terminal immediately before the tinning bath for applying flux to the terminal, means for guiding the belts in a second course to invert the component and orient the untinned terminal in a depending attitude, a first belt-separating means for urging said belts apart to discharge the component from the grip of said belts, a discharge chute adjacent to said first belt-separating means for directing the discharged component so that the untinned second terminal thereof extends downwardly, a second set of belts positioned to receive the untinned terminal therebetween in the same manner as the first pair of belts, a second tinning bath, drive means for said second set of belts, means for holding the edges of said second set of belts in edge-to-edge engagement to grip the second terminal in a manner similar to said first terminal, means for guiding said second pair of belts past the second tinning bath in which the second terminal is tinned, a second flux applicator immediately before the second bath for applying flux to the second terminal, a second belt separating means for urging said second set of belts apart to discharge the component after said second terminal has been tinned, and a container for receiving said component as it is discharged from said second set of belts.

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