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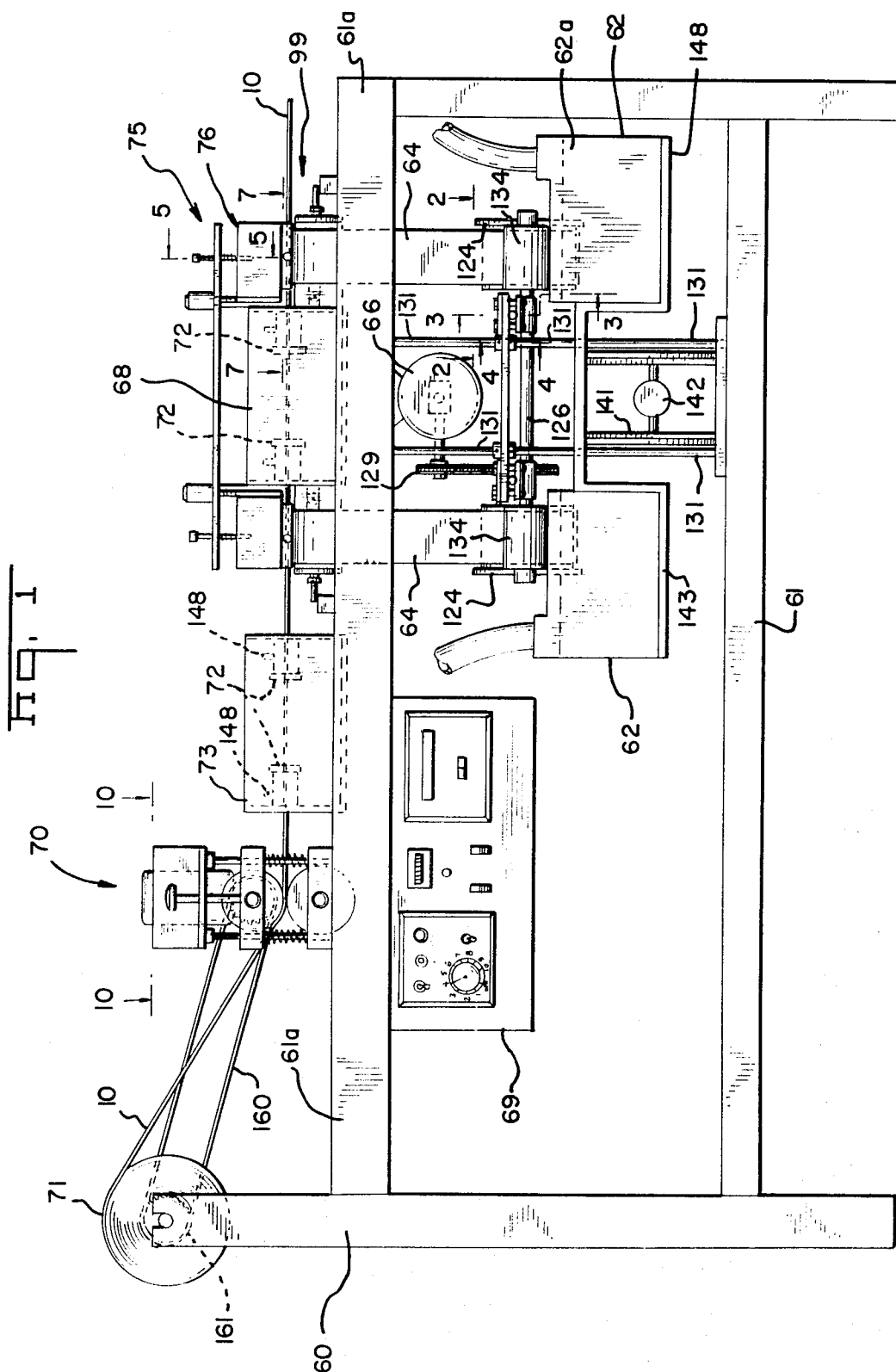
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BELT PLATING APPARATUS

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Fig. 2

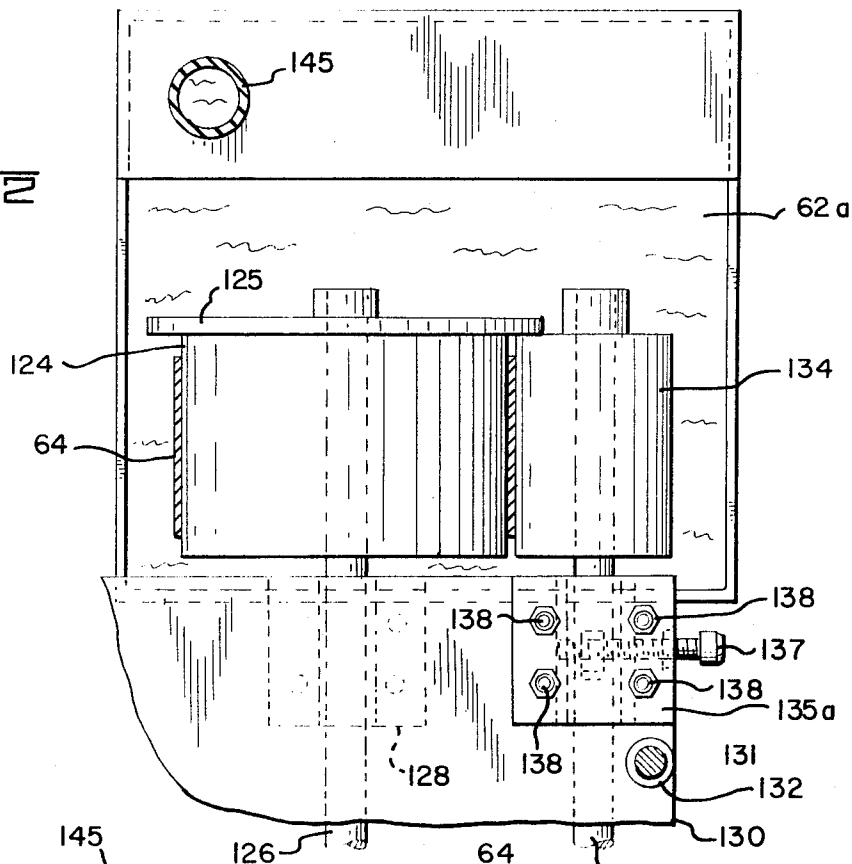


Fig. 3

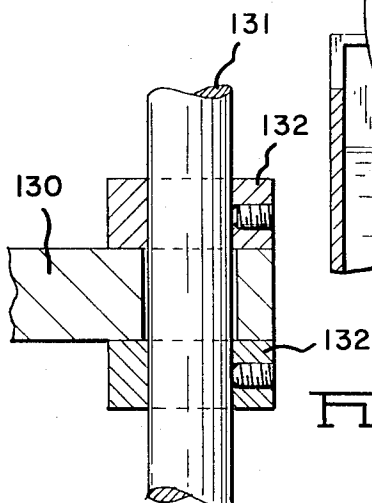
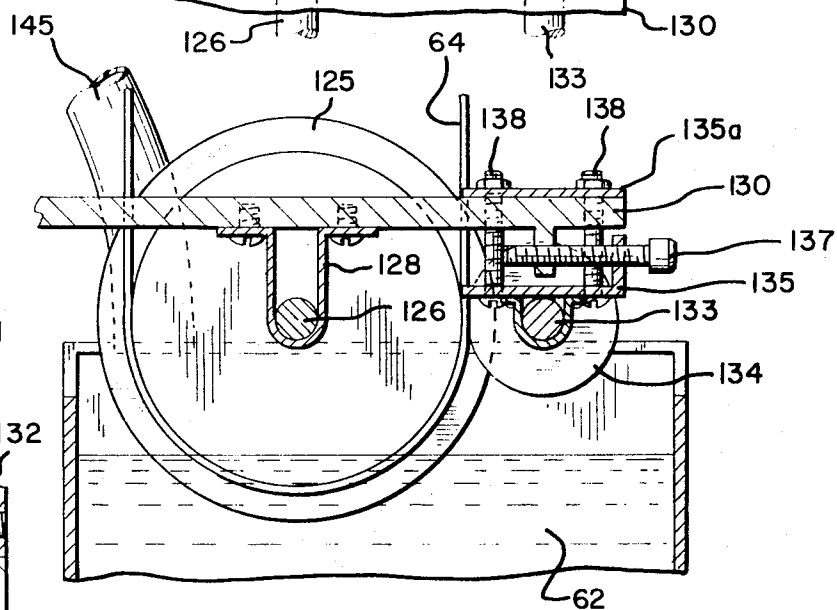


Fig. 4

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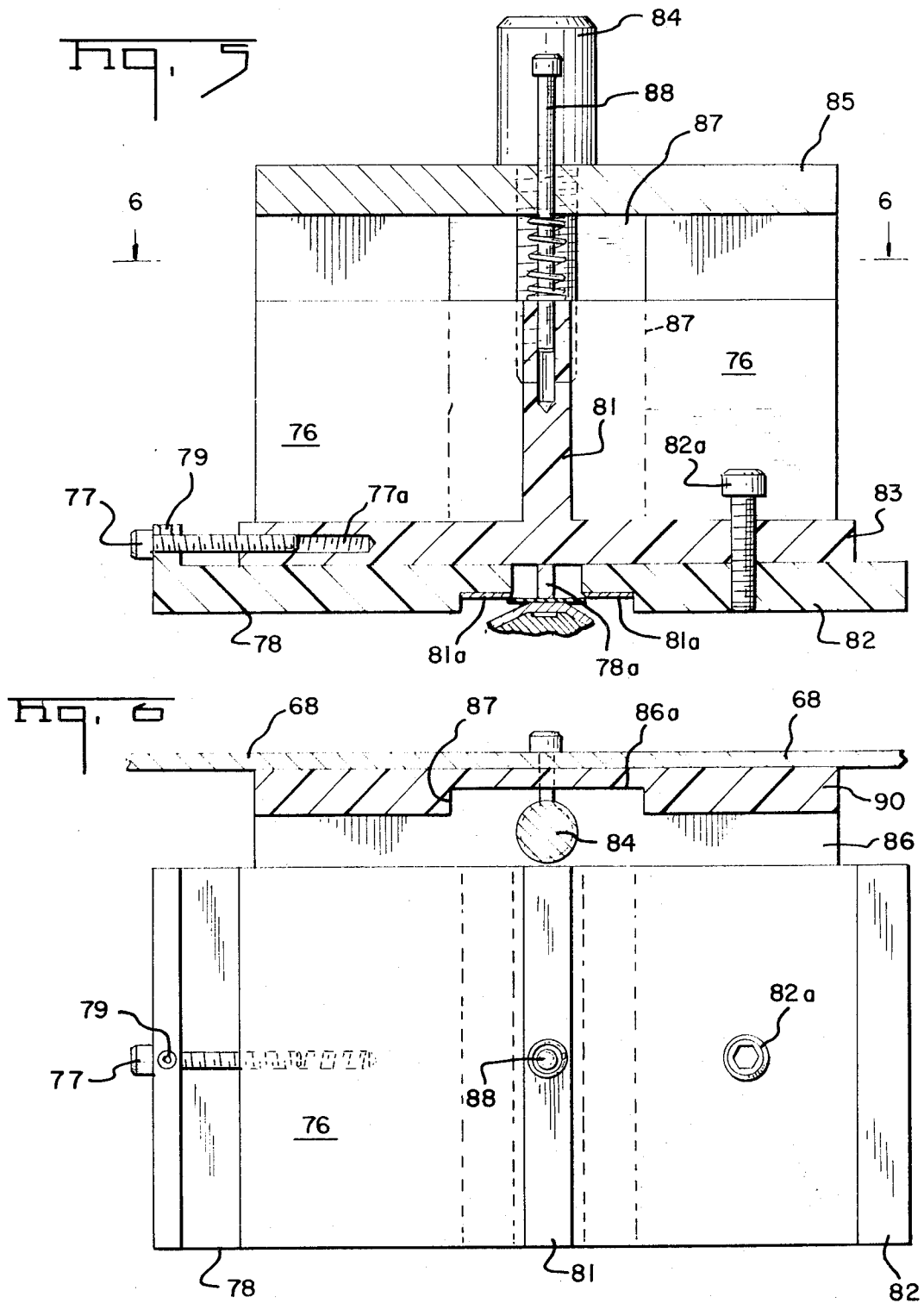
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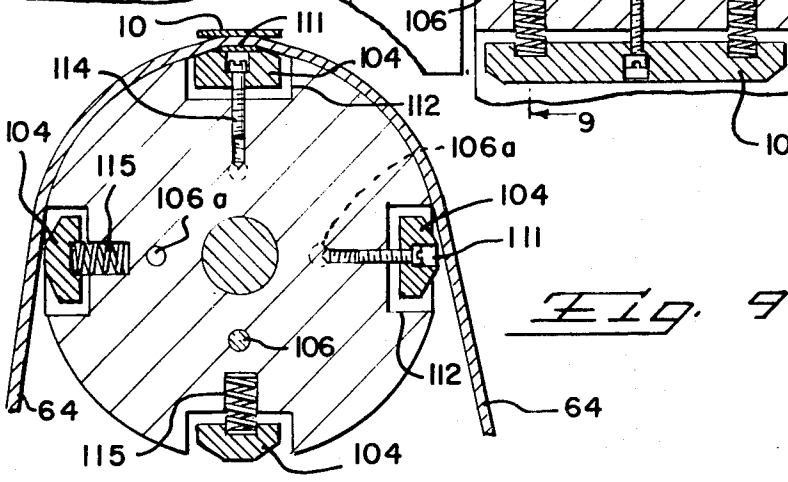
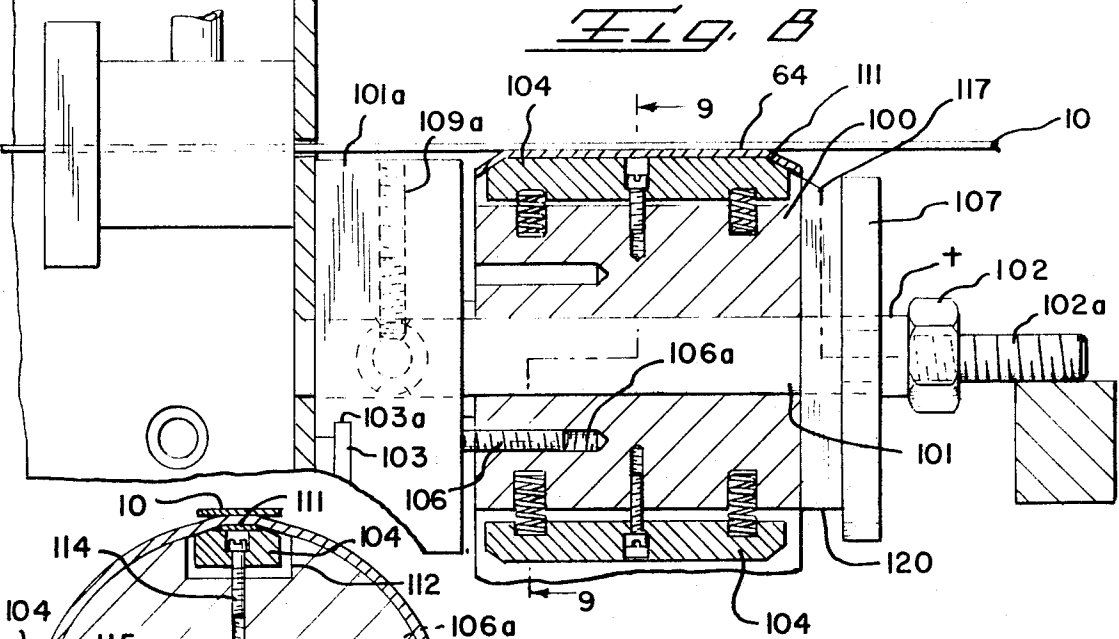
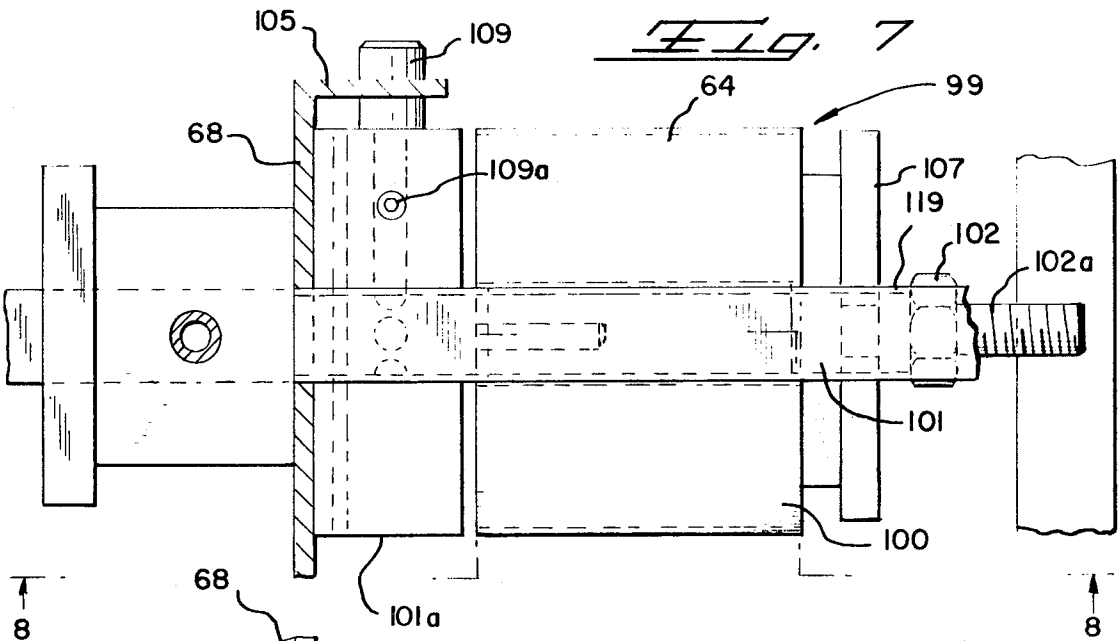
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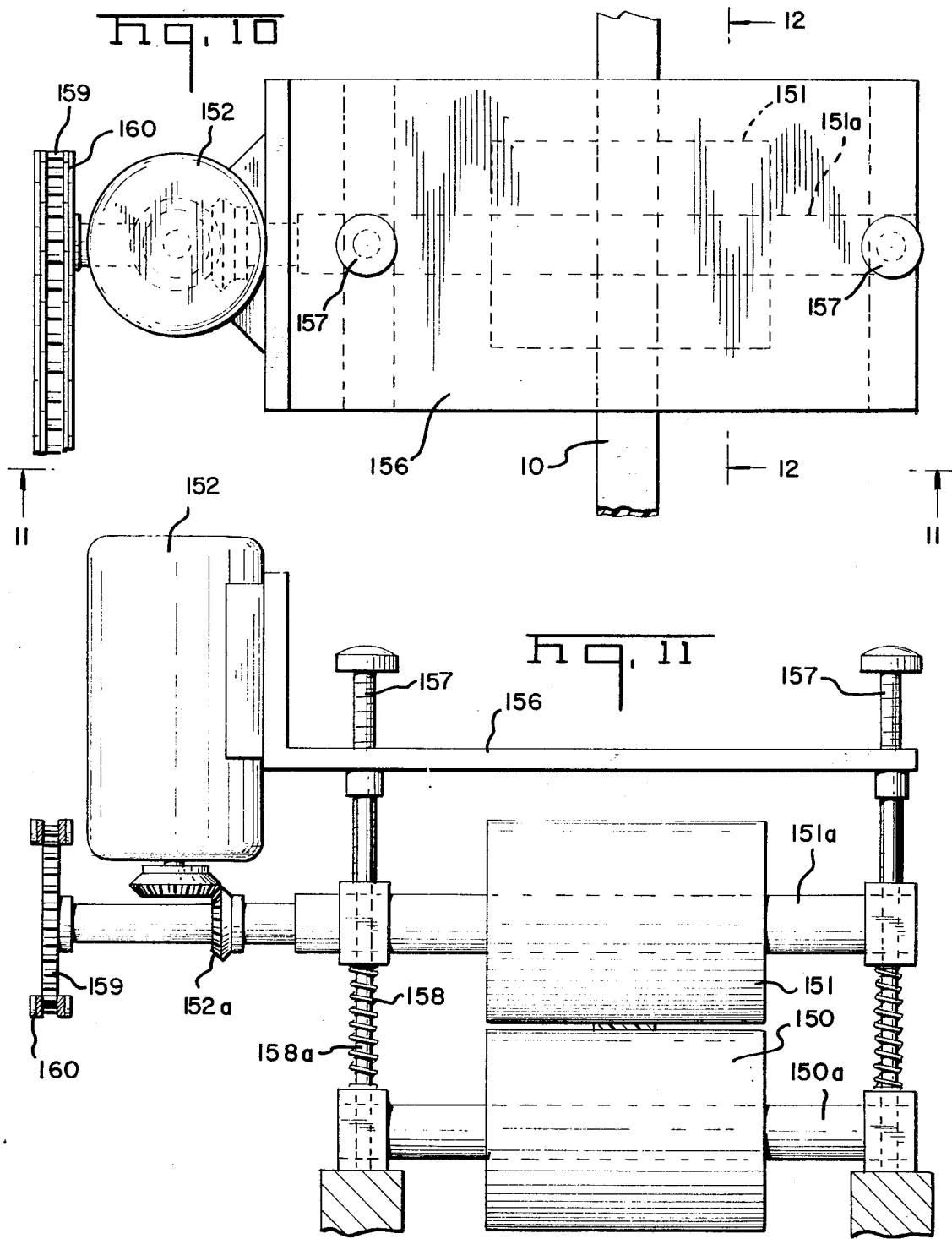
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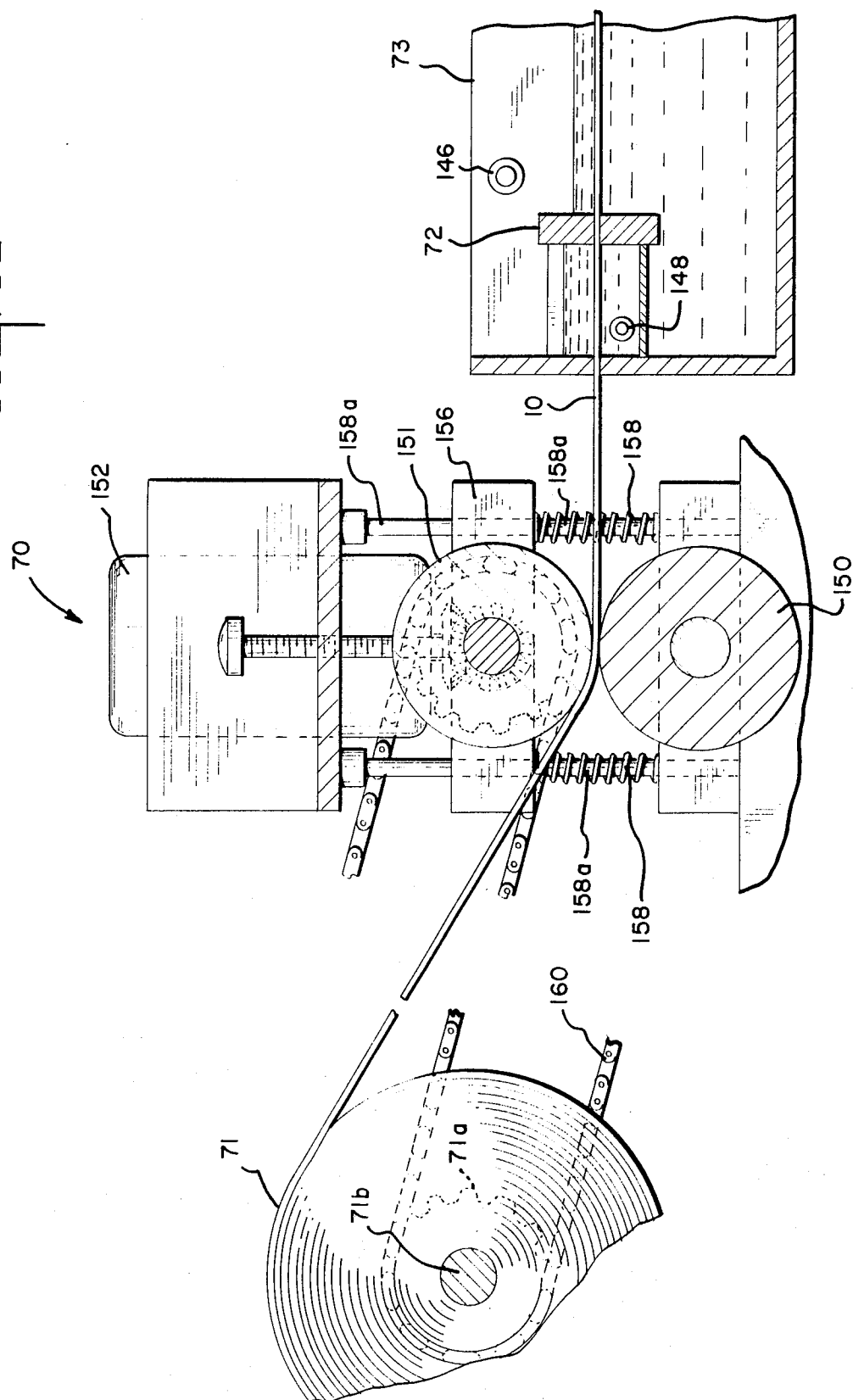
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Fig. 12



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FIG. 14

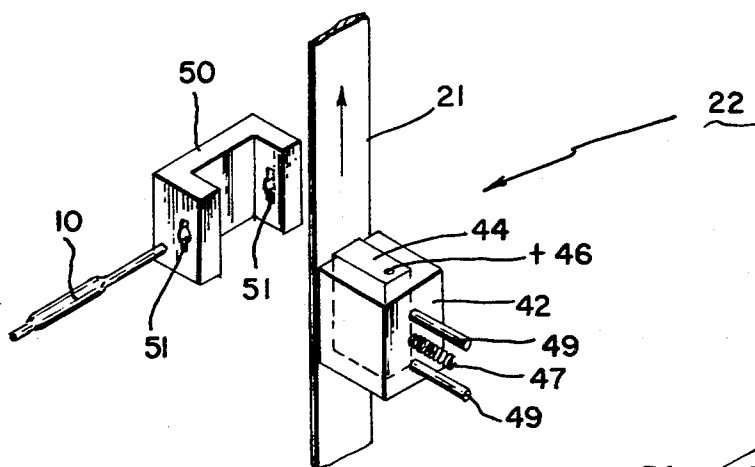
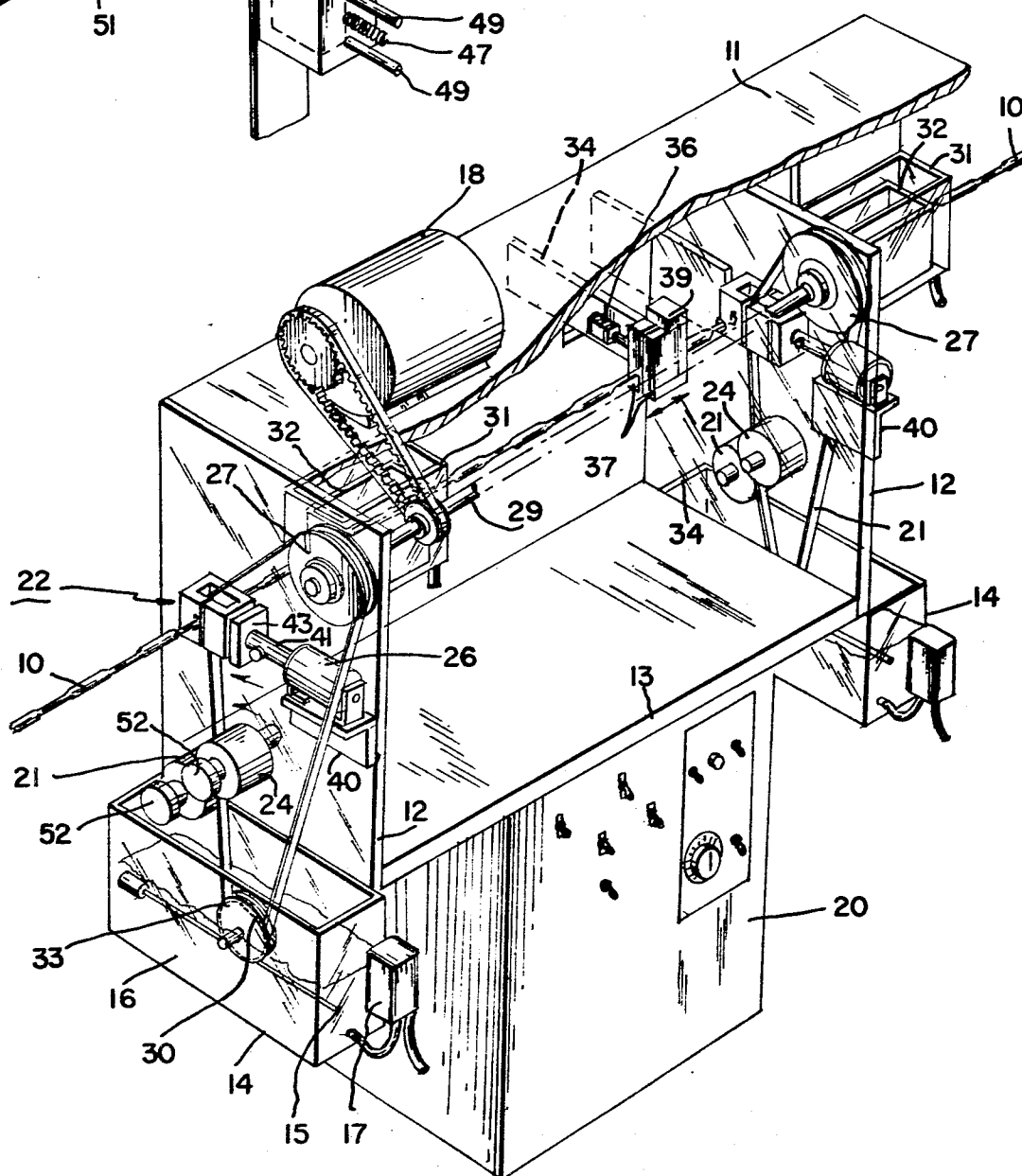


FIG. 13



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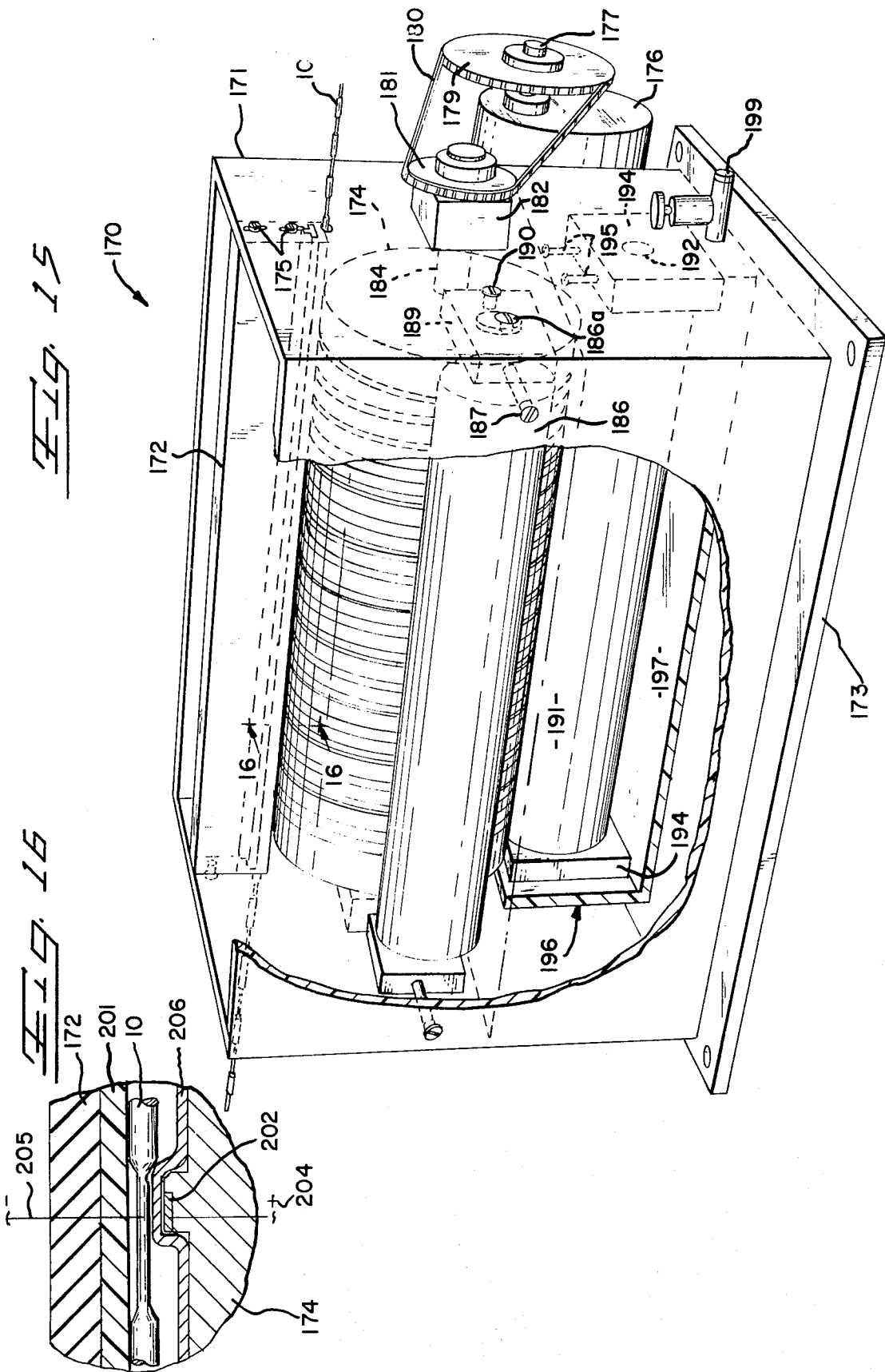
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BELT PLATING APPARATUS

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Int. Cl. C23b 5/68

U.S. Cl. 204—206

16 Claims

ABSTRACT OF THE DISCLOSURE

A novel dual head belt plater has been disclosed which can plate continuously selected portions of a stamped strip forming an electrical connector component blank or a blank as a part of a connector. Another embodiment of the novel belt plater allows continuous plating with one or more metals a continuous strip on a different metal whereby an electrodeposit of a certain or varying width is obtained. In a further embodiment, a machine accomplishes plating in a substantially continuous manner by moving continuously a workpiece over a periphery of a drum carrying an anode covered with a belt.

This invention relates to belt plating apparatuses for plating of metal parts which may be used for forming electrical connectors; more specifically, this invention relates to machines plating a continuous strip of a metal strip from which electrical connectors are formed or for plating partially formed electrical connections still joined in a strip as well as a method for plating various types of metal strips or strips from which electrical connectors may be, thereafter, stamped or otherwise formed.

In a previous application entitled "Belt Plating Apparatus, Method of Belt Plating and Novel Electrodeposits," Ser. No. 833,279 filed June 16, 1969 and now abandoned there has been disclosed a method for plating, by means of a belt plater, a strip of metal which thereafter may be used for stamping various electrical connectors therefrom. In general, this method provides the plating of metal parts by running a belt carrying an electrolyte in a direction of travel of the workpiece or against the direction of travel of the workpiece but in a machine direction. The belt travels at a rate different from that of the workpiece, depositing specific types of electrodeposits on the metal strip which metal strip may be used subsequently to form the necessary electrical connectors therefrom. However, it has been found that if a connector is partially formed from the metal strip and discontinuous areas need to be plated on these strip or certain areas need to be plated with sequentially different layers, the method disclosed in the above-identified application cannot be used; also it cannot be used only on a partially formed strip of electrical connectors.

Consequently, the present invention represents a further development in the art of plating by means of electrolyte carrier belts, certain electrical connectors in novel apparatuses and using novel methods whereby continuous plating may be achieved at rates heretofore unobtainable in normal still baths or basket plating operations at a concomitant saving in the electrodeposited metal and in a manner whereby a continuous strip may be fed and discontinuous areas may be plated.

Furthermore, the present invention also allows for the plating of a continuous strip of a preformed material with electrodeposits of same or different metals either adjacent to each other or on top of each other and whereby the electrodeposits on certain metal strips may be made by a belt moving in a cross-direction to the travel of these

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continuous metal strips. Additionally, the same or a different metal may be plated at one location on the workpiece, or overlappingly at two, or at adjacent locations on the workpiece. Thus, a considerable improvement in the metal plating efficiency may be provided by utilizing the novel multiple head belt plating devices further described herein.

In reference to the drawings herein, which illustrate the disclosed machines and in which identical parts are labeled by the same numerals and wherein:

FIG. 1, illustrates a dual head plating apparatus which plates a strip of a metal;

FIG. 2, illustrates in a top view along line 2—2 of FIG. 1, a drive roller or a pulley and a squeeze roller to control the amount of electrolyte in a belt;

FIG. 3, illustrates in a cross-sectional view along lines 3—3 of FIG. 1 the drive roller and squeeze roller and a means for adjusting the pressure against the belt by the squeeze roller;

FIG. 4, illustrates in partial cross-section along line 4—4 of FIG. 1, a means for adjusting the tension on the belt;

FIG. 5, illustrates in a cross-sectional view along line 5—5 of FIG. 1, a cathode section of said belt plater;

FIG. 6, illustrates in a partial cross-sectional and top view along line 6—6 of FIG. 5, a means for adjusting the position of a cathode section;

FIG. 7, illustrates a side-view of the anode body of belt plater;

FIG. 8, illustrates a longitudinal and cross-sectional view of the anode body along line 8—8 of FIG. 7;

FIG. 9, illustrates in a cross-sectional view along lines 9—9 of FIG. 8, the anode body;

FIG. 10, illustrates a top view, along lines 10—10 of FIG. 1, of a workpiece feed means for the machine;

FIG. 11, illustrates in a plane view, along line 11—11 of FIG. 10, the workpiece feed means used in the apparatus of FIG. 1;

FIG. 12, shows a cross-sectional view of the workpiece feed means along line 12—12 of FIG. 10 including additional details as the take-up reel and air locks used with the plating apparatus shown in FIG. 1;

FIG. 13, illustrates, in perspective, another embodiment of a dual head or dual belt plater;

FIG. 14, illustrates, in a perspective, the anode section of a dual head or dual belt plater;

FIG. 15, illustrates, in perspective, a plating apparatus in a form of a drum; and

FIG. 16, illustrates, in a cross-sectional view along lines 16—16 of FIG. 15, the anode and cathode section of the plating apparatus shown in FIG. 15.

Referring to the drawings herein, FIG. 13 discloses a dual head reed and strip plater which plates a workpiece 10 from which subsequently a connector is made in a manner well known in the electrical connector art. The apparatus shown in FIG. 13 rests on a table (not shown) and has a base plate 13 to which are attached three or four side plates 12, three of which are shown in FIG. 13. These plates generally form an integral box-like structure which may be provided with a cover 11 in the event the space contained by the walls is kept enclosed such as for preventing oxidation or for containing the liquids as shown in tanks 31 and 32. For convenience of observation, the plates may be made of polyacrylates such as Lucite or Plexiglas. Electrolyte tanks 14 are affixed to the side walls 12 of the machine and since there are two plating stations provided, these will be the same for each. Thus, the electrolyte tanks 14 contain the electrolyte which is agitated or pumped through the tank by means of pump 17 which circulates and/or introduces the electrolyte 16 and pumps it through a perforated mandrel 30 rotating in tank 14. The mandrel 30 is provided with shims 33.

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As the motor 18 drives shaft 29 on which is mounted the belt driving pulleys 27, the belt 21 is immersed into the electrolyte 16. Thereafter, the amount of electrolyte in belt 21 is controlled by squeeze rollers 24 rotating on shafts 52 and adjusted appropriately by urging one movable roller such as the upper one shown in FIG. 13 against the lower one, to provide the correct amount of electrolyte in belt 21.

Thereafter, the belt 21 is pulled into the anode section 22 further shown in FIG. 14. The belt, as it is pulled across the anode 44, is being urged against the workpiece 10, for deposit on the workpiece 10, the metal in the electrolyte. The workpiece 10 is made cathodic by an appropriate circuit connection (not shown).

A solenoid 26 appropriately interconnected with a work indexing means via a conventional control circuit (not shown) retracts the spring 47 loaded anode block 42 away from the workpiece 10 while the workpiece is being indexed to the next position. The solenoid 26 illustrated in FIG. 13 is mounted on a bracket 40 affixed to the side plate 12. The solenoid rod 41 is connected to a plate 43 which plate in turn is engaged to pins 49 to block 42 and thus confines the spring 47 therebetween by which the pressure of the anode is adjusted in respect to the belt and the workpiece. An appropriate internal travel may be provided for the solenoid rod 41 to control the proper disengagement while the workpiece is being indexed.

The workpiece 10 is mounted in a Lucite support block 50 while it is being plated. Block 50 has apertures therein for receiving the stock and generally confining the workpiece therein at the same time allowing for easy advancement. Block 50 is affixed to side plate 12.

The anode strip conforms to the area approximately plated on the workpiece at the place of engagement with the workpiece 10. The anode strip 44 is connected to a lead wire 46.

The workpiece is being indexed by means of index arm 34 which is mechanically driven or reciprocated (the driving means are not shown). The arm 34 has an index arm solenoid 36 mounted thereon which engages one of the index jaw plates 37 as pivoted by index arm jaw plate guide 39.

Before the workpiece 10 enters into a belt plater section, it goes through two tanks 31 and 32. Tank 32, for convenience, is affixed to the edges of the plate 12. Tank 31, i.e. the outer one, is an overflow tank and the inner one 32 contains an appropriate wash solution.

Further, both tanks 31 and 32 may be operated in such a manner that different types of liquids may be contained in the outer tank 31 and inner tank 32 and the solution levels in the outer tank 31 and the inner tank 32 positioned as desired. It is well that the workpiece passes through the wall 12 above the liquid level in tank 31.

A control panel 20 has also been provided which is showing the various switches activating the means such as the electrolyte pumps 17, the motor 18, or the solenoid 26, should only one electrolyte belt be used in plating.

A temperature sensing and control means 15 is also provided for each of the electrolyte tanks 14.

As can be envisioned, instead of the mechanically driven stock indexing arm 34 such as shown in FIG. 13, there can be employed feed means similar to that shown in FIG. 1 for feeding the workpiece 10 in the event it is merely a strip and in the event the anode section is plating in a cross direction a continuous or a discontinuous and discrete area on the metal. In the later event, the feed means are operated discontinuously.

In another embodiment, as shown in FIG. 1, a dual head or two belt plater has been shown. Briefly, it consists of a stand 60 above the lower level 61 of which are two electrolyte tanks 62. In these tanks belts 64 are immersed. Motor 66 is driving these belts via chain 129, shaft 126, by means of a drum roller or pulley 124 in unison. Individual motors (not shown) may be provided

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for each of the belts 64 to drive the same at different rates to deposit at varying rates the same or different metals.

An electrolyte pump (not shown) may be provided which agitates the electrolyte and/or replenishes the electrolyte. Squeeze rollers 134 control the amount of electrolyte in belts 64.

A control panel 69 contains the various control elements such as variable speed adjusters, drive adjusters, switches, etc.

The workpiece 10 is fed, i.e. pulled through the machine by means of the workpiece drive means 70, whereby the workpiece is wound on a take-up reel 71. The workpiece 10 as it emerges from a previous wash section (such as shown in respect to tanks 31 and 32 in FIG. 13) proceeds through an air lock (such as 72 used in connection with wash tank 68 and final wash tank 73) to prevent the wash solution from entering with the workpiece or being carried into the plating section.

As the workpiece 10 approaches the cathode section 75, it enters below the cathode bracket 76. Positioned below the workpiece is an anode section 99. The belts 64 travel crosswise to the workpiece 10 and are urged in an appropriately selected and adjusted contact by means further explained herein. After the workpiece 10 emerges from the first belt plating section it enters into wash tank 68 provided with appropriate air locks 72, i.e. small air chambers into which air is pumped at a pressure sufficient to prevent the escape of the wash solution from the tank into the electrolyte. At the same time, air locks provide some agitation to the wash solution so that the wash water effectively scrubs any remaining residual impurities deposited on the workpiece in the first plating section.

As the workpiece emerges from tank 68, it enters into a second belt plating section which is identical for all practical purposes to the first except that one is a left hand and the other is a right hand unit. From this work section, the workpiece enters into a final wash tank 73 which again scours the remaining electrolyte from the workpiece in order to prevent the electrolyte's corroding the workpiece after the electrical parts have been stamped from the workpiece. The feed section has been briefly described above and will be described in great detail.

Returning now to the cathode bracket 76, shown in FIG. 5, it consists of a vertical cathode height adjustment frame 81 to which is affixed a horizontal plate 83 under which is mounted a cathode width adjustment frame 78. On the other side of plate 83 is a permanently affixed frame 82 having a securement bolt(s) 82a therefor. An adjustment bolt 77 projecting into plate 83 allows adjustment of the cathode frame 78 by means of an appropriate threaded aperture 77a in plate 83. Bolt 77 urges inwardly and outwardly the cathode width adjusting section 78 and is locked in place by lock bolt 79. The cathode element 78a is connected to a current source by means of a wire (not shown) leading to the cathode element 78a which is mounted on plate 83 shown in the FIG. 5 as a narrow strip of metal. The cathode element may also be the two narrow strips 81a shown in FIG. 5.

The cathode bracket 76 is positioned above the anode by means of the knob 84 on top of plate 85 which urges a slide plate 86 having a protruding rail as shown in FIG. 6, 86a to slide vertically in a guide slot 87 when adjusted by knob 84 and also guided by a cathode bracket guide bolt 88. A spring 89 on bolt 88 provides sufficient adjustment for variation in workpiece irregularities as well as rigidity to the cathode bracket 76. The cathode section 75 in turn has been mounted on the tank 68 via plate 90, this plate containing the T-shaped slide slot 87 or guide slot.

Referring now to the anode section 99, it is illustrated in greater detail in FIGS. 7 to 9 and it consists of a positionable head 100 having as a convenient illustration four

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positions shown in FIG. 9. The positionable head 100 is mounted on a shaft 101 which holds the anode head 100 stationary. Shaft 101 allows longitudinal movement of the anode head 100 when the head is disengaged by removing lock nut 102 on lock bolt 102a and anode end plate 107 and sliding anode head 100 on shaft 101 to disengage pin 106 located in one of the four apertures 106a. Anode and plate 107 may also be provided with a pin 106 and corresponding apertures 106a provided on the other end of anode body 100. Thus, when turning the anode head 100 for positioning by engagement of pin 106 with an aperture 106a corresponding to another anode strip 111 which may be of different width, an electrodeposit of different width may be obtained.

Various anode segments 104 are provided with an anode strip 111 of various widths and the anode head 101 is positioned at the beginning of each plating run.

In order to provide precise electrodeposits on the workpiece at an appropriate plate or width, the anode head 100, in relationship to the cathode section 75, is adjusted in cross-direction in respect to the cathode bracket 76 and hence, the workpiece 10. That is, anode head 100 is positioned by means of positioning bolt 109 which engages the shaft 101 as well as the shaft anchor block 101a. Bolt 109 is locked in place by lock bolt 109a and prevents the movement of shaft anchor block 101a in relationship to the cathode. Shaft anchor block 101a is adjusted by appropriately turning bolt 109 which bolt is anchored by bracket 105 attached such as to the wall of tank 68.

A rail 103, attached to the wall of tank 68 having a corresponding groove 103a in anchor block 101a allows the sliding of shaft anchor block 101a in respect to the cathode bracket 76. For convenience, the cathode bracket 76 has been mounted in a stationary position.

On the outer end of the anode head 100 the end plate 107 has been provided also to guide the electrolyte belt 64. Further, the end plate 107 may be connected through an anode wire lead plate 120 which contains an anode contact lead wire 117 which comes in engagement whenever an anode head is positioned in respect to one of the anode strips 111. The anode strips are mounted on the anode segments 104 in anode head slots 112 by means of a bolt 114. Each slot is provided with a bolt 114 as well as two anode head springs 115 used for exerting a certain predetermined pressure upon the workpiece when the anode segment 104 is adjusted by bolt 114 to protrude above the anode head body 100. The anode strip 111 is in turn positioned at the apex of the anode segment 104 and the strip contact 117 as previously indicated connects to the anode wire lead 119.

In reference to FIGS. 1 to 4, the belt 64 is driven by rollers 124 having on the outside one or two guide shims 125. These rollers are mounted on shaft 126 and driven by motor 66 via chain 129. For sake of convenience, belts 64 are driven by a common motor but individual motors may be used.

An adjustment plate 130 to which the shaft 126 has been affixed by bracket 128 carried the motor 66 on the top thereof; a plate 130 can be moved upwardly and downwardly to exert the proper tension of the belts 64 by moving the same on the guide rods 131. For proper leveling of plate 130, four guide rods 131 have been provided which are affixed to bottom level 61 and top level 61a of the machine frame 60. These guide rods 131 carry upper and lower collars 132 positioned, respectively, above and below the plate 130 and these are adjusted as indicated in FIG. 4.

A squeeze roller 134 which, for convenience, engages the belt between the shims 125 is provided with means for adjusting the pressure via the pressure plate 135 which also carries the squeeze roller shaft 133. The pressure by the squeeze roller 134 on rollers 124, i.e. the movement of shaft 133a is adjusted via the bolt 137 after the bolts 138 which secure the plate 135, as well as the top plate 135a, have been loosened.

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A scissors jack 141 which is shown in FIG. 1 adjusted by knob 142 places the electrolyte tanks 62 in a proper position by urging upwardly or downwardly the electrolyte tank holding plate 143 and provides thereby for proper immersion of the electrolyte carrying belt 64. The electrolyte is designated 62a.

A hose 145 is provided for supplying the tank 62 with a fresh electrolyte; hose 145 may also be used to remove any fumes which may be formed in the electrolyte tanks 62.

After the workpiece has been plated in the first and second plating section, as shown in FIG. 1, it proceeds to a wash tank 73 having two air locks 72. The air locks are provided with air introduction ports 148 which are connected to shop air (not shown) under suitable pressure and which prevents the wash solution in tank 73 from escaping with the workpiece.

The feed section suitable for the herein disclosed apparatuses is illustrated in great detail in FIGS. 1 and 10 to 12. In FIG. 10, a top view of the feed section, shows workpiece pulled by motor 152 which drives the feed rollers 151 on shaft 151a which shaft also contains one of the beveled gears 152a the other being driven by the motor 152.

At the extension of shaft 151a is a sprocket gear 159 having a chain 160 trained around the same and leading to a take-up reel 71 which has a correspondingly sized take-up sprocket gear 71a mounted on shaft 71b.

The rollers 151 and 150 are made of an elastomeric material and may also be provided with a groove therein (not shown) to accommodate the workpiece 10.

In order to exert sufficient force on the workpiece 10 as it is being pulled through the apparatus, the upper feed roller 151 can be adjusted by screws 157 urging downwardly plate 156 and compressing springs 158, mounted on each of the positioning bolts 158a.

In reference to the take-up reel 71, sufficient slack is provided in the chain 160 to allow the removal of the reel 71 from its shaft 71b as the chain operates properly with this slackness in it and the chain is of considerable length.

In reference to FIGS. 15 and 16, a drum plater has been disclosed therein which again plates a continuous workpiece such as 10 which may be a reed connector strip wherein the reed connector blanks are joined to each other, or a workpiece which has discontinuous sections. Thus, herein the reed connector blanks are joined to each other, the workpiece is moved in a machine direction through the apparatus as a particular section of a number of workpieces is being plated. The tank within which the apparatus has been contained has been identified as 171 and it rests on a suitable support platform 173; the main tank 171 contains within it an inner tank 196 in which is confined an electrolyte 197. The actual plating is accomplished by drum 174 being synchronously rotated at a rate which corresponds to the workpiece travel rate as the workpiece 10 is being moved through the apparatus. As the anode and the belt, further described below, are wound spirally on the drum 174, the rate of rotation of the drum and the rate of travel of workpiece allow a convenient means for controlling the rate of plating, which incidentally can also be varied such as by changing current density, cathode pressure, temperature, etc. The feed means by which the workpiece has been moved through the apparatus has not been shown, but it may be similar to that shown in FIG. 1.

The motor 176 drives a sprocket gear 179 shown in FIG. 15 which sprocket gear is mounted on shaft 177. The chain 180 in turn drives another sprocket gear 181 which is mounted on the extension of shaft 184 on which the drum 174 is mounted.

Shaft 184 is suitably supported by a shaft block 182 which is affixed to the walls of the tank 171. A squeeze roller 186 again performs the function to introduce an appropriate amount of electrolyte to the work site and it is adjusted by bolt 187 positioning squeeze roller shaft

186a in a support block 189 and locking it with a lock pin 190 which pin secures the block 189 in a proper position. The squeeze roller is covered with an elastomeric material.

The bottom roller 191 is for the purpose of insuring a supply of fresh electrolyte as well as some agitation whereby a constant composition electrolyte solution is supplied by belt 206 to the plating site. Roller 191 is mounted on a shaft 192 which shaft is positioned by means of blocks 194 and adjusted by bolts 195.

Referring to the cathode section, it is shown as 172 in FIG. 15 and it is a T-shaped bar. The cathode section 172 is also shown in cross-section in FIG. 16. The T-shaped bar carries on the underside thereof, conduit 201 or if the workpiece may be sufficiently conductive, it may be made cathodic merely by a suitable connection such as a rotating wheel (not shown).

An appropriate pressure exerted by the cathode bar 172 on the workpiece 10 and thus the anode 202 may be achieved by adjusting bar 172 by means of bolts 175.

The plating site or section is shown in FIG. 16 which illustrates the drum 174 in partial cross-section, the anode is identified as 202 and the lead wire thereto as 204. The belt, which is spirally wound around the drum, is shown as 206.

As the workpiece is moved and as the drum rotates, the anode section 202 defines a precise area on a small electrical connector which area may be progressively plated as the workpiece moves over the drum. Furthermore, if the part is such that it forms merely a continuous strip, it may similarly be electroplated in the same manner as shown in FIG. 16.

The various means which are used to control the electrolyte such as pumps, heaters and inlet and outlet means, being conventional in the art have not been shown, except that valve 199 has been shown for the introduction of the electrolyte in inner tank 196. The inner tank 196 may be isolated in a manner such that it merely contains the electrolyte and the appropriately slanted barrier means may be provided within the outer tank 171 so that excess electrolyte 197 returns to the inner tank 196. In the event the electrolyte gives off noxious fumes, a cover (not shown) placed on container 171, may be employed which may have an opening therein for evacuation and subsequent scrubbing of these fumes; these same means may be employed with the other apparatuses.

As shown above, various apparatuses have been illustrated which allow the plating by means of an electrolyte carrier belt electrical connector preforms or blanks at current densities such as from 200 to 500 amps per sq. ft. at a workpiece strip speed from 3 to 12 feet per min. These workpieces may be of varying width. Further, various thicknesses of stock may also be accommodated in the described apparatuses. According to the disclosed invention, an electrodeposit of selected width in the form of a single stripe or multiple superimposed or adjacent stripes may be deposited on the metal strip and the stripe widths may be varied as desired such as from 0.05 in. to 0.3 in. The cathode sections may be loaded so that cathode pressures from 10 to 30 lbs. per sq. in. may be achieved at the corresponding anode spring pressures.

As further described in the previously identified application, the belts of the desired type are generally made of Dacron material and possess the desired resistance to the plating solutions allowing the plating of long length of continuous strips at considerable saving in the noble metal.

What is claimed is:

1. An apparatus for plating a metal on selected areas of a continuous strip as a workpiece, the apparatus comprising:

a plating circuit comprising a source of current, an anode and a cathode;
means for holding an electrolyte;

means for transporting said electrolyte to a first plating site for completing a plating circuit;

means for positioning the cathode in respect to a workpiece;

means for positioning an anode in respect to said cathode and said workpiece;

means for feeding said workpiece to a plating site, said means for feeding said workpiece and said means for transporting said electrolyte being operatively interconnected for moving substantially in cross-direction to each other, said means for feeding including means for advancing said workpiece to a next plating site, said next plating site comprising an anode, a cathode, a source of current, means for transporting an electrolyte to a plating site from a means for holding an electrolyte and means for positioning said cathode and anode in respect to said workpiece at said next plating site.

2. The apparatus as defined in claim 1 and wherein the means for transporting said electrolyte includes means for bringing a fresh electrolyte solution to a plurality of plating sites in a cross direction to a workpiece travel.

3. The apparatus as defined in claim 1 and wherein the means for transporting said electrolyte includes means for bringing a fresh electrolyte solution to a plating site above an anode and below a cathode in a cross-direction to a direction of travel of said workpiece.

4. The apparatus as defined in claim 1 and wherein the means for bringing a fresh electrolyte to a plating site is a drum around the periphery of which is a spiral anode and on top of which anode is an electrolyte carrier belt.

5. The apparatus as defined in claim 1 and wherein the means for feeding said workpiece include means for intermittently feeding said workpiece.

6. The apparatus as defined in claim 5 and wherein the means for feeding said workpiece include means for intermittently feeding said workpiece, said means intermittently feeding being operatively interconnected with means for engaging and disengaging said workpiece from said means for transporting said electrolyte to said plating sites whereby the workpiece is fed when said means for transporting said electrolyte is disengaged.

7. The apparatus as defined in claim 1 and wherein the means for positioning said anode in respect to said cathode includes means for continually positioning said anode operatively and synchronously interconnected with means for feeding said workpiece to a plating site.

8. The apparatus as defined in claim 7 and wherein the means for feeding said workpiece to a plating site include means for continually advancing said workpiece to a next plating site operatively interconnected to said means for continually positioning said anode.

9. The apparatus as defined in claim 1 and wherein the means for feeding include means for taking up a plated workpiece.

10. An apparatus for plating a continuous strip as a workpiece with a metal, said apparatus comprising:

(1) a plating site defined by an anode, a cathode, a source of electrical current; means for transporting an electrolyte from a receptacle containing said electrolyte spaced apart from the workpiece, said means including means for carrying said electrolyte to a plating site in carrier belt, means for controlling the amount of electrolyte carried by said carrier belt, means for adjusting a rate at which said carrier belt travels, means for feeding a workpiece between said cathode and anode including means for supporting said cathode and said carrier belt, means for supporting said anode including means for positioning the same in respect to said workpiece and means for guiding said carrier belt; and, means for completing said electrical circuit; means for adjusting pressure between said carrier belt and said workpiece; means for removing residues from said workpiece after said plating, and wherein said means for feeding said

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workpiece and said carrier belt in respect to each other is in cross-direction; and

(2) means for taking up a plated workpiece.

11. The apparatus as defined in claim 10 and wherein a plurality of the defined plating sites are in a machine direction of said workpiece.

12. The apparatus as defined in claim 10 and wherein means for removal of residues from a plated workpiece are operatively interconnected with means for feeding said workpiece.

13. The apparatus as defined in claim 10 and wherein means for positioning said anode comprise a shaft means, an anode head holding a plurality of anode segments, means for indexing said anode head including means to adjust the width of each anode segment, means for rigidly engaging said anode head in respect to an anode segment, means for completing said electrical circuit via said anode head to said anode segment and means for positioning the anode head in respect to said workpiece.

14. The apparatus as defined in claim 10 and wherein

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the cathode comprises a cathode shoe, means for confining a workpiece within said cathode shoe, means for adjusting the means for confining the workpiece, and means for positioning the cathode shoe upwardly and downwardly whereby adjustments in pressure on the anode head is obtained.

15. The apparatus as defined in claim 10 and wherein an electrolyte tank has immersed therein a roller around which said electrolyte belt is trained.

16. The apparatus according to claim 10 and wherein an electrolyte tank is associated with each plating site.

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