

Nov. 2, 1943.

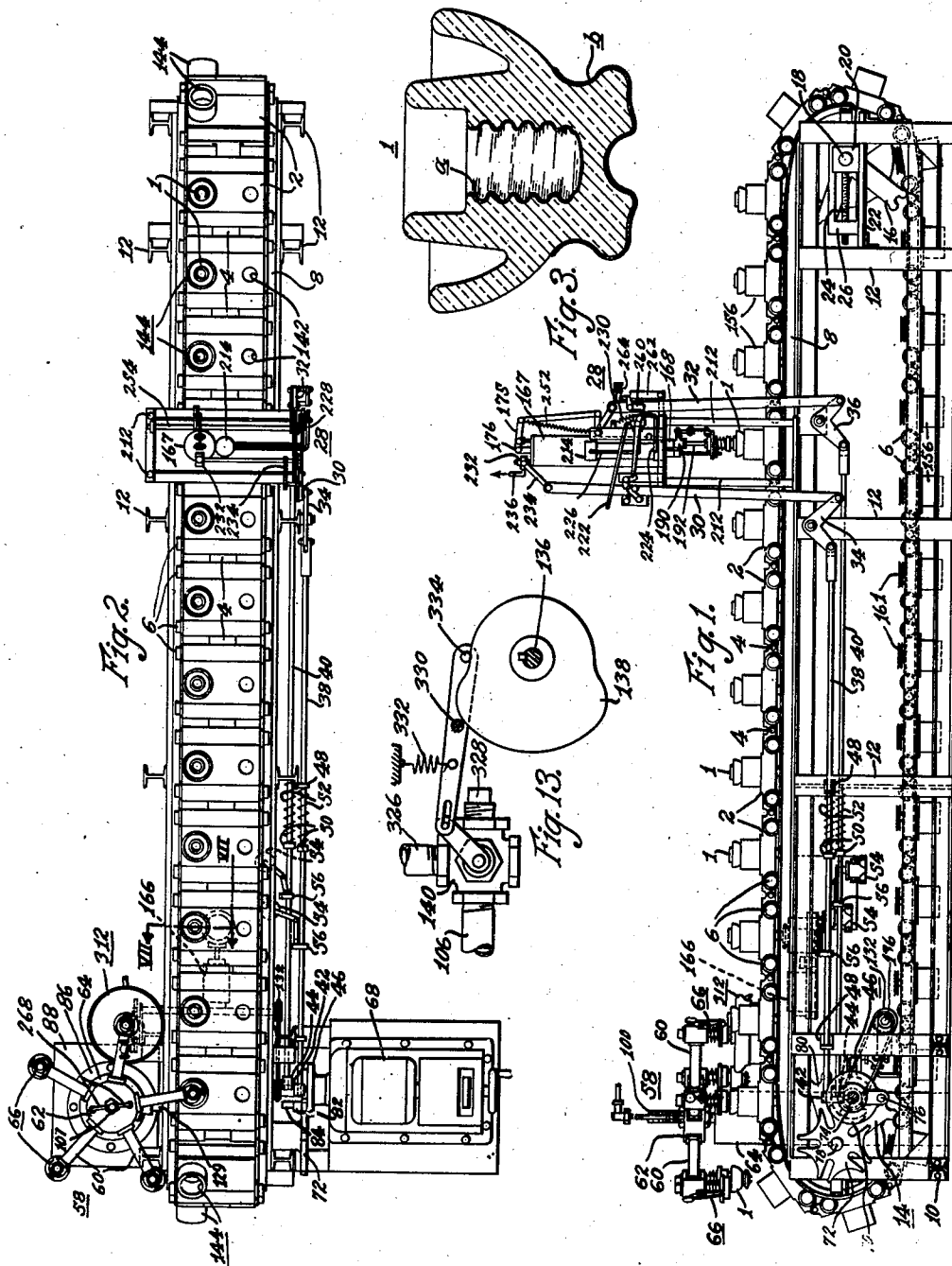
E. H. FISCHER

2,333,557

COATING OF INSULATORS

Filed July 31, 1940

7 Sheets-Sheet 1



WITNESSES:

E. J. Oberheim
David Friedl

INVENTOR

Eugene H. Fischer

BY

W. H. H. H. H.
ATTORNEY

Nov. 2, 1943.

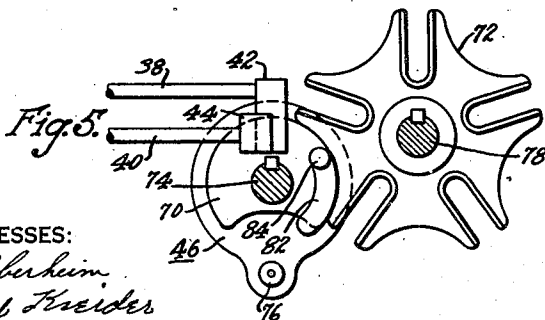
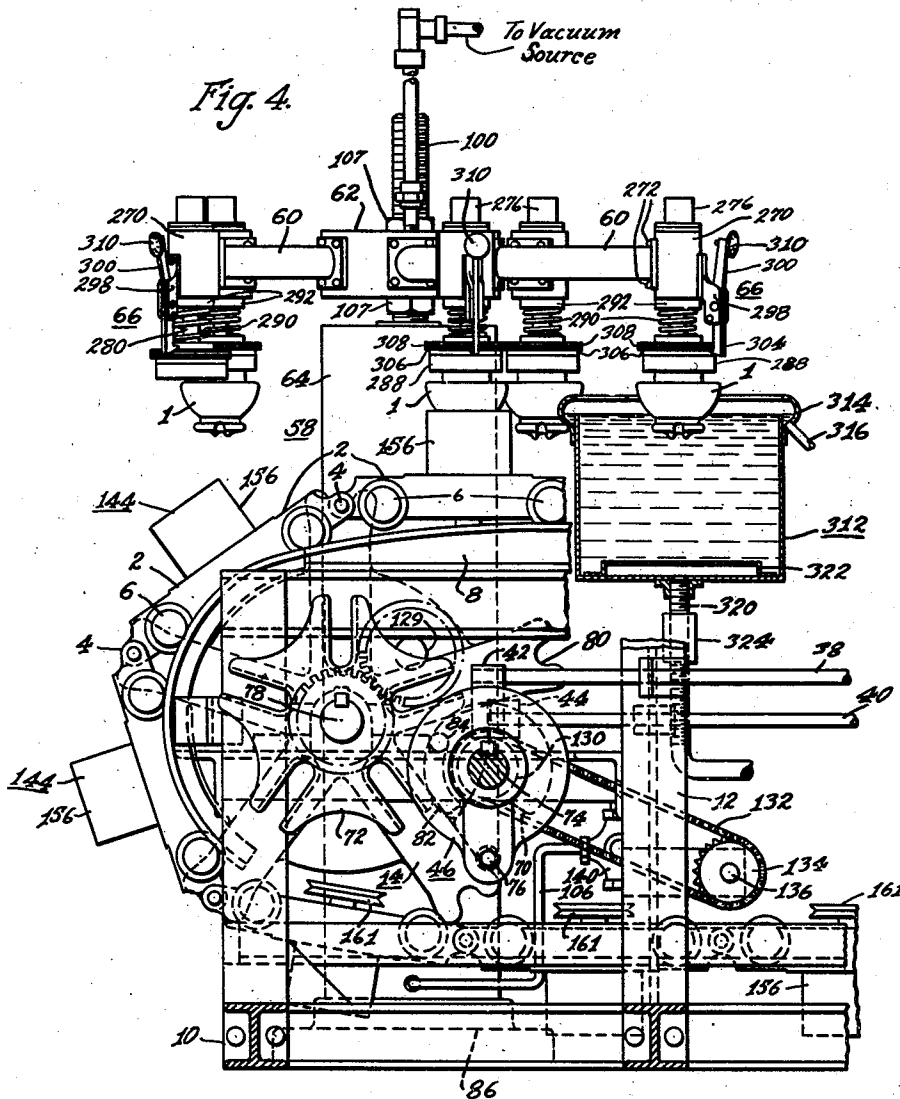
E. H. FISCHER

2,333,557

COATING OF INSULATORS

Filed July 31, 1940

7 Sheets-Sheet 2



WITNESSES:
E. H. Fischer
David Breider

INVENTOR
Eugene H. Fischer
 BY *W. H. H. H. H.*
 ATTORNEY

Nov. 2, 1943.

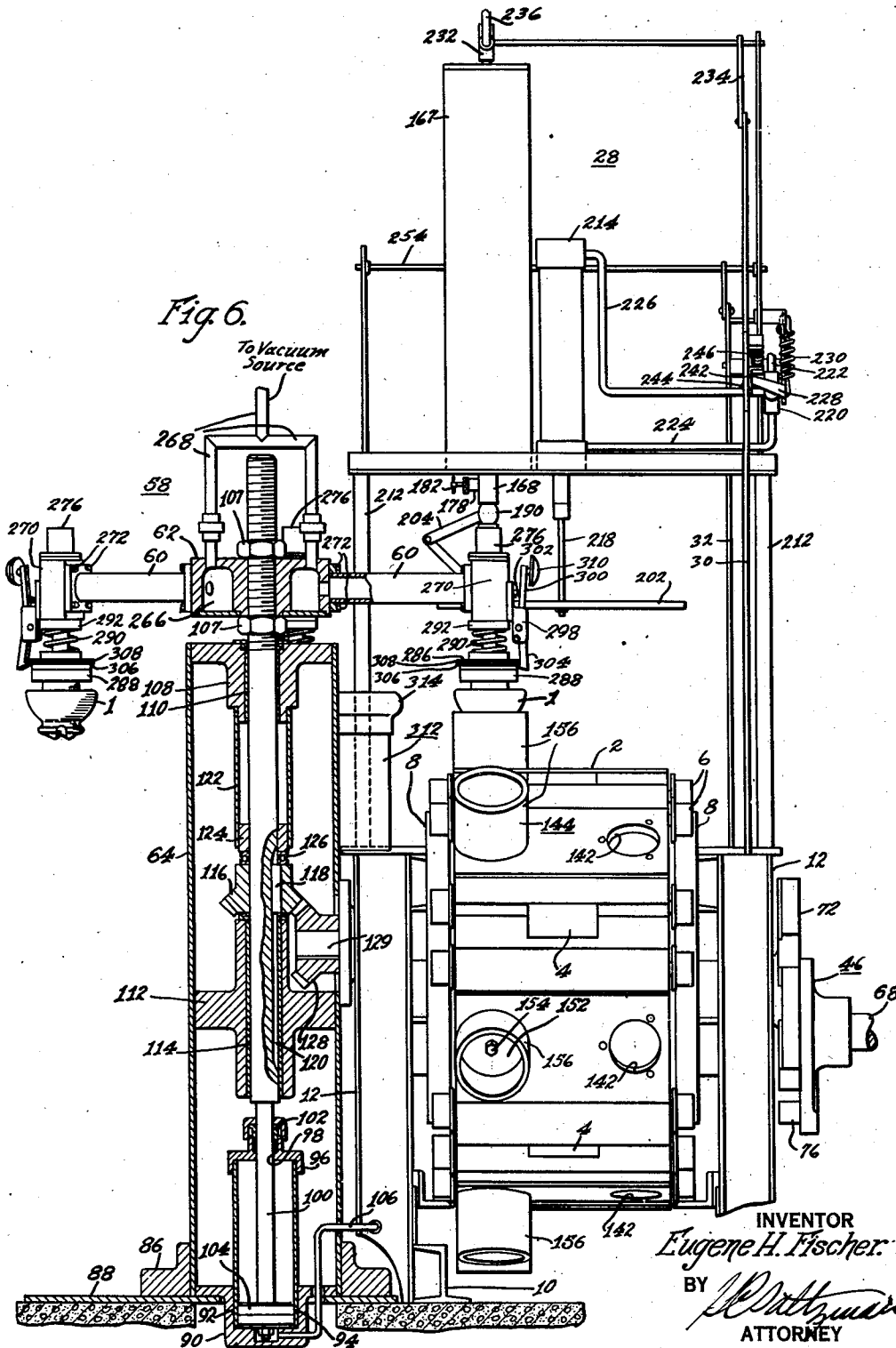
E. H. FISCHER

2,333,557

COATING OF INSULATORS

Filed July 31, 1940

7 Sheets-Sheet 3



Nov. 2, 1943.

E. H. FISCHER

2,333,557

COATING OF INSULATORS

Filed July 31, 1940

7 Sheets-Sheet 4

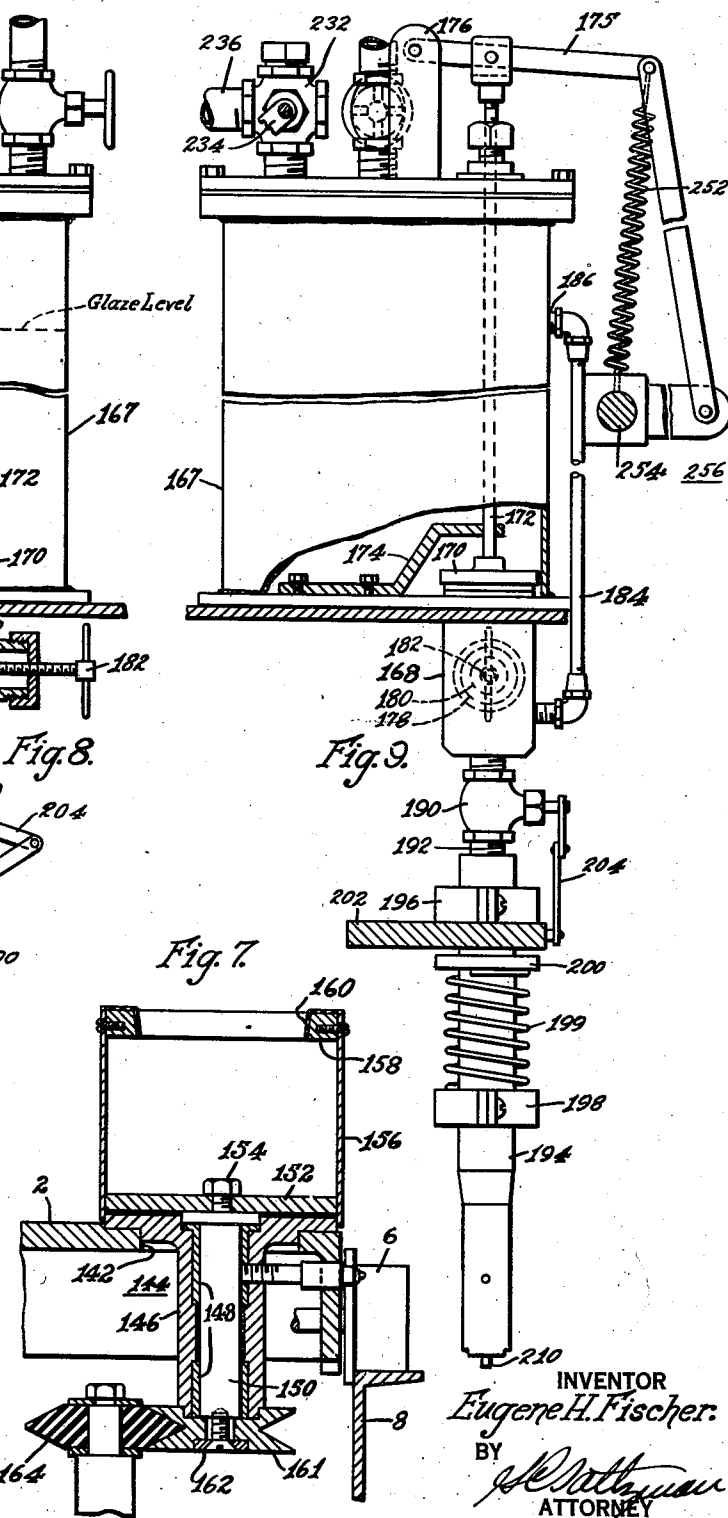
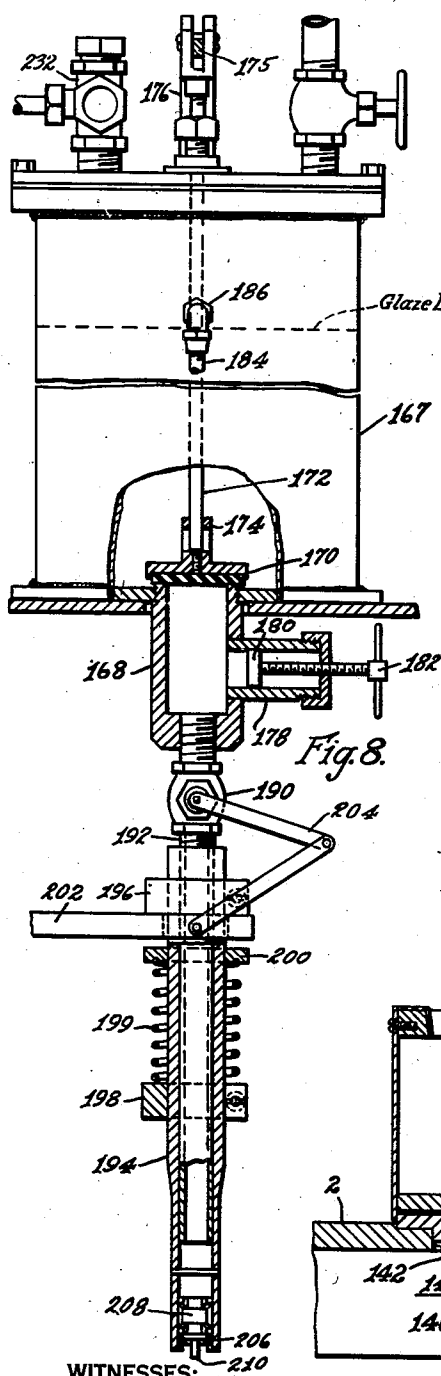
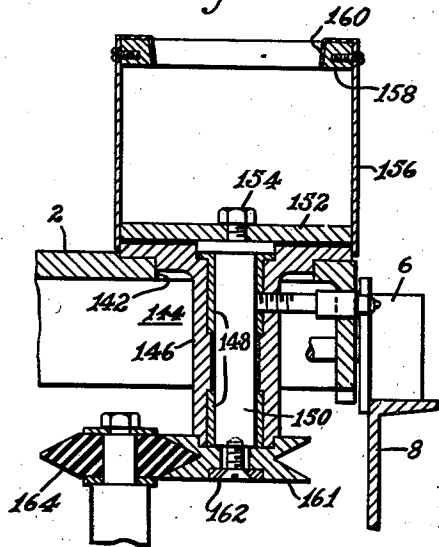


Fig. 7



WITNESSES:
E. J. Oberheim
David Schneider

INVENTOR
Eugene H. Fischer.
BY
Attorney

Nov. 2, 1943.

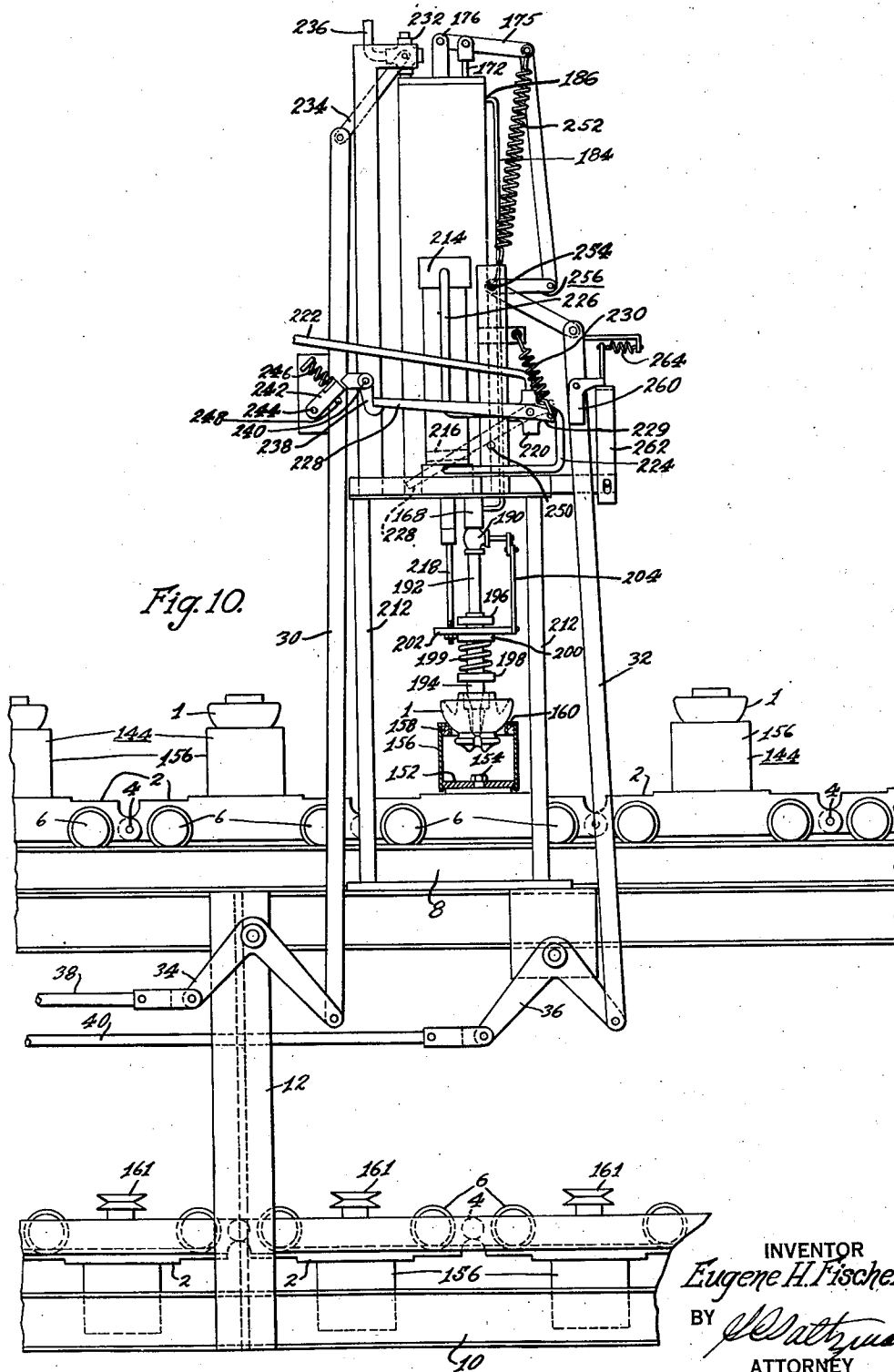
E. H. FISCHER

2,333,557

COATING OF INSULATORS

Filed July 31, 1940

7 Sheets-Sheet 5



Nov. 2, 1943.

E. H. FISCHER

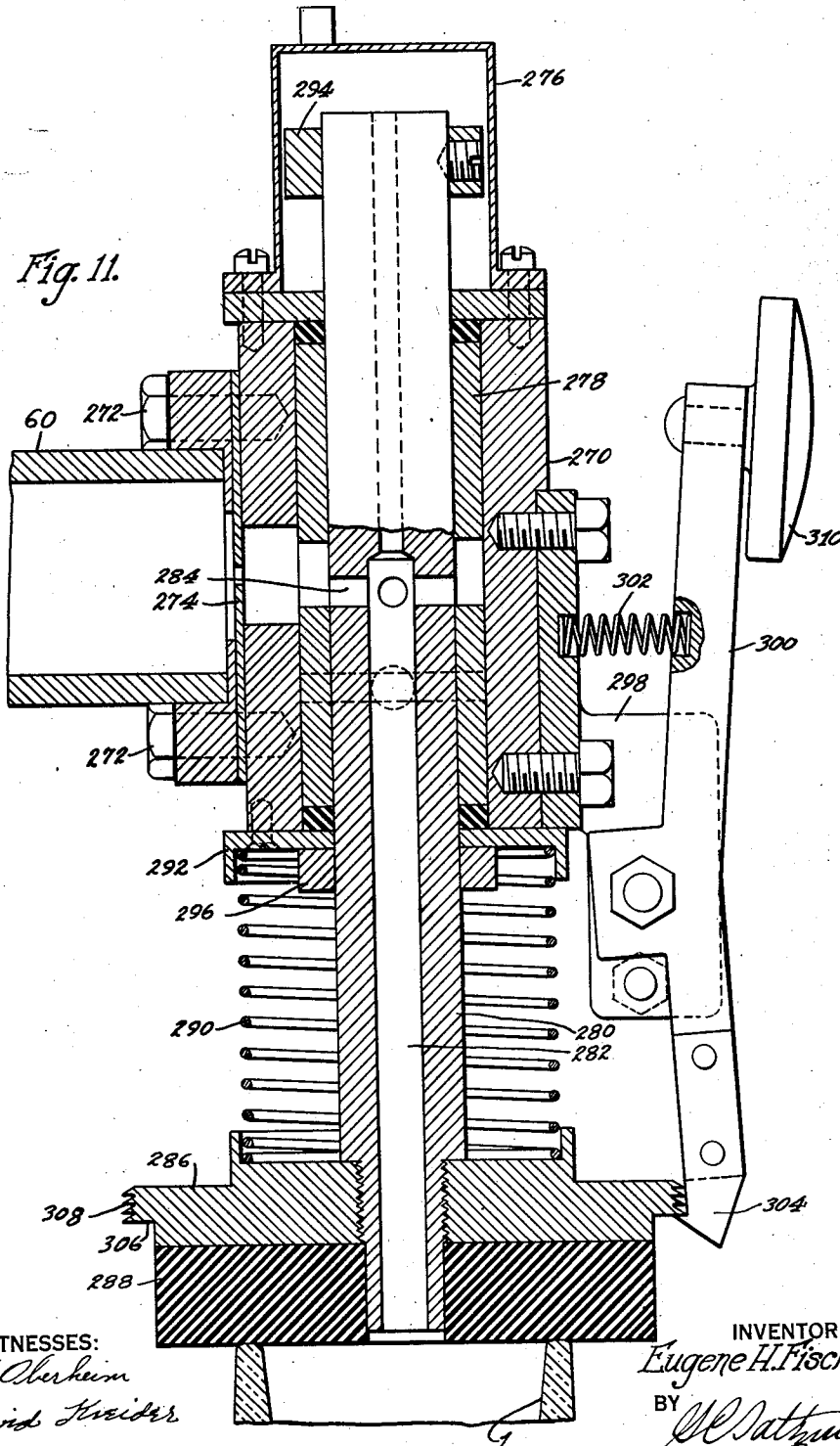
2,333,557

COATING OF INSULATORS

Filed July 31, 1940

7 Sheets-Sheet 6

Fig. 11.



WITNESSES:
E. A. Oberheim
David Kreider

INVENTOR
Eugene H. Fischer.
BY *W. Nathan*
ATTORNEY

Nov. 2, 1943.

E. H. FISCHER

2,333,557

COATING OF INSULATORS

Filed July 31, 1940

7 Sheets-Sheet 7

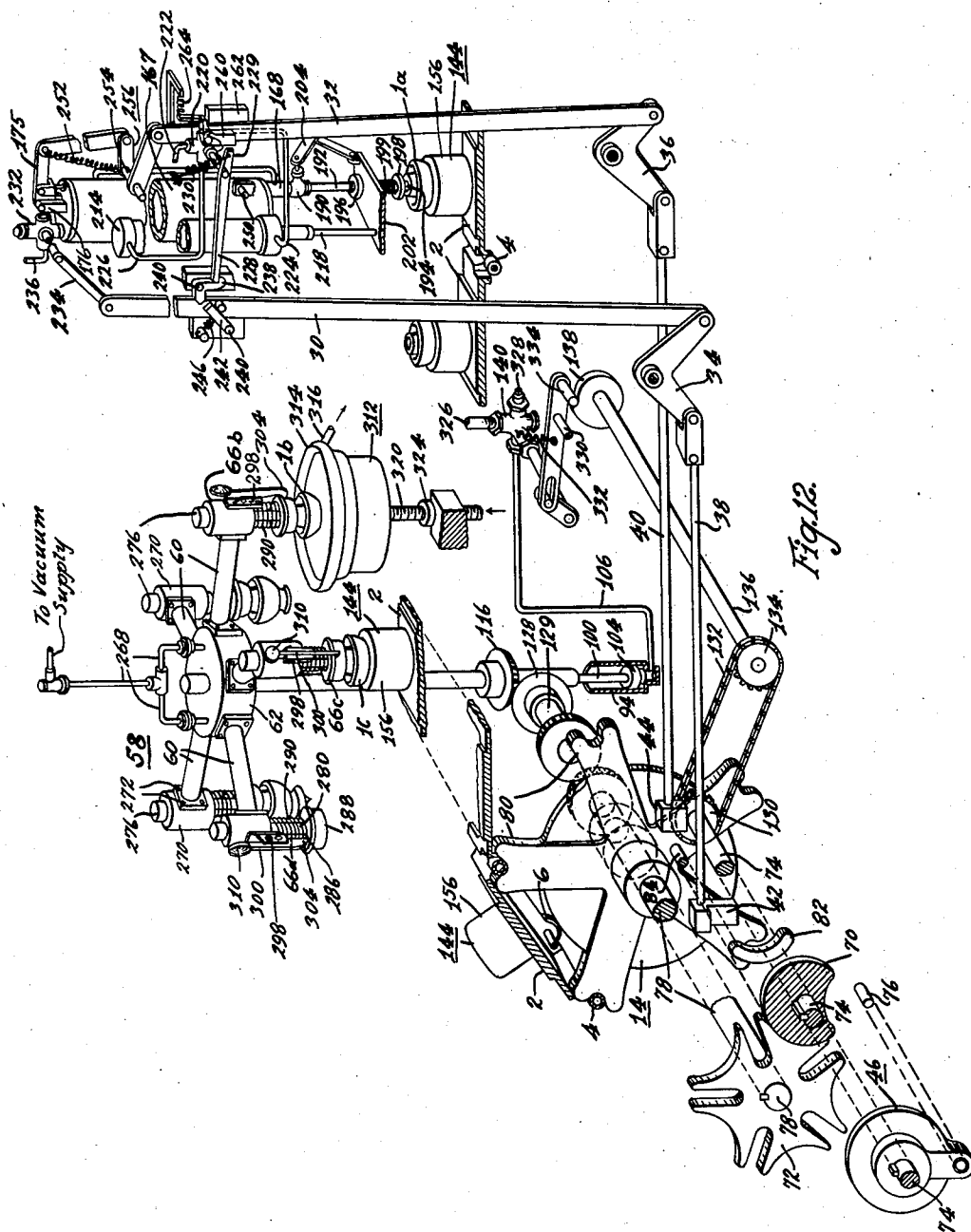


Fig. 12.

WITNESSES:

E. F. Oberheim

David Freider

INVENTOR

Eugene H. Fischer.

BY

W. H. Hattman

ATTORNEY

UNITED STATES PATENT OFFICE

2,333,557

COATING OF INSULATORS

Eugene H. Fischer, Derry, Pa., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application July 31, 1940, Serial No. 348,804

15 Claims. (Cl. 91—18)

The present invention relates to the coating of ceramic bodies and it has particular relation to the application to electrical insulating bodies of coatings which are to cover only a predetermined portion thereof.

In the electrical insulator art, it has become common practice to apply a conducting coating to portions of insulators, generally in addition to the regular glaze, for such purposes as the suppression of radio interference. This conducting coating is applied to the insulator surface at and adjacent to the points of contact with conductors and other metallic parts or members to reduce electrical discharge to the insulator surface. The coating material employed is preferably a liquid of the composition described in Hunt U. S. Patent No. 1,973,076, while further consideration of the principles involved may be found in Patents Nos. 1,997,688 and 1,997,686.

Insulators of the pin-type, for example, are generally provided with a coating of this type at the upper surface to cover the conductor and tie-wire groove portions and also within the pin hole. For each type and size of insulator, the most efficient and effective extent of the conducting coating is readily determinable. Since application of the coating to any greater amount of the surface results in a waste of material and may impair the effectiveness of the insulator, the industry has encountered the problem of accurately and uniformly applying this material to the proper surface portion of the insulator in an inexpensive and efficient manner.

According to one embodiment of the present invention, an intermittently driven conveyor is provided to carry insulators placed thereon in sequence to a pair of predetermined stationary positions serving as operating stations. At the first of these stations a tube is automatically lowered into the pin hole of an inverted insulator and a measured amount of coating material is passed through the tube to fill the pin hole to the height to which a coating is desired therein. The tube is then connected to a vacuum source in the top of the coating receptacle and the coating material in excess of that adhering to the surface of the pin hole is withdrawn from the bottom thereof. The tube is next withdrawn from the pin hole after which the insulator is moved to the second station. A multi-armed member which is intermittently rotated in synchronism with the conveyor moves downwardly as each insulator reaches this second position and grips it to remove it from the conveyor. At the same time another arm of the conveyor dips

an insulator previously picked up by it to a predetermined depth in coating liquid disposed in a constant level receptacle disposed elsewhere along the periphery of the rotating member.

Thus, the device continuously coats the desired portions of the insulators at a rapid rate and it is only necessary for an operator to place the articles on the conveyor at some point in its travel and remove them from the rotating member after completion of the coating process. It will appear evident that the invention is not limited to any particular type of insulator and may be used to coat articles with materials other than the conducting or semi-conducting compound previously described.

It is accordingly an object of the present invention to provide an improved method and means for applying a coating to ceramic bodies.

It is another object of the invention to provide improved apparatus for coating a predetermined portion of the surface of electrical insulators.

Another object of the invention is to provide improved apparatus for coating recesses in electrical insulators to a predetermined height.

A further object of the invention is to provide apparatus for automatically applying coating material to the pin holes and a portion of the outside surfaces of electrical insulators of the pin type.

Other objects and advantages of the invention will appear from the following detailed description taken in conjunction with the accompanying drawings in which:

Figure 1 is a side elevational view of apparatus built in accordance with the present invention;

Fig. 2 is a plan view of the apparatus of Fig. 1;

Fig. 3 is an enlarged vertical sectional view of a pin type insulator illustrating a type of glaze coating which may be applied thereto by means of the invention;

Fig. 4 is an enlarged side elevational view of the driving end of the apparatus of Fig. 1 with parts broken away;

Fig. 5 is an enlarged view, partly in section of the intermittent driving and cam mechanism of the apparatus;

Fig. 6 is an end view partly in section and at an enlarged scale, of the apparatus of Figs. 1 and 2;

Fig. 7 is an enlarged vertical sectional view taken along the line VII—VII of Fig. 2;

Fig. 8 is an enlarged view, partly in section and partly in side elevation of the pin hole glaze-

ing equipment taken from the direction of the right hand end of Fig. 1;

Fig. 9 is a view similar to Fig. 8 but taken from a direction displaced ninety degrees clockwise therefrom;

Fig. 10 is an enlarged side elevational view of a portion of the apparatus of Fig. 1 including the pin hole glazing equipment;

Fig. 11 is an enlarged vertical sectional view of the chuck shown in Figs. 1 and 2;

Fig. 12 is an exploded perspective view, with parts broken away, of the driving and controlling connections of the apparatus; and

Fig. 13 is an elevational view of a portion of the control mechanism of Fig. 12.

In the drawings is shown apparatus for treating an insulator 1 such as is shown in Fig. 3 in accordance with the invention. The embodiment illustrated is such as will coat the pin hole of the insulator with glaze to a predetermined height as indicated at *a* and the outer top surface as at *b* for a predetermined distance.

Referring now to Figs. 1 and 2, the apparatus includes a conveyor comprising a plurality of cars or trays 2 which are pivotally connected to each other by means of roller pins 4 to form an endless chain. Each of these cars includes wheels or rollers 6 which engage a metal track 8 in the upward portion of their travel. The track-way 8 is secured to base members 10 by means of a plurality of supporting beams 12. The cars are arranged to be driven by a driving sprocket 14 located at one end of the track while an idler sprocket 16 is located at the other end. The idler sprocket is fixed to a shaft 18 seated in bearing members 20 which are adjustable horizontally along a pair of supporting bars 22. This adjustment is made by means of a screw threaded member 24 which is attached to the bearing 20 and engages threads in a stationary member 26.

Located near one end of the conveyor is a pinhole glazing apparatus indicated generally at 28, the operation of which is synchronized with the intermittent movement of the table by means of a pair of vertical rods 30 and 32. These rods are operated through bell cranks 34 and 36, respectively, by means of horizontal push rods 38 and 40. On the ends of these push rods are located at pair of cam followers 42 and 44 which are operated from a conveyor driving disk 46 in a manner which will hereinafter be explained. The push rod 38 is supported from the track supports 12 by means of brackets 48 while the rod 40 is slidably supported in holes in the member 12. Each of these rods has secured thereto a collar 50 engaging a compression spring 52 which bears against its stationary support to bias the rods toward the driving disk. Also secured to the conveyor supporting structure are a pair of snubbers 54, one of which engages each of the push rods at 56 to control the rate of motion thereof.

Located near the driving end of the conveyor is a dipping assembly 58 which includes a plurality of angularly spaced arms 60 attached to an index head 62 which is, in turn, supported from a vertical column indicated at 64. The index head is adapted to operate in synchronism with the conveyor and on the end of each of the arms is disposed a chuck 66 for gripping an insulator when it is disposed at a particular position of the conveyor.

Having particular reference to Figs. 4 and 5, the driving sprocket 14 is arranged to be driven

from a motor 68 through an intermittent drive including a driving disk 70 and a Geneva gear 72. The driving disk 70 is keyed to a driving shaft 74 which is driven by the motor and includes a driver pin 76 for engagement between the spokes of the Geneva gear to intermittently drive a shaft 78 to which it is attached. With a Geneva gear having 5 spokes, as shown, it will be evident that its shaft will be rotated through $\frac{1}{5}$ of a revolution for each revolution of the driving disk. Likewise, the sprocket 14, which is fixed to the shaft 78 will be driven $\frac{1}{5}$ of a revolution during the same time. Since the rollers 4 between the trays are adapted for engagement by spokes 80 of the driving sprocket, each of them will be driven a predetermined distance during the motion of the sprocket to bring each of them, in turn to a predetermined stationary position.

Attached to one side of the driving disk 70 is a cam shoe 82 while a cam pin 84 extends further out from the leading edge of this cam shoe. The cam shoe and cam pin are disposed to engage the cam followers 42 and 44, respectively to actuate the push rods 38 and 40 in synchronism with the movement of the conveyor.

As is best shown in Fig. 6, the vertical column 64 for the dipping mechanism is secured at its bottom to a metal flange 86 which is in turn attached by any suitable means to a base member 88. Disposed within the lower end of this column is a metallic base member 90 having a recess 92 within which is seated the lower end of a cylindrical body 94. A cylinder bonnet 96 having an opening 98 through which a main vertical shaft 100 extends is disposed on the upper end of the cylinder while suitable packing means 102 surrounds the shaft at this point. A piston member 104 is secured to the lower end of the shaft 100 to fit snugly within the cylinder while an air-pressure pipe 106 communicates with the bottom of the cylinder at a point below the lowermost travel of the piston. The index head 62 is secured to the shaft 100 in a vertically adjustable position between nuts 107 engaging the screw threaded upper end thereof.

Located within the upper end of the vertical column 64 is a top bearing support 108 which carries a bushing 110 for engaging the shaft 100. A central bearing support 112 is disposed in the vertical column intermediate the ends and also includes a bushing 114 for engaging the shaft 100. A bevel gear 116 is attached to the shaft 100 at a point above the central bearing support by means of a key 118. This key fits into a longitudinal slot 120 in the shaft 100 so that the shaft itself may be moved vertically upward while the gear 116 remains stationary. The gear is held in the stationary position by means of a bearing spacer 122 which engages the top bearing support at its upper end and is secured at its lower end to a collar member 124. This collar member 124 engages the gear 116 through a bearing 126.

Having reference also to Figure 12, it will be seen that this gear 116 is engaged by another bevel gear 128 which is secured to a shaft 128 driven from the shaft 78 which carries the Geneva gear already described. In addition, a sprocket wheel 130 is secured to the driving disk shaft 74 and engaged by a chain 132 to drive another sprocket member 134. The sprocket 134 is keyed to a shaft 136 which has a cam 138 at its other end for operating a valve 140 for controlling the admission of air to the pipe 106.

Within each of the trays 2, there is disposed a pair of parallel holes 142 within one of which is located a support 144. As is best shown in Figure 7, a spindle body 146 is disposed within the aperture 142 and secured to the tray by bolts or the like. Within the spindle body are a pair of bushings 148 for engaging a rotatable vertical spindle 150 to which is secured a base member 152 by means of a bolt 154. To this base is secured a pot or holder body 156 in any suitable manner, while an adapter member including an annular body 158 is bolted to the upper end thereof. A rubber pad 160 is preferably cemented to the annular member to prevent injury to the surface of an article disposed therein.

To the lower end of the spindle 150 is secured a V-pulley 161 by means of a bolt 162. This pulley is disposed to engage a rubber driver 164 of cooperating shape driven by a motor 166 (Fig. 1) when it reaches a predetermined stationary position. The motor 166 is preferably supported directly from the main track supporting structure.

The pin hole glazing apparatus includes a glaze tank 167 which is best shown in Figs. 8 and 9. At the lower end of the glaze tank is located a measuring container 168 which communicates therewith through a valve 170 attached to a valve rod 172. The valve rod 172 extends through a guide member 174 disposed in the tank and through the top of the tank where it is connected to an operating lever 175, which, in turn, is pivotally secured to the tank at 176. On the side of this measuring container is an adjustment cylinder 178 in which is disposed a piston 180, the position of which may be controlled by a handle 182 to vary the capacity of the measuring unit. A return pipe indicated at 184 extends from a lower portion of the measuring container to the side of the glaze tank at a point 186 disposed above the glaze level therein as indicated.

Connected to the bottom of the measuring container through a glaze valve 190 is a pipe 192 which forms the inner member of a telescoping tube. A second tube 194 extends around the pipe 192 in longitudinally movable relationship thereto to complete the telescoping tube. A pair of separable collars 196 and 198 are secured to this outer tube 194 while a compression spring 199 is disposed therebetween with a seat member 200 at its upper end. An operating plate 202 is located beneath the collar 196 to engage the spring seat 200 for moving the outer member 194 downwardly along the inner pipe 192 to extend the unit. An operating lever 204 for the valve 190 is secured to the operating plate 202 to open the valve upon the tube being extended a predetermined amount. In the lower end of the tube 194 is disposed a valve seat 206 for engagement with a drop valve 208. This drop valve includes a downwardly projecting pin 210 and is of such weight that after being opened by being moved upwardly within the tube, it will automatically close because of its own weight.

As is shown in Figure 10, the glaze tank 167 is mounted in a stationary position of supports 212 attached to the track 8, while an air cylinder 214 is similarly supported therefrom. Within the air cylinder is disposed a piston 216 to which is attached a rod 218 connected to the operating plate 202. A four-way valve 220 communicates with a source of air pressure through a pipe 222 while other passages communicate through pipes 224 and 226, respectively, with the upper and lower portions of the air cylinder 214. An oper-

ating lever 228 is arranged to cause communication between pipes 222 and 226 while in the substantially horizontal position shown, while it causes the pipe 222 to communicate with the lower portion of the air cylinder through the pipe 224 when in a position displaced substantially 45 degrees counter-clockwise therefrom as shown in the dotted lines. At the end of the lever 228 near the valve 220 is a downwardly bent portion indicated at 229 which is connected to a spring 230 secured to the framework.

Another valve 232 is disposed on top of the glaze tank 167 and is provided with an operating lever 234 which, in the position shown, 15 causes communication between a pipe 236 leading from a vacuum source and the interior of the receptacle. Movement of the lever upwardly in a clockwise direction causes the upper portion of the tank to communicate with the atmosphere. A latch member 238 is pivotally attached to the stationary framework at 240 to ordinarily retain the operating lever 228 in the position shown against the bias of the spring 230. An operating lever 242 is pivotally attached to the stationary frame at 244 with a compression spring 246 biasing it in a clockwise direction against a stop 248 on the vertical rod 30 to swing the latch 238. The member is thus adapted, upon upward movement of the rod 30 30 to pivot the latch 238 in a clockwise direction and permit the spring 230 to swing the operating lever 228 downwardly to the dotted position against a stop at 250.

A spring 252 extends from an end of the 35 lever 175 to a shaft 254 on the supporting structure to bias the valve rod 172 downwardly to closed position. The shaft 254 is part of a rotatable link mechanism 256 which is adapted to raise the valve rod 172 to open the valve 170 in response to upward movement of the rod 32. Also secured to the vertical rod 32 is an operating latch 260 which is adapted to be engaged by a stationary arm 262 upon downward motion of the rod and rotated counterclockwise against 45 the biasing action of a tension spring 264 to engage the portion 229 of the operating lever 228. This action results in moving the lever 228 from its down position to the up position shown.

Referring to Figs. 6 and 11, it will be seen that 50 the spindle head 62 includes an annular passage 266 which communicates with the interior of the arms 60 as well as with tubular members 268 which lead to a vacuum pump or tank, as indicated. On the end of each of the arms, there is disposed a tubular casing 270 which is secured thereto by means of bolts 272 while an apertured baffle member 274 extends therebetween. A cap portion 276 is fitted over the top of the casing in sealed relationship while a bushing 278 is centrally arranged within it. Within the bushing is located a tubular shaft 280 which is slidably arranged within the casing and includes an axial opening 282 communicating with a radial opening 284. The radial opening is arranged to communicate with the interior of the arm 60 through apertures in the casing and bushing when the shaft 280 is in an upward vertical position.

To the lower end of the shaft 280 there is secured a horizontal plate 286 to which is cemented a soft rubber pad 288. An aperture is provided in the pad 288 to permit communication of vacuum with the interior of the insulator engaged thereby. A compression spring 290 75 is disposed around the shaft 288 between the

member 286 and a bottom member 292 attached to the casing 270. In addition, collars 294 and 296 are secured to the shaft 280 to limit respectively the downward and upward motion thereof.

A bracket member 298 is secured to the casing, as indicated, in order to pivotally support an operating lever 300. A spring 302 is disposed between the casing and the operating lever to bias the lower portion of the lever including prong 304 inwardly. The prong 304 is adapted to engage either the lower surface of a flange 306 on the member 286 or one of the annular grooves 308 therein.

Thus when the chuck is moved downwardly so that the rubber pad 288 engages an insulator such as that indicated at 1, the tubular shaft is pushed upward in the casing to bring the opening 284 into communication with the vacuum source. At the same time, the operating lever, being biased inwardly, grips the flange 306 or one of the grooves 308 therein to lock the shaft 280 in communication with the vacuum source after the chuck unit is moved upwardly and thus hold the insulator thereon. To release the article, it is only necessary to push inwardly on a knob 310 on the operating lever to permit the spring 290 to force the shaft 280 out of communication with the vacuum source.

At a predetermined position along the path of rotation of the arm 60 is disposed a receptacle 312 for glazing fluid. This receptacle is provided with annular overflow chamber indicated at 314 from which fluid may be removed by means of a tube 316 to maintain the level in the receptacle proper constant. At the same time, the interior passage of a tubular supporting member 320 communicates with the interior of the receptacle 312 to permit the pumping of additional fluid into it from the bottom. In order to prevent undue agitation of the fluid, a baffle plate 322 is disposed over this lower entrance. The support 320 is screw threaded and secured within a bracket 324 attached to the stationary part of the apparatus so that the vertical position of the receptacle may readily be adjusted.

The control of the valve 140 for causing vertical movement of the shaft 100 and index head 62 will be readily understood upon reference to Figs. 12 and 13. The four-way valve 140 may be of usual construction and in addition to communicating with the pipe 106 which leads to the air cylinder 94 has another passage connected with a compressed air source through a pipe 326. The remaining passages are closed by a plug 328 and open to the atmosphere, respectively. An operating link assembly for the valve is pivoted about a fixed point 330 and connected to a spring 332 to bias a pin 334 thereon against the surface of the cam. In the embodiment shown the pipe 106 is open to the atmosphere when the pin 334 engages the lower cam surface and is connected to the air pressure pipe 326 when the pin bears against the raised surface of the cam.

The operation of the device may be best explained upon reference to Fig. 12 which shows the relative positions of the operating elements with the apparatus in the same position shown in the drawings. The operating plate 202 is down, retaining the tubular member in extended position in the stationary insulator 1a. At the same time, the dipping mechanism is also in its downward position so that an insulator 1b on one of the chucks 66b is being dipped to a predetermined depth in the receptacle 312. Upon further movement of the disk 70, but previous to movement of

the Geneva gear, the cam shoe 82 engages the cam follower 42 to push the operating shaft 38 to the right, thereby causing upward movement of the rod 30. The lever 242 thus causes the latch 238 to disengage the lever 228, thereby causing the compressed fluid in pipe 222 to communicate with the bottom of air cylinder 214 causing the piston 216 to move the telescoping tube upwardly out of the pin pole of the insulator. At the same time, the raised portion of the cam 138 engages the pin 334 causing the valve 140 to permit the passage of compressed air into the bottom of the cylinder 94 to raise the index head 62 of the dipping mechanism upwardly and withdraw the insulator 1b from the receptacle 312. At the same time another chuck 66c lifts from the conveyor an insulator 1c which it engaged while the unit 58 was in the down position.

A short time later, the rod 30 has moved far enough to cause the interior of the receptacle 167 to communicate with the atmosphere through the valve 232. In the meantime, the cam pin 84 has come into engagement with the cam follower 44 to cause upward movement of the vertical rod 32 for rotating the link 256 to the position at which the arm 172 opens the valve 170. The measuring chamber 168 is then immediately filled with glazing or coating liquid and the rod 32 moves downward to again close the valve 170. While traveling downwardly, however, the rod moves the latch 260 into engagement with the end 229 of the operating lever 228 to move it again to its original position in which the air pressure pipe 222 communicates with the upper portion of the cylinder 214. This results in downward movement of the rod 218 and accordingly, of the entire telescoping mechanism.

In the meantime, the operating pin 76 has come into engagement with the Geneva gear 72 and the conveyor mechanism has moved the length of one tray so that the next insulator is directly under the telescoping tube in a stationary position. During the same time the dipping mechanism has been rotated in a counter clockwise direction to bring the next chuck 66d to a position directly above another insulator which has been moved to the stationary position which was primarily occupied by 1c. At the same time the chuck 66c and article 1c are moved to the position over the receptacle 312. The downward motion of the operating plate 202 opens the valve 190 to permit the material from the measuring container 168 to enter into the tube portion, and upon the pin 210 on the stop valve engaging the bottom of the pin hole, the measured amount of material flows out.

Being longer in operation than the rod 32, the rod 30 is still traveling downwardly during the aforementioned operations and it reaches a position, opening the valve 232 to the vacuum source immediately after the material has been poured into the pin hole. With the upper portion of the receptacle 167 at vacuum pressure, the material in the pin hole is then drawn upwardly through the telescoping tube, the measuring container 168, and through the return pipe 184, into the receptacle. The drop valve 208 closes itself immediately upon its pin coming out of contact with the bottom of the pin hole and thus prevents any dripping of material during removal of the telescoping tube.

While the driving pin 76 is out of engagement with the Geneva gear the lower portion of the cam 138 engages the pin 334 causing the valve

140 to connect the pipe 106 to the atmosphere. The mechanism 58 then drops to its lower position in which the chuck positioned directly over the insulator at position 1c engages it and the insulator gripped by the chuck directly over the receptacle 312 is dipped therein.

While each tray 2 is at the stationary position at which the driving wheel 164 of the motor 166 (Fig. 2) engages the pulley 162 the holder and article thereon will be rotated. Although not necessary to the invention, it is preferred to provide this rotation since it facilitates drying of the glaze in the pin hole. Further this makes it convenient to adapt the mechanism for stripping or spraying the articles with a spray gun, if desired.

It will appear evident that the apparatus may be readily adapted to handle articles of various different sizes. The position of the index head 62 on the movable shaft 100 may be adjusted by means of the nuts 107 while the vertical position of the glaze tank may be changed through the medium of the bracket support 324. Different sized adapters 158 may be used in the holder units and, if desired the size of the holders themselves may be changed. The chuck units 66 readily accommodate themselves to slight variations in insulators of the same general size because of the grooves 308 thereon. Further, the effective volume of the measuring cylinder 168 may be varied through the medium of the adjustment cylinder 178. The speed of operation is controllable in a simple manner while the various cams may be designed to provide the most desirable operating cycles.

While only one of the holes 142 in each tray is shown provided with insulator holders and only a single dipping mechanism 58 is employed, it will be evident that this and the pin coating mechanism may be duplicated to simultaneously treat two rows of insulators. It is also within the scope of the invention that electrical timing and solenoid equipment may be substituted for the mechanical cam arrangements shown to properly control the cycle of operation.

Since these and numerous other modifications may be made without departing from the spirit and scope thereof it is intended that the invention be limited only by the appended claims interpreted in view of the prior art.

I claim as my invention:

1. A device for coating the inner surface of a ceramic article having a recess therein comprising a movable member, means for intermittently moving said member, means for supporting a recessed article on said member with the open end of the recess disposed upwardly when said member is in a predetermined stationary position, means for introducing a predetermined amount of liquid coating material into the recess in the article while at said predetermined position, and means for withdrawing the excess of said coating material from the recess.

2. A coating device comprising a movable indexing member, means for intermittently moving said member, means for supporting a plurality of ceramic articles each having a recess therein on said member to cause it to successively move each of the articles to a predetermined stationary position with the open end of its recess disposed upwardly, means for introducing a predetermined amount of liquid coating material into the recess in an article at said predetermined position, and means for withdrawing the excess

of said coating material from said recess while the open end thereof is disposed upwardly.

3. A device for coating the inner surfaces of ceramic articles having recesses therein comprising a movable table for supporting a plurality of recessed articles in spaced positions, means for intermittently driving said table to successively move each of said articles to a predetermined stationary position with the open end of the recess disposed upwardly, means for automatically introducing liquid coating material to a predetermined depth in the recess in an article at said predetermined position, and means for automatically withdrawing from the recess the portion of the material not adhering to the surface thereof.

4. A device for coating the interior surfaces of ceramic articles having recesses therein comprising a movable member, means for supporting a plurality of recessed articles on said member in spaced relationship with the open ends of the recesses disposed upwardly, means for intermittently moving said member to move each of said articles successively to a pre-determined stationary position, a tubular member, means for moving said tubular member into the recess in an article at said position, means for introducing liquid coating material into said recess to a predetermined depth through said tubular member, means for withdrawing from the recess the portion of the material not adhering to the surface thereof, and means for withdrawing said tube from the recess prior to movement of the article away from said position.

5. A coating device of the class described comprising a movable table, means for supporting a plurality of pin type insulators on said table in spaced relationship with the open ends of the pin holes disposed upwardly, means for intermittently moving said table to move each of said insulators successively to a predetermined stationary position, a tubular member, means for automatically moving said tubular member downwardly into the pin hole in an insulator at said position, means for introducing a predetermined amount of liquid coating material into said pin hole through said tubular member, means for automatically withdrawing the coating material not adhering to the pin hole surface through said tubular member, and means for automatically withdrawing said tubular member from the pin hole prior to movement of the insulator from said position.

6. A coating device comprising a movable table, means for maintaining a plurality of articles each having a recess therein on said table in spaced relationship with the upper ends of the recesses disposed upwardly, means for intermittently moving said table to move each of said articles successively to a predetermined stationary position, a tubular member, means for automatically moving said tubular member into the recess in each article while at said predetermined position, a receptacle for liquid coating material, a measuring chamber, means for automatically causing periodic communication between said receptacle and said chamber to fill the chamber with coating material, means for automatically introducing the coating material from said chamber into the recess in the article through the tubular member therein, pumping means, means for automatically controlling said pumping means to withdraw from the recess the coating material not adhering to the surface thereof, and means for automatically withdrawing said tubular mem-

ber from the recess prior to movement of the article from said position.

7. A coating device comprising a movable table, means for maintaining a plurality of articles each having a recess therein on said table in spaced relationship with the upper ends of the recesses disposed upwardly, means for intermittently driving said table to move each of said articles successively to a predetermined stationary position, a tubular member, means controlled by said driving means for moving said tubular member into the recess in each article while in said predetermined stationary position and for removing it prior to movement of the article away from said position, a receptacle for liquid coating material, a measuring chamber, means controlled by said driving means for periodically causing communication between said receptacle and said chamber for a limited time during each movement cycle to measure a predetermined amount of material in the chamber, means controlled by said driving means for introducing the predetermined amount of coating material from said chamber into the recess in the article through the tubular member therein, and pumping means controlled by said driving means for withdrawing through said tubular member the portion of said coating material not adhering to the surface of the recess in the article and conducting it back into said receptacle.

8. A coating device comprising a movable table, means for supporting a plurality of similar ceramic articles each having a recess therein on said table in spaced relationship with the open ends of the recesses disposed upwardly, means for intermittently moving said table to move each of said articles successively to a predetermined stationary position, a tubular member including a normally closed valve on the end thereof which is operable to open position when said member extends into a recess in one of said articles in a predetermined position, means for automatically moving said tubular member into its said predetermined position into the recess of each of said articles while in said predetermined stationary position and for removing it prior to movement of the article away from its said position, means for automatically introducing a predetermined amount of liquid coating material into said recess through said tubular member while in its said predetermined position, and means for automatically withdrawing the coating material not adhering to the surface of the recess through said tubular member while in its predetermined position.

9. A device for coating the inner surface of ceramic articles having recesses therein comprising a movable conveyor member for supporting a plurality of recessed articles in spaced relationship, means driving said conveyor to successively move each of said articles to a predetermined stationary position with the open end of the recess disposed upwardly, means for automatically introducing a predetermined amount of liquid coating material into an article at said predetermined position, means for withdrawing from the recess the portion of the material not adhering to the surface thereof, and means for rotating each article when at a position subsequent to said predetermined position.

10. Apparatus for applying a coating to a ceramic article having a recess therein comprising a movable member, means for maintaining a plurality of recessed ceramic articles on said member in spaced relationship with the open ends of

the recesses disposed upwardly, means for intermittently moving said member to successively move each of said articles to each of two predetermined stationary positions, means for automatically introducing a predetermined amount of liquid coating material into the recess of an article at the first of said predetermined positions and withdrawing therefrom the portion thereof not adhering to the contacted surface, a receptacle for liquid coating material, means for automatically gripping an article while at said second predetermined position and removing it from said table to dip it to a predetermined depth in the coating material in said receptacle.

11. Apparatus for applying coating material to a pin type electrical insulator comprising a movable member, means for maintaining a plurality of pin type insulators on said member in spaced relationship with the open ends of the pin holes disposed upwardly, means for intermittently moving said member to successively move each of said articles to each of two predetermined stationary positions, means for automatically introducing a predetermined amount of liquid coating material into the recess of an article at the first of said predetermined positions and withdrawing therefrom the portion thereof not adhering to the contacted surface, a receptacle for liquid coating material, a rotatable member and means for intermittently driving it in synchronism with said movable member, a plurality of means on said rotatable member for holding insulators, means for moving said rotatable member when in non-rotating condition to cause one of said holding means to grip an insulator at said second predetermined position and remove it from said movable member, and means for subsequently dipping the insulator to a predetermined depth in the coating material.

12. Apparatus for applying coating material to a pin type electrical insulator comprising a movable member, means for maintaining a plurality of pin type insulators on said member in spaced relationship with the open ends of the pin holes disposed upwardly, means for intermittently moving said member to successively move each of said articles to each of two predetermined stationary positions, means for automatically introducing a predetermined amount of liquid coating material into the pin hole of each insulator while at the first of said predetermined positions and withdrawing therefrom the portion thereof not adhering to the contacted surface, a receptacle for liquid coating material, a rotatable member, spaced means on said rotatable member for gripping and holding insulators, means for intermittently rotating said rotatable member in synchronism with the movement of said movable member to successively bring each of said holding means over an insulator in said second predetermined position and subsequently to a second rotary position over said receptacle, and means for moving said rotatable member when in the non-rotating position to cause the holding means over said second predetermined position to grip the insulator thereat and the holding means at said second rotary position to dip an insulator thereof into the coating material a predetermined depth.

13. A coating device of the class described comprising a movable table, means supporting a plurality of pin type insulators on said table in spaced relationship with the open ends of the pin holes disposed upwardly, means for intermittently moving said member to successively

move each of said articles to each of two predetermined stationary positions, a tubular member, means for automatically moving said tubular member into the pin hole in each insulator while at the first said predetermined position and for removing it prior to movement of the insulator away from said position, means for automatically introducing a predetermined amount of liquid coating material into said pin hole through said tubular member extending thereinto, means for automatically withdrawing the coating material not adhering to the pin hole surface through said tubular member before its withdrawal from the pin holes, a receptacle for liquid coating material, a rotatable member and means for intermittently driving it in synchronism with said movable member, a plurality of spaced means on said rotatable member for gripping insulators when brought into contact therewith and holding them, means for moving said rotatable member when in non-rotating position to cause one of said holding means to grip an insulator at said second predetermined position and remove it from said movable member and to simultaneously dip an insulator previously gripped by another of said holding means to a predetermined depth in the material in said receptacle.

14. A device for coating the inner surface of articles having recesses therein comprising a receptacle for liquid coating material, a tube communicating with said receptacle and insertable into the recess of an article disposed with the open end thereof extending upwardly, means for introducing a predetermined amount of liquid coating material from said receptacle into the recess in the article through said tube, a passage defining member providing communication be-

tween said tube and the upper part of said receptacle above the level of the liquid therein, means for reducing the pressure in the upper portion of said receptacle above the level of the liquid material therein to pump the portion of the material in the recess not adhering to the surface thereof through said tube and said passage defining member into said receptacle.

15. A device for coating the inner surface of recessed articles comprising means for supporting an article in a predetermined position with the open end of the recess extending upwardly, a main receptacle for liquid coating material, a measuring receptacle designed to communicate with said main receptacle, a first valve for controlling communication between said main receptacle and said measuring receptacle, a telescoping tube communicating with said measuring receptacle, a second valve for controlling communication between said measuring receptacle and said tube, means for extending said telescoping tube to dispose the end thereof in the recess of an article at said predetermined position, means for closing said first valve prior to the extension of said tube, means for maintaining said second valve open while said tube is in extended position to introduce a predetermined amount of material into the recess from said measuring receptacle, a passage defining member for providing communication between said tube and the upper portion of said main receptacle above the level of the liquid material therein, and means for reducing the pressure in the receptacle above said liquid to pump the portion of the material in the recess not adhering to the surface thereof through said tube and said passage defining member into said receptacle.

EUGENE H. FISCHER.