Feb. 22, 1944. W. A. SMITH 2,342,307

SPRAYING MACHINE

Filed July 21, 1942 6 Sheets-Sheet 1

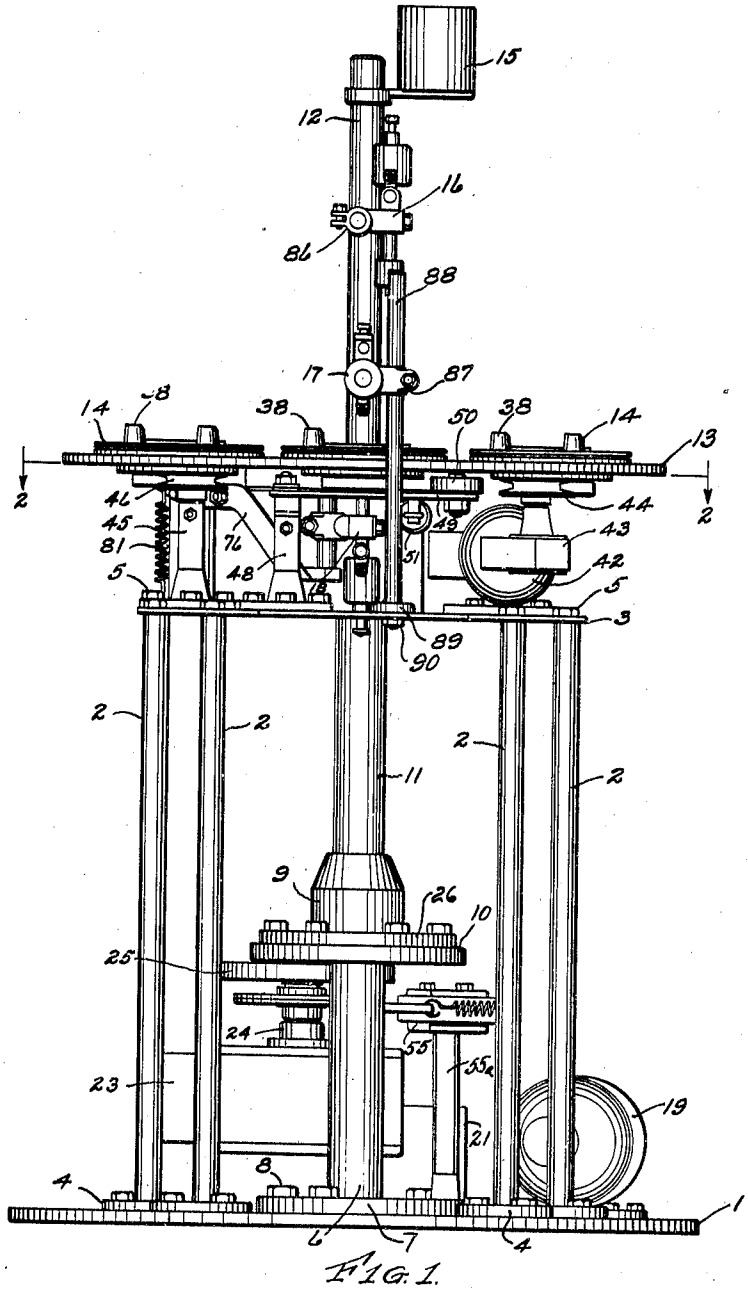


FIG. 1.

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SPRAYING MACHINE

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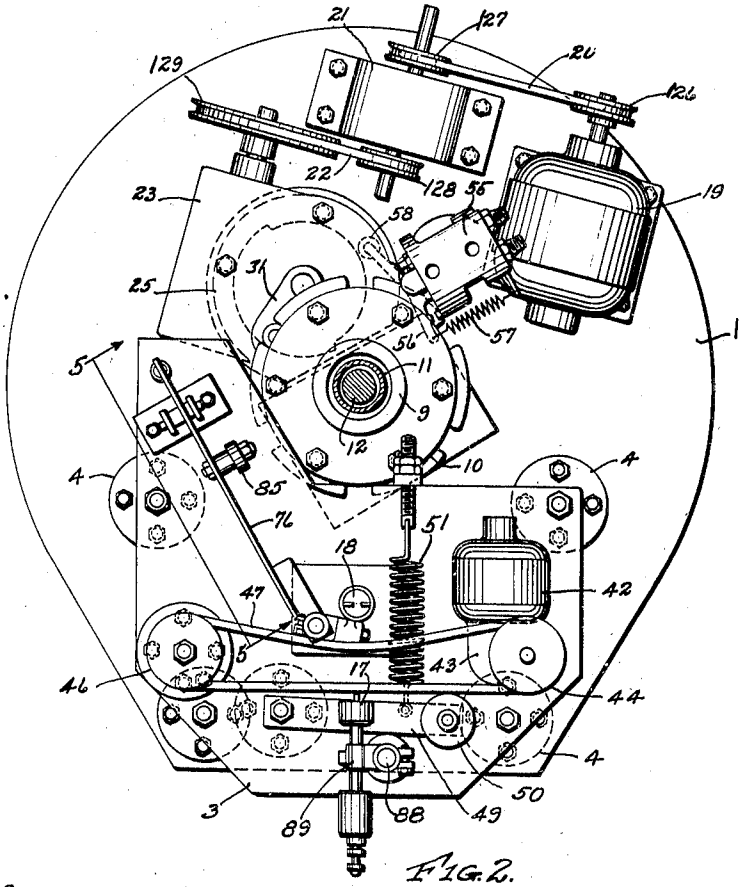


FIG. 2.

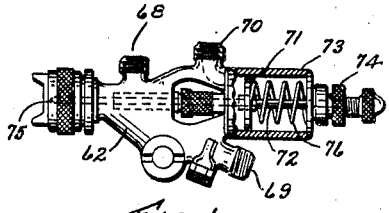


FIG. 6.

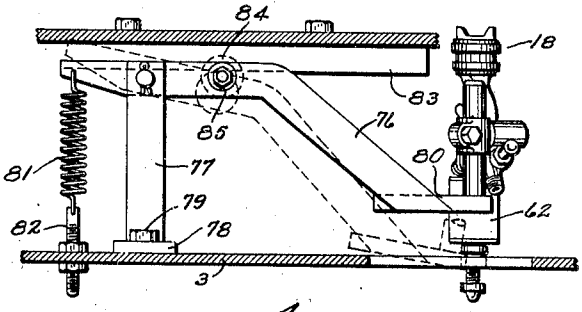


FIG. 5.

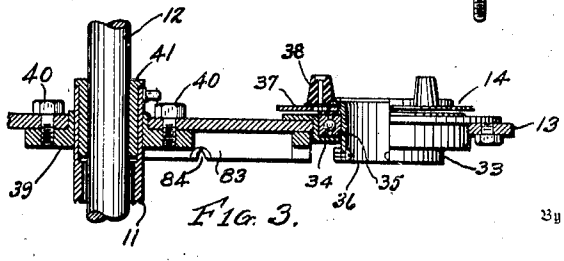


FIG. 3.

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SPRAYING MACHINE

Filed July 21, 1942 6 Sheets-Sheet 3

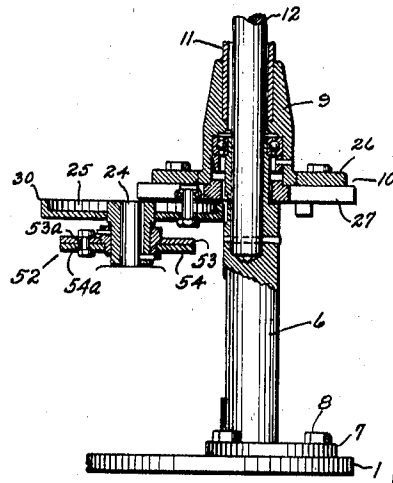


FIG. 4.

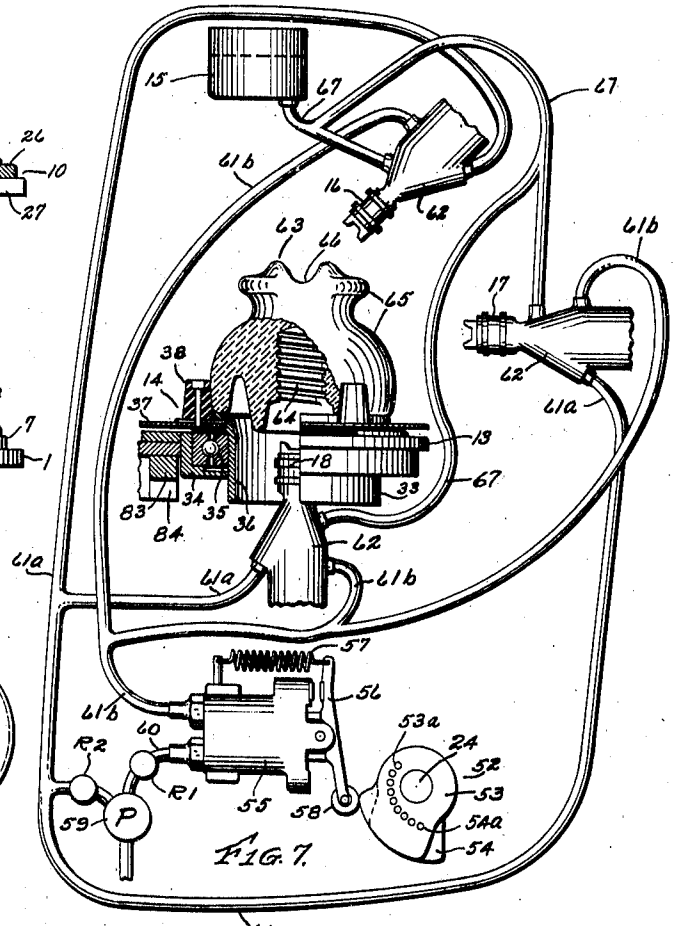


FIG. 7.

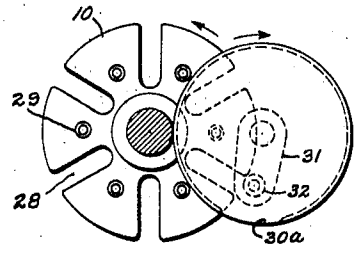


FIG. 8.

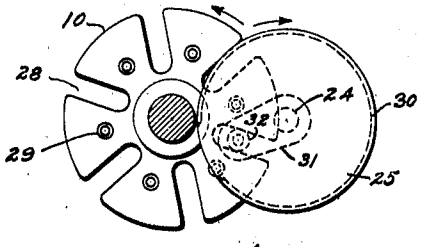


FIG. 9.

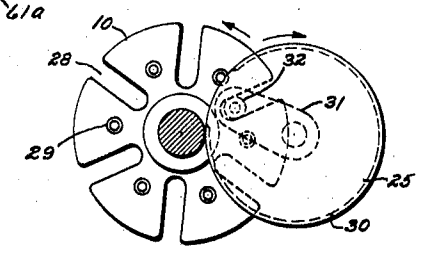


FIG. 10.

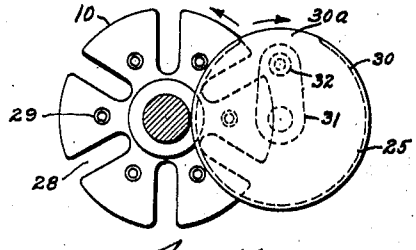


FIG. 11.

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SPRAYING MACHINE

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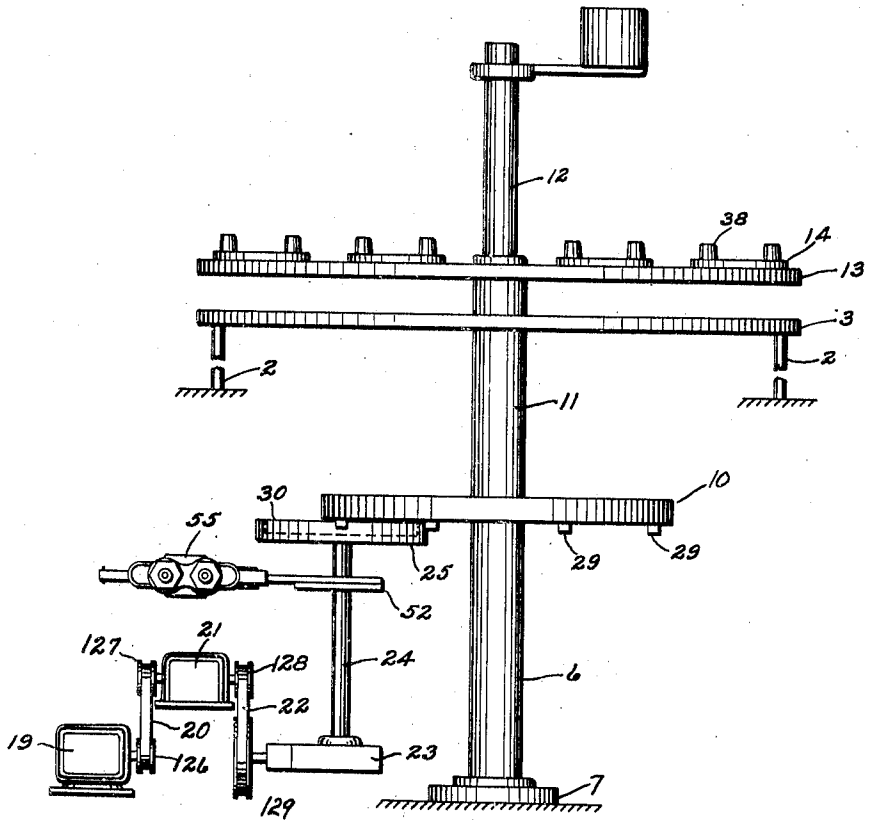


FIG. 12.

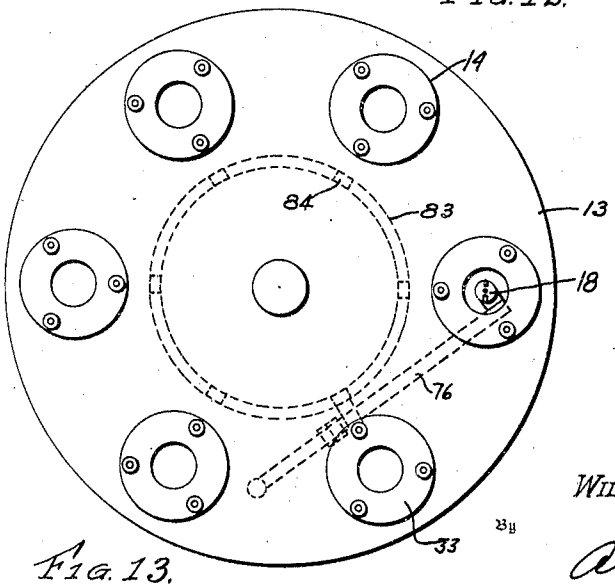


FIG. 13.

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Feb. 22, 1944. W. A. SMITH 2,342,307

SPRAYING MACHINE

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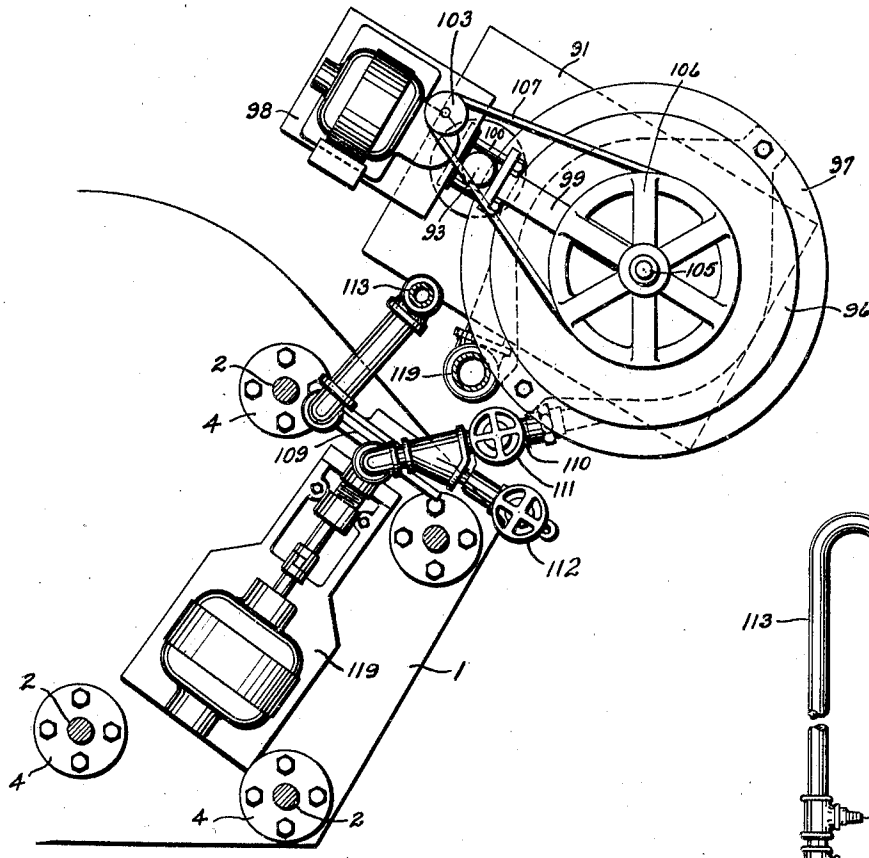


FIG. 14.

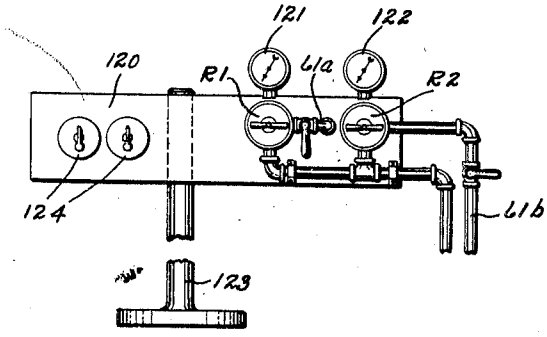


FIG. 18.

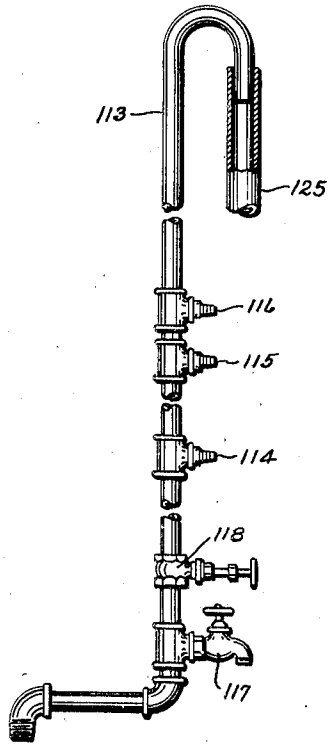


FIG. 16.

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SPRAYING MACHINE

Filed July 21, 1942 6 Sheets-Sheet 6

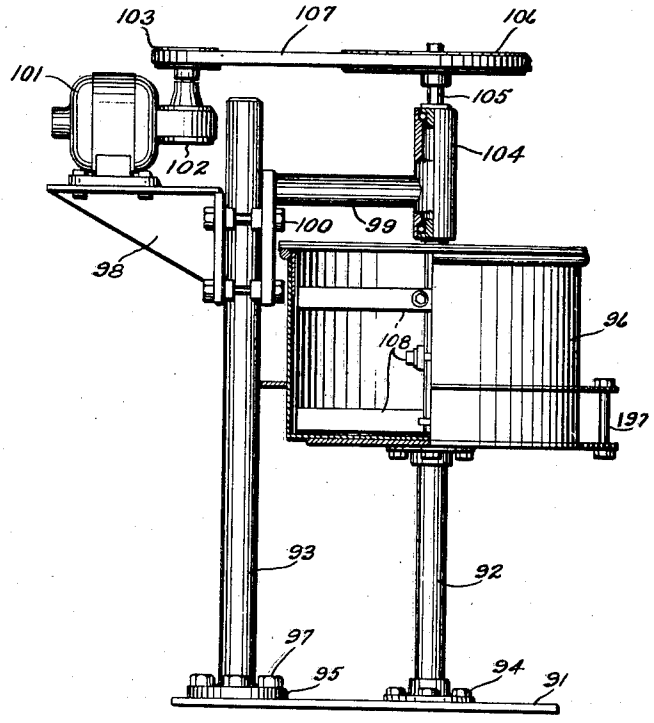


FIG. 15.

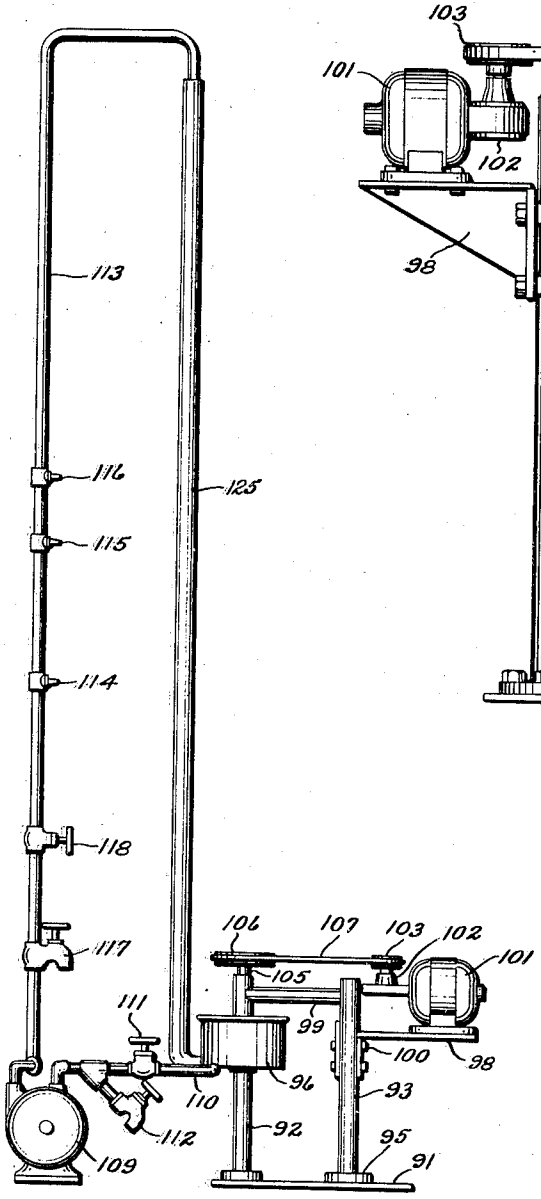


FIG. 17.

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Patented Feb. 22, 1944

2,342,307

UNITED STATES PATENT OFFICE

2,342,307

SPRAYING MACHINE

William A. Smith, Akron, Ohio, assignor to The Ohio Brass Company, Mansfield, Ohio, a corporation of New Jersey

Application July 21, 1942, Serial No. 451,801

22 Claims. (Cl. 91—45)

This invention concerns spraying machines and in its more specific aspects is particularly directed to a device whereby selected areas of a given work piece have a coating applied thereto.

The object of this invention is to construct a spraying machine in which selected areas of an insulator have a conducting coating applied thereto.

Another object of the invention is to provide a spraying machine having an indexable work table on which a plurality of rotatable work holder spindles are mounted.

A further object of the invention is to construct a machine for spraying specially prepared coatings on selected areas of an insulator which is adapted to successively index work pieces past a plurality of spray nozzles and which provides mechanism for rapidly rotating the work piece when it is stationed adjacent the nozzles.

Another and further object of the invention is to provide a spray machine for coating selected areas of a work piece; which includes mechanism for spraying only at such instances when the indexable table is at rest and the work holder is rotating and which shuts off the source of pressure fluid to the spray needle operating chamber when the work table is indexing.

Another and further object of the invention is to provide a mechanism that will pivot or vertically move a selected spray gun in timed relation with the indexing of a work table.

Another and still further object of the invention is to provide an improved indexing and locking mechanism for a spray machine.

Another and still further object of the invention is to provide a simplified transmission for a spray machine that incorporates a work spindle drive adapted to rotate the work spindle only when it is the direct range of the spray nozzles.

Another and further object of the invention is to provide mechanism for keeping the coating or glazing mixture supply to the nozzles under a constant head and which is further adapted to be characterized by the fact that such coating or glazing mixture or compound is kept in a state of agitation and circulation.

Other objects are to reduce cost and time of applying a conducting coating to insulators, to increase the quality of the ultimate product, increase production and eliminate tedious and unreliable manual operations.

Other and further objects of the invention will occur to those skilled in the arts to which this invention pertains as the description proceeds which taken in connection with the accompanying drawings sets forth a preferred embodiment of the invention but such disclosure is not to be construed as a limitation of the invention which is limited only by the appended claims and any and all modifications, alterations and variations of structure coming within the spirit and scope hereof are deemed to be included herein.

In the drawings:

Fig. 1 shows a front elevational view of a machine incorporating the invention.

Fig. 2 shows a view taken along the line 2—2 of Fig. 1.

Fig. 3 shows a detail of the work rotating spindle.

Fig. 4 shows an enlarged detail of the indexing mechanism.

Fig. 5 shows a detail of one of the tilting mechanisms for one of the guns.

Fig. 6 shows an elevational detail of one of the spray guns with parts in section.

Fig. 7 shows a schematic detail of the spray system and its organization with respect to a work piece.

Figs. 8–11, inclusive, show the progressive movement of the indexing device through a cycle of operation.

Fig. 12 shows a schematic elevational detail of the power transmitting mechanism and its connection with the table devices.

Fig. 13 shows a plan view of the work table.

Fig. 14 shows a plan view of a modification of the glazing compound agitating and pressure mechanism with parts in section to show detail.

Fig. 15 shows a side elevational view of the agitating mechanism with parts in section.

Fig. 16 shows a detailed elevational view of the pressure head mechanism.

Fig. 17 shows a schematic elevational view of the mechanism.

Fig. 18 shows a panel and control mechanism for the device.

The utilization of conducting glazers on various types of insulators, such as are now currently in use in the art, requires that those conducting coatings, which are usually characterized as of a comparatively high resistance, must be applied, in order that they shall accomplish their most effective purpose, to certain areas of the insulator or work piece. Generally speaking, such areas are adjacent to the region of contact between different materials or areas influenced by the shape of the insulator itself. By use of the high resistance conducting glaze, there is a redistribution of the electrostatic field created at regions which would otherwise be electrically over-

stressed and by reason of such redistribution there is a minimum disturbance to any radio broadcast reception in the vicinity by reason of the disturbing insulator. Inasmuch as the conducting glaze coatings have characteristics that are materially different from those of the usual glaze coatings, it is highly desirable and necessary that the conducting glaze coatings be applied only at the areas which would be electrically overstressed on an insulator not treated with conducting glaze. Previously, the conducting glaze coatings have been applied to the insulators by means of rather laborious hand methods, frequently by brushing, such as employed in a painting operation that tends to make the application of the conducting glaze coating a rather unsatisfactory procedure for the reason that the conducting glaze is not properly applied. Other methods were to use a simple manually actuated spray device in which the insulator is held in some appropriate manner or by hand and a relative rotatable movement applied to the insulator while the spraying operation was performed. This method likewise produced variable results for the reason that there was an indefinite application of the conducting glaze to the insulator and the time element for any given work piece was never the same as for any other work piece with the net result that there were various thicknesses of conducting glaze applied to the insulator. These results had a tendency to unnecessarily increase the cost of applying the conducting glaze coating. The applicant has, therefore, devised a mechanism that is adapted to apply the conducting glaze coating to any one of a number of preselected areas of an insulator and that will apply a predetermined amount of the conducting glaze coating to such areas which will result in the proper application of the glaze to the several preselected surfaces of the insulator in such a manner that the thickness of the glaze will decrease progressively to nothing at the outer extremity thereof and, therefore, the resistance will increase uniformly from the section of maximum glaze thickness to the outer edge of the treated area. There is a uniform rotation applied to the insulator and there is a standard unvarying time in which the several spray nozzles are held open during which time conducting glaze is applied to the insulators. It will be apparent, therefore, that by reason of a standardized speed of rotation and a definite time in which the conducting glaze coating is sprayed on to the several surfaces there will be a uniform distribution of the glaze coating applied to the insulators or work pieces. This automatically reduces variations in the coating on the insulators and has a tendency to reduce the amount of material used to the minimum required for the conducting glaze coating to serve its useful purpose.

The above improved ideas, structure and objects are embodied in the construction set forth in the several views of the drawings in which 1 is an appropriate base element of the machine to which a plurality of uprights 2, 2 are fixed and which uprights support a plate element 3 at their upper ends. The uprights are appropriately secured to the base element 1 by means of appropriate collars 4, 4 to which they are secured by cap screws, and at their upper ends they may be drilled and tapped and held by means of a plurality of screws 5 to the plate 3 thereby forming a supporting mechanism for some of the operating parts of the machine.

Supported on the base element 1 is a column 6 fixed to an appropriate flange 7 that is bolted by means of a plurality of screws 8 to the base plate 1. The column 6 rotatably supports a coupling element 9 to which a Geneva type cam wheel 10 is rigidly secured which is described in greater detail later in the specification. Secured to the coupling 9 is a tubular shaft 11 that extends upwardly through the plate 3 and has a column or support 12 arranged therein that extends beyond and above the operating mechanism of the machine to support other parts of the device. The support 12 is fixed to column 6 as is more clearly shown in Fig. 4. Fixed to the shaft or rod 11 is an indexable work table 13 that supports a plurality of rotatable work holders 14 driven by a mechanism likewise hereinafter more specifically set forth. The column 12 is adapted to support at its upper end a receptacle 15 intended to receive a conducting glaze compound as well as to support the uppermost spray nozzle 16. The receptacle 15 will maintain the glaze coating at the spray guns under a substantially constant head. The lower spray nozzle 18 is disposed below the table 13 on mechanism subsequently set forth. Spray nozzle 17 is substantially horizontally disposed above table 13.

The operating mechanism for the device originates in a motor 19 that is supported on the base plate 1 and is belt-connected by means of a power transmitting element 20 to a speed reducer 21 likewise supported on the base plate 1. The outlet or output side of speed reducer 21 is connected by means of a belt 22 to a gear box 23 from which the operating shaft 24 extends upwardly or at right angles thereto parallel to shaft 11 and has mounted thereon an arm or Geneva indexing element 25 cooperating with the Geneva cam 10 adapted to periodically rotate or index the table 13 through the tubular shaft 11. The shaft of motor 19 is provided with a belt pulley 126 and the input shaft of the speed reducer 21 is provided with a pulley 127, the latter two pulleys being connected by power transmitting means 20 and the output shaft of the speed reducer 21 has a pulley 128 thereon that is belt-connected by means of power transmitting element 22 to a pulley 129 fixed to the input shaft of the gear box 23. The purpose of the aforementioned mechanism is to cause the upright shaft 24 to rotate at a predetermined constant rate of speed.

The elements 10 and 25 in effect constitute a Geneva indexing mechanism and for various reasons, it has been found that the conventional Geneva wheel mechanism is unsatisfactory for the purpose of the instant device. There has been developed therefore a modified Geneva indexing mechanism whose structural detail is more particularly outlined in Figs. 8 through 11 which also discloses and sets forth the mode of operation thereof. The element 10 is in reality a two-part mechanism, one of which is a part of and integrally associated with the coupling mechanism 9 and more particularly designated by the numeral 26 to which is secured by means of a plurality of screws a circular slotted plate 27 that has arranged therein a plurality of radial slots 28, shown as six in number in the particular illustration, but which may have as many slots provided therein as it is desirable to have work holders or operating stations. Fixed to the one side of the slotted or grooved plate 27, preferably the bottom side, are a plurality of pin or roller devices 29 disposed centrally of the segments comprising the wheel element 27. The cam wheel 25 is a device that has a peripheral flange 30 thereon

that extends almost entirely around the outside or periphery of the wheel 25 and over a portion of the periphery it is cut away as at 30a more particularly illustrated in the several views of the drawing referred to. The cam arm 31 integrally associated with 25 has a roller 32 supported thereon at an appropriate distance from the center of the shaft 24 that is intended to selectively engage one of the slots 28 for rotating or indexing the table 13 and its associated work holders. The Geneva indexing construction just described serves a dual function of not only indexing the work table 13 but by reason of the arrangement of the rollers 29 and the peripheral flange 30 locks the table 13 during the period of rest. The several views 8, 9, 10 and 11 illustrate the course of movement of the slotted wheel 27 and the cam wheel 25 with its cam arm 31 and the flange 30. Fig. 8 shows the position of the wheels just prior to the commencing of an indexing operation and it will be noted at this point that the roller 32 of cam arm 31 is about to enter one of the slots 28. As soon as the roller 32 has entered the slot 28, it will begin to rotate the shaft 11 and when in the position of Fig. 9 the roller 29 that is on the succeeding segment will pass inside of the flange 30 through opening 30a in substantially the position shown in the said figure and upon continued rotation of the wheel 25 to the position shown in Fig. 10, then the roller 29 that was within the flange 25 initially is about to leave the inside position through opening 30a and be arranged externally of the flange 30. The two positions just described show that the cam arm 31 will be below the center line connecting the shafts 11 and 24 or to one side thereof as the one roller 29 is about to enter the inside position of the flange and when the preceding roller 29 is about to leave the interior of the flange 30 the roller 32 will be above or to the other side of the line connecting the centers of the respective shafts 11 and 24 or of the wheels 10 and 25. Fig. 11 shows the position of the elements 10 and 25 as soon as the indexing operation is complete and further illustrates that two of the rollers 29 function to lock the wheel 10 against an unintentional rotation. It should be observed in this figure that the two rollers engage the external surface of the flange 30 and the rotating movement of the wheel 25 will cause the engaging rollers 29, 29 to rotate but there can be no rotation of the element 10 until the next indexing movement is initiated by reason of the roller 32 engaging with the succeeding slot 28. In view of the foregoing it should be evident that a simplified compact mechanism has been provided that will positively index the table 13 and during the rest periods thereof, the flange 30 cooperating with the rollers 29, 29 that engage therewith will cause the shaft 11 and its associated table 13 to be held in a locked relationship.

As previously indicated, the table 13 is provided with a plurality of work holders 14, here shown as six in number corresponding to the number of slots 28 in the Geneva wheel element 27. Each of the work holder elements 14 is freely and rotatably mounted in the work table 13 and comprises a dished element 34 that supports an anti-friction bearing 35. Disposed within the bearing 35 is a tubular element 36 that extends above the surface of the table 13 and has a flange portion 37 thereon in which is supported a plurality of rubber or resilient work holder devices 38, appropriately secured to the flange portion 37. Intermediate supports or spacers as shown in Fig. 7 may be provided if desired between the elements 38 and the flange 37 but the foregoing constitutes the essential devices. The element 36 is preferably tubular in form and the center of the entire assembly is cored out so that the interior of the insulator supported thereon may be exposed to a nozzle arranged concentrically of the tubular element 36. The work table 13 is fixed to a flange 39 supported on shaft 11 and secured thereto by a plurality of cap screws 40. Interposed in this mechanism is a plain sleeve bearing 41 that rotates relatively of the shaft or support 12. The tubular element 36 at its lower end constitutes a belt pulley 33 that periodically comes into engagement with the belt 47 to rotate the work holder assembly 14.

Mounted on the plate 3 is a driving motor 42 that has fixed thereto a gear mechanism 43 adapted to rotate a pulley 44 whose axis is transverse to the axis of the armature shaft of motor 42. On the opposite side of the plate 3 there is a column or support 45 that rotatably mounts a pulley 46. The pulley 44 is connected to pulley 46 by means of a belt 47. The belt 47 is adapted to engage with pulley 33 formed on the element 36 of the work holder 14 as set forth above. The plate 3 is further provided with a column 48 that has a lever arm 49 pivotally mounted thereon supporting an idler pulley 50 that engages the belt 47. A spring 51 has its one end fixed to the arm 49 and its opposite end is adjustably secured to the plate 3 on an appropriate bracket mechanism by an adjustable screw means whose function is that of keeping the belt 47 taut. Each of the work holders 14 and its pulley 33 is indexed successively past the operating station and is engaged by the belt 47, is rotated thereby and during this period of rotation the preselected surfaces of the work piece or insulator have the conducting glazed coating applied thereto. The principal function of the belt tightener arrangement 49, 50, and 51 is to keep the belt 47 in tension during such times when the belt 47 is not engaging the pulley 33 formed on one of the work holder elements 14. It should be apparent therefore that the work holder 14 is rotated only at such times when anyone given work holder mechanism 14 is in direct engagement with the belt 47. By reason of the belt tightener arrangement just described when there is no work holder in engagement with the belt 47, it will not because of looseness become disengaged from the pulley elements 46 and 44.

It has been previously stated that the conducting glaze solution is applied to the preselected areas of the insulator for given periods of time and these given periods of time are those instances in which the work holder comes into engagement with the work holder rotating means just described. Mechanism has been provided that operates in a timed relationship with the rotation of the work holder whereby a conducting glaze coating is applied to the said preselected areas or surfaces of the insulator. This mechanism originates in an adjustable cam device 52 secured to shaft 24. The adjustable cam 52 is composed of two plates 53 and 54. They are adjustable relative to each other and each of the plates is provided with a plurality of apertures 53a and 54a that are so disposed in the plates such that any two of them, one above one in each plate, will be in registration with each other and in which some form of cap-screw or bolt, preferably a blind or flush screw, is arranged to hold the two plates 53 and 54 in adjusted relationship. It should be apparent that the time in which

the nozzles hereinafter set forth are open is determined by the adjusted positions of the lobe portions of the elements 53 and 54 of the cam 52. Since the cam 52 is fixed on to the shaft 24, there is a constant rotation of the cam and for that reason it must be disposed on that shaft such that it will have the nozzles open or in operation during the period of time that the work holder being rotated is in proximity to the nozzles.

The adjustable cam 52 is adapted to operate a valve 55 supported on a column 55*a* fixed to base 1 and is provided with a pivoted lever 56 that is acted upon by a spring 57 for the purpose of closing the valve during such instances when the lobes of the cam elements 53 and 54 are not in engagement with the roller 58 mounted on the arm 56. The valve 55 controls the flow of pressure fluid from a suitable source of supply originating in a pump 59, or some convenient compressed air reservoir in lieu of the pump, and passes through pressure regulator R_1 and is connected to the input side of the valve 55 by means of a conduit 60. The exhaust side of the valve 55 has a flexible conduit 61*b* connected thereto which branches out and extends to each of the needle operating cylinder connections on spray guns 16, 17 and 18 disposed in appropriate positions about the work piece 63. Flexible tube 61*a*, from supply 59, by-passes valve 55, passes through pressure regulator R_2, branches out and extends to the atomizer connections on each of the spray guns 16, 17 and 18. The lower gun 18 is intended to spray the threaded portion 64 of the insulator or work piece 63 and the side spray gun 17 is intended to apply conducting glaze to the tie wire groove surface indicated at 65 and the upper spray nozzle 16 is intended to spray the line wire groove surface 66 with conducting glaze. An appropriate flexible conduit 67 leads from the reservoir 15 that holds a supply of conducting glaze or from a pump which maintains a constant head and also agitates the glaze thus preventing settling subsequently described in greater detail. The said conduit 67 is led to each of the spray connections on housings 62; the conduits 61*a* and 61*b* lead to two different positions or locations on housings 62. The one to supply the air or pressure fluid for the atomizer connection for spraying purposes and the other to actuate the nozzle needle or plunger.

By referring to Fig. 6 wherein is set forth a detailed construction of the nozzle, it will be observed that the inlet 68 is adapted to be connected to the glaze supply. The inlet 69 is adapted to receive the atomizing air supply through pressure regulator R_2 and conduits 61*a* directly from source 59, and inlet 70 is adapted to receive pressure fluid supply from the conduit 61*b* through valve 55 thence from source 59 to operate the plunger 71. The plunger 71 is fixed to a rod 72 whose threaded end extends beyond the portion 73 of the nozzle housing 62 and has a nut 74 thereon adapted to provide for a plurality of adjustments in order to alter the quantity of material to be sprayed. The rod 72 extends entirely through the nozzle housing 62 and terminates in the needle element 75. It should be apparent that the needle element 75 functions as a valve and that plunger 71 in conjunction with the spring 76 will either open or close the valve, the plunger 71 being opened by the pressure fluid supply and the spring 76 closing it after the pressure fluid supply has been shut off. Various adjustments are provided, as previously indicated, in the nozzle to determine the quantity of material to be sprayed and the velocity at which the conducting glaze is applied to the insulator and these adjustments must, of course, be determined by the operator, depending upon the intended characteristics of the device to which the coating is being applied.

It will be observed that means must be provided to raise and lower the nozzle 18 in order that the work table 13 may be indexed because if such provision is not made, the nozzle 18 will not extend below the lower end of the tubular portion 36 and thereby prevent any indexing operation. This mechanism comprises a bar element 76 that is pivotally mounted on a support or column 77 fixed to the plate 3 by means of a flange 78 and cap screws 79. The nozzle 18 is arranged on a holding element 80 that may be either integral with or otherwise secured to the pivoted bar 76. The spray gun 16 and the bar 76 are counterbalanced by means of a spring 81 that has its one end connected to the free end of the bar 76 and the other end of the spring is secured to a screw element 82 fixed in the plate 3. The screw 82 is vertically adjustable in the plate 3 in order to vary the tension of the spring element. The table 13 has arranged on its lower side a flange or collar 83 that is concentric with the shaft 11 and the axis of the table 13. Arranged in the flange or collar 83 at appropriate positions are a plurality of notches 84 equal in number to the work holders 14 rotatably arranged in the table 13. Fixed to and rotatably mounted on the lever or bar 76 is a roller 85 adapted to engage or seat in the notches 84. The operation of the foregoing mechanism is such that as the table 13 is indexed the roller 85 which rests in one of the notches 84 will become disengaged therefrom and the said roller 85 will run along the lower edge of the flange 83 which action will pivot the bar or lever 76 relative to the plate 3 on its support 78 and lower the nozzle 18 out of the path of motion of the lower portion of the work holder 14 thereby enabling the table 13 to be indexed.

The upper and lower nozzles in the particular illustrations are shown as mounted on the plate 3 and one being mounted directly on the bar or support 12. Clamp mechanism 86 is associated with the upper nozzle housing 62 for holding the same on the support 12 and the side nozzle housing 62 has a clamp 87 associated therewith which fixes the nozzle 17 to a support 88 mounted on the plate 3 by means of the flanged end 89 and a nut 90 that is threaded to an extension or projection of the support 88 extending through the plate 3.

The overall operation of the device is such that upon initiation of rotation in the motor 19 and the shaft 24 carrying adjustable cam 52 and Geneva cam wheel 25 the latter will cause the cooperating Geneva mechanism 10 to rotate the coupling 9 and shaft 11 and in turn the table 13. By reason of the Geneva mechanisms 10 and 25, the movement of table 13 will be periodical to index the table from one position to the next, it being understood that a work station is that work holder which is in immediate proximity to the several spray guns 16, 17 and 18. The operator's duties are confined to the simple operation of removing a finished or sprayed insulator from one of the work holders 14 and replacing it with an unfinished work piece and each succeeding work piece is therefore indexed on the table 13 underneath and in proximity to the sev-

eral nozzles 62. As each of the work holders 14 is brought adjacent the nozzles, its pulley 33 will engage the belt 47 and cause it to be rotated thereby. Simultaneously with this action the lower nozzle 18 will be lifted to the full-line position shown in Fig. 5 by reason of the roller 85 on the pivotal element coming to rest in the notch or depression 84 such that the spray therefrom will be directed into the threaded portion or pin-hole of the insulator 63. As soon as this action has been completed, the adjustable cam 52 will have rotated to a position such that it will open the valve 55 and admit pressure fluid to connections 70 of spray guns 16, 17 and 18 which in this instance is preferably compressed air. The pressure fluid will axially move the needle element 75 of the gun thus opening the glaze valve in the nozzle. The continuously flowing air from connection 69 will atomize the glaze and spray it on to the respective surfaces 64, 65, and 66. Since the cam 52 is being continuously rotated, it will in proper time open the valve 55 and in proper time the spring 57 will close the valve 55, subsequently the cam arm 31 of the wheel 25 will enter one of the slots 28 of the Geneva element 10 and start or initiate an indexing operation, it being understood that by this time the valve 55 will have been closed and thereby permit only the minimum desired quantity of the conducting glaze to be applied to the selected areas of the work piece. Simultaneously with the initiating with the indexing operation, the lower nozzle 18 will be depressed to its lowermost position as indicated in Fig. 5 by reason of roller 85 becoming disengaged from the notch 84. It will be understood that the several operations described are continuous and as previously indicated the operator's sole duty is the removal of the finished work piece from the holders 33 and replacing an unfinished work piece in each of the work holders.

A modification of the means of supplying glazing solution to the several spray guns 16, 17 and 18 is set forth in Figs. 14–17. This form of supply assures a virtually constant hydrostatic head as well as enabling a more uniform mixture by reason of the continuous circulation and the provision of a constantly actuated agitating means.

The device originates in a base element 91 on which a pair of pedestals 92, 93 are mounted by means of flange elements 94, 95 and screws 96 and 97. At the upper end of pedestal 92 a receptacle or vessel 96 is arranged, enclosed within a frame 97. Pedestal or column 93 supports a double bracket constituting parts 98 and 99, each of which is clamped to the pedestal 93 by a plurality of bolts 100 that extend through apertures in each of the brackets.

Bracket 98 supports a motor 101 adjustably mounted thereon. A speed reducer 102 is secured to the motor 101 terminating in a pulley 103. Bracket 99 is provided with a longitudinally extended vertically disposed bearing 104. A shaft 105 is held against vertical movement in bearing 104 and at its upper end is provided with a pulley 106 connected to pulley 103 by a belt 107. On the other end of the shaft 105 that extends into vessel 96 is fixed a plurality of paddles or agitating elements 108 secured thereto by appropriate clamping devices. The paddles 108 keep the glaze solution in vessel 96 in a state of agitation and prevents settling of the glaze compound.

The means of keeping a constant pressure head on the several nozzles for this system comprises a circulating system directly connected to the vessel 96. This system comprises a pump 109 fixed to the base 1 of the machine, or it may be an independent element, whose intake line 110 is directly connected to the vessel 96 in the manner shown and is provided with a gate or globe valve 111 and a drain valve 112. The exhaust line 113 of the pump 109 extends vertically a sufficient distance such that there will be the required hydrostatic head on the several outlets 114, 115 and 116 connectible to the nozzles 16, 17 and 18. The conduit 113 is also provided with a drain valve 117 and a globe valve 118. The upper end of conduit 113 is goose-necked and drains into a conduit 125 loosely fitting the same and then leads to the vessel 96 in the manner shown; the fluid returning to the vessel by gravitational action. Pump 109 is driven by a motor 119. It is therefore evident that nozzles 16, 17 and 18 are provided with glazing compound under a constant head and that the glazing fluid is in a constant state of circulation and agitation. The valves 112 and 117 facilitate the flushing of the system in addition to acting as means to drain the pipe and conduit connected thereto.

A panel structure 120 is shown in Fig. 18 which shows regulators R_1 and R_2 fixed to the panel 120 and provided with pressure gage elements 121 and 122. The panel is supported on a pedestal 123 which may be mounted on base 1 or any other appropriate base. The panel also mounts a plurality of switches 124, 124 for the control of the several motors, 119, 108 and 119.

The above description is thought to so fully reveal the gist of the invention that will enable others skilled in the art to which this apertains to construct and understand the same. That which is regarded new, novel and useful and which is sought to be protected by Letters Patent of the United States is as follows:

1. In a spray machine for insulators; a base; a work table on said base; means to index said table; a plurality of rotatable work holders on said table; means to successively rotate said work holders; a plurality of spray guns; cam means operable by said means to index said table to actuate said guns in a timed relation with the indexing of said table and rotation of one of said work holders; and means to move one of said guns toward and away from a selected work holder.

2. In a spraying machine; a base; a work table supported on said base; a plurality of work holders on said table; a plate supported on said base; means on said plate to successively rotate said work holders; means to index said table; a plurality of spray guns on said machine arranged to spray specific areas of an insulator; a control valve operatively connected to each of said spray guns; means to admit spray material to each of said spray guns under a substantially constant hydrostatic head; cam means operated in a timed relation to said indexing means to govern said control valve; and means on said plate cooperating with means on said table to vertically move one of said spray guns to permit indexing of said table and to bring the spray guns into the proper working position.

3. A conducting glaze spraying machine; a base; a work table supported on said base; a power source; a speed reducer and gear box on said base operatively associated with said power source; a driven shaft extending vertically from said gear box; a column fixed to said base and extending upwardly parallel to said shaft; a shaft rotatably supported on said column; a Geneva

wheel indexing mechanism connecting said shafts to index said shaft on said column; a work table supported on said shaft on said column; a plurality of work holders rotatably supported on said table; means mounted on said base vertically spaced from said table supporting means to successively rotate said holders; an adjustable cam on said shaft extending vertically from said gear box; a control valve controlled by said adjustable cam; means to move one of said guns vertically with respect to other of said guns in timed relation with said indexing mechanism; a plurality of spray guns supported adjacent said table; and means connecting said valve spray guns; and said table indexing movement and said control valve actuation operating in timed relationship to spray a work piece held in said work holders as they are successively presented to said spray guns.

4. In a spray machine for insulators; a base; a work table supported above said base; a plurality of work holders on said base; means on said base supporting means to successively rotate said work holders; a transmission and power source on said base; a driving shaft connected to said transmission; a driven shaft connected to said table; means to periodically rotate said driven shaft from said driving shaft which includes a wheel having a peripheral flange and including a cam arm formed on said wheel, said flange extending only partially about the wheel; a slotted cam wheel fixed to said driven shaft said cam arm engageable with the slots in said slotted wheel to index said table from said driving shaft; and a plurality of pins on said slotted wheel; said pins and wheel interlocking when said driven shaft is at rest to hold it in a stable condition; one of said work holders being rotated when said driven shaft is locked against movement.

5. In a spraying machine; a base; a work table rotatably supported on said base; a plurality of rotatable work holders on said table; a support on said base mounting means to successively rotate said work holders; a motor on said means; a speed reducer and a gear box on said base connected together and driven by said motor; a driving shaft connected to said gear box; a driven shaft connected to said table; a flanged wheel having a cam arm and a slotted cam wheel operatively associated and connecting said shafts to index said table from said driving shaft, said slotted wheel having means thereon engageable with said flanged wheel to lock said table against movement when one of said work holders is being rotated; a plurality of spray guns fixed on said machine; a valve to control said spray guns; and an adjustable cam mounted on said driving shaft to control said valve; said valve being held open by said adjustable cam when one of said work holders is being rotated.

6. In a machine adapted to spray specific areas of an insulator; a base; a work table supported on said base; a plurality of work holders rotatably mounted on said table; means to index said table including a driving and a driven shaft; a plurality of spray guns fixed to said machine one directed at each specific area; a valve to control said nozzles; an adjustable cam on said driving shaft to govern said valve; a valve governed in a timed relation to the indexing of said table and rotation of one of said work holders; means to vertically move one of said nozzles in a timed relation with the indexing of said table comprising a notched means secured to said table; and a pivoted lever engageable with the notches in said means to vertically move said nozzle in timed relation with said table and the governing of said valve.

7. In a spray gun moving mechanism for a spray machine; a base supporting a table having a plurality of work holders thereon; a supporting element on said base and disposed beneath said table; a collar integral with said table and having a plurality of notches therein; a support on said element; a bar pivoted to said support having a spray gun fixed thereto; the nozzle of said spray gun when in operating position extending into one of said work holders; a roller on said bar engageable in said notches; said collar depressing said lever when said table is indexed to move said nozzle out of the way of said work holder, and said roller when entering the succeeding notch allowing said pivoted bar to tilt and said nozzle carried thereon to enter the succeeding work holder.

8. In a spray gun moving mechanism; a base; a work table including a plurality of rotatable work holders mounted on said base; means to index said table; a support mounted on said base; means on said support adapted to successively rotate said holders; a pivoted bar on said support; a spray gun on said bar adapted to be moved thereby into and out of said work holder undergoing rotation; a notched collar concentrically disposed on said table; and a roller on said bar engageable in one of said notches in said bar; said spray gun being in an elevated position when said roller is seated in said notch and in a depressed position when said roller is disengaged from one of said notches.

9. In a spray machine adapted to coat selected areas of an insulator; a base; an indexable table supported thereon; means to index said table; a plurality of rotatable work holders in said table; means supported in said base to rotate said work holders; a plurality of spray guns; one spray gun being directed at each preselected area; means operated by said means to index said table to govern the admission of pressure fluid to said spray guns in a timed relation with the indexing of said table; and means to vertically move one of said spray guns in a timed relation to the indexing of said table, and to the rotation of one of said work holders.

10. In a spray machine; a base; a shaft rotatably mounted on said base; a table fixed to said shaft; a plurality of work holders rotatably mounted on said table; means fixed to said base vertically displaced from said table supporting a transmission means to successively rotate one of said work holders; a plurality of spray guns on said machine; means to supply pressure fluid and conducting glaze to said guns under substantially constant pressure, including a standpipe in which the level of said conducting glaze is higher than said spray guns; means to index said table; a valve to govern the admission of pressure fluid to said spray guns; and means associated with said means to index said table to operate said valve in a timed relation to the indexing of said table and rotation of one of said work holders.

11. In a device for a spray machine to deliver glazing fluid to spray guns at a constant hydrostatic head; a receiving vessel; an agitating means in said vessel; a pump adapted to draw glazing fluid from said vessel; a stand pipe associated with said pump adapted to receive the exhaust of said pump; a plurality of spray gun

outlets on said standpipe; said standpipe extending above the spray gun outlets and the guns connected therewith to gravitationally apply pressure to said outlets; and means connecting the upper end of said stand pipe with said vessel; said pump and said agitating means keeping the glazing fluid in a state of circulation and agitation.

12. In a machine for coating the surface of a work piece; a base; a work table movably supported on said base; means to impose an indexing movement on said table; a plurality of rotatable work piece holders supported on said table; means to selectively rotate one of said work holders; a plurality of spray guns supported on said base; means to supply coating material to said spray guns which includes a standpipe extending above the level of said spray guns and in which the level of the material is maintained above said spray guns; and means operable by said means to impose an indexing movement on said table to control the actuation of said spray guns in a timed relationship with the indexing movement of said table.

13. In a coating machine; a base; a work table; means to rotatably support said table on said base; a plurality of work holders rotatably mounted on said table; means to index said table on said means; means supported on said base to successively rotate said work holders; a plurality of spray guns adapted to spray a work piece held in said work holders; means operatively connected with said indexing means, including a valve and valve operating device, to control the actuation of said spray guns in a timed relation with said means to index said table; and means on said table to move one of said spray guns relative to other of said spray guns during the indexing of said table.

14. In a spray coating mechanism; a base; a work table rotatably supported on said base; driving means to index said work table; a fixed table supported on said base; a plurality of work holders on said table; means on said fixed table to successively rotate said work holders; a plurality of spray guns on said mechanism adapted to spray-coat specified areas of a work piece; a control valve conduit connected to each of said spray guns; pump and stand pipe means to admit spray material to each of said spray guns under a constant hydrostatic head; cam means operable by said driving means and in a timed relation to said indexing to govern said control valve; and means to move some of said spray guns relative to each other to enable said table to index and bring said spray guns into proper working position.

15. In a spray machine; a base; a shaft rotatably mounted on said base; a table fixed to said shaft; a plurality of work holders on said table; means fixed to said base supporting a transmission means to successively rotate said work holders; a plurality of spray guns on said machine; means to supply conducting glaze to said guns under a substantially constant pressure; means to index said table; means to vertically move one of said spray guns out of the path of movement of said work holders during indexing of said table; a source of pressure fluid; a valve to govern the admission of pressure fluid to said spray guns; and means to operate said valve in a timed relation to the indexing of said table and rotation of one of said work holders.

16. In a spraying machine; a base; a shaft rotatably supported on said base; a table secured on said shaft; a plurality of rotatable work holders on said table; means associated with said base mounting means to successively rotate said work holders; a plurality of spray guns on said machine; means to supply pressure fluid and conducting glaze to said nozzles under a substantially constant pressure which includes a standpipe extending above the level of said spray guns; means to index said table; means to move one of said spray guns out of the path of movement of said work holders; a valve to govern the admission of pressure fluid to said spray guns; and cam means to operate said valve comprising a pair of relatively adjustable plates having cam lobes thereon, said lobes being adjustable to vary the opening and closing time of said valve, said cam means associated with said means to index said table and operable in a timed relation to the indexing of said table and rotation of said work holders.

17. In a spraying machine; a base; a work table rotatably supported on said base; means to index said table; a plurality of rotatable work holders on said table; means to successively rotate said work holders; a plurality of spray guns whose nozzles are directed toward a given work piece; a valve to control said guns; cam means associated with said means to index said table to operate said valve; and means on said table to vertically move one of said guns during the indexing movement of said table.

18. In a device as defined in claim 17 in which said means to index said table includes a power transmission terminating in a shaft; a shaft fixed to said table; and a Geneva indexing means including means to lock one element thereof against rotation when said table is at rest.

19. In a spray machine, a base; a table supported on said base; a first shaft to which said table is secured; means to index said table which includes a power producing and transmitting elements, the terminal element of which is a second shaft parallel to said first shaft; a wheel having a cam arm associated therewith fixed to said second shaft, said wheel having a flange extending partially around the periphery thereof, a slotted wheel fixed to said first shaft, said slots cooperating with said cam arm to index said table; a plurality of spray guns supported on said base; a control valve for said guns; cam means on said first shaft to open and close said valve; said cam means opening said valve when table is at rest and closing said valve when said table is in indexing movement; means on said slotted wheel engaging said flange to lock said table against movement between each indexing of said table; and means on said base to rotate the work holder adjacent said guns between indexing movements.

20. In a device as defined in claim 19, having means on said table to vertically move one of said guns during the indexing movement of said table.

21. In a spray machine; a base; a column on said base; a shaft supported on said columns, a table fixed to said shaft; power transmission means on said base terminating in a driven shaft in operative relation to said column shaft; means connecting said shafts to index said column shaft from said driven shaft, including means to lock said column shaft against motion when no indexing movement is applied thereto; a plurality of work holders on said table; means mounted on said base to rotate each of said work holders in succession; a plurality of spray guns supported on said base whose nozzles are directed toward a selected work holder; a valve to control said

nozzles; means on said driven shaft to open said valve when said holder is rotated, and close same when said table is indexing; and cam means on said table to vertically move one of said guns when said table is indexing.

22. In a spraying machine; a base; a transmission unit mounted on said base; a Geneva cam arm rotated by said transmission unit; a supporting shaft and column mounted on said base; a Geneva cam wheel mounted on said shaft, said cam arm indexing said shaft when said cam arm is rotated; a table mounted on said shaft having a plurality of rotatable work holders thereon; a support mounted on said base and vertically spaced from said table; driving means on said support to successively rotate said work holders as they are presented to said driving means; a plurality of spray guns carried on said machine; an adjustable cam rotated in timed relation to said cam arm; a valve controlled by said adjustable cam, said valve controlling said spray guns; and said valve operating cam and the Geneva indexing mechanism operating in a definite timed relationship.

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