AUTOMATIC PAINTING, WIPEING, AND POLISHING MACHINE


Application October 10, 1956, Serial No. 615,093

18 Claims. (Cl. 117—64)

This invention relates to finishing machines and more particularly to machines for cleaning and polishing articles of manufacture.

This application is a continuation in part of application, Serial No. 561,468, filed January 26, 1956.

In the finishing of articles of manufacture, for example, in filling the letters embossed in a plastic article or in filling other designs on plastic or other materials with paint, it is sometimes objectionable to spray the paint or other coating material on the article because of resulting paint fumes which are deposited in the ambient atmosphere and because a thin consistency of paint must be used for spraying and a stencil or spray mask must be used to protect the part not to be coated. Further, such spraying results in an uneconomical use of paint since a majority of the sprayed paint goes into the ambient atmosphere. Furthermore, it is generally impossible to wipe and polish partly dried paint on an article. The paint will smear when partly dry and will not wipe clean.

It has been discovered that by utilizing a paint applying means in the form of a paint gun having a special nozzle therein made of a resilient material and of proper design and controlled in a proper manner so that a metered amount of paint is dispensed by the nozzle for each application of paint, it is possible to spread the paint on articles of manufacture and, after a drying period, to wipe the excess paint from the article and, subsequently, after an additional drying period, to polish the thin residual film of paint from the article. It has also been discovered that if paint is supplied to the paint gun disclosed herein when it is moving in one direction, the gun will apply the paint to the article. Then if the nozzle of the gun is moved back over the paint applied, the paint will spread in a uniform layer. No stencil or mask is used with the process herein disclosed.

Disclosed herein is a machine which accomplishes the above purposes and, further, accomplishes these purposes automatically; that is, the operator may load the articles being finished in suitable designed fixtures and the paint will be applied and spread on the article at one station and wiped at a subsequent station and subsequently polished at still another station.

It is, accordingly, an object of this invention to provide a machine which accomplishes the above results and it is a further object of this invention to provide a machine which is simple in construction, economical to manufacture, and simple and efficient in operation.

Another object of this invention is to provide a specific method of applying paint to articles of manufacture.

A further object of the invention is to provide a machine which will apply paint at one stage, wipe the paint at another stage, and polish the painted article at still another stage.

Still another object of the invention is to provide an improved paint gun.

A still further object of this invention is to provide a machine which will apply paint to an article at one stage and provide a drying time following the painting followed by a stage at which excess paint is wiped from the article and, subsequently, a stage for polishing the article.

With the above and other objects in view, the present invention consists of the combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawings and more particularly pointed out in the appended claims, it being understood that changes may be made in the form, size, proportions, and minor details of construction without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings:

Fig. 1 is an isometric view of a painting machine according to the invention;

Fig. 2 is a piping diagram of the operating circuit of the machine;

Fig. 3 is a cross sectional view of a paint gun according to the invention;

Fig. 4 is an end view of the paint gun shown in Fig. 3;

Fig. 5 is an enlarged view of a timer valve according to the invention;

Fig. 6 is an enlarged view of a cloth index valve which is similar to the gun actuating valve of the machine;

Fig. 7 is an enlarged view of a pilot control valve according to the invention;

Fig. 8 is an enlarged view of an article oscillating arrangement and article support with the lock-down pistons and poppet valves according to the invention;

Fig. 9 is an enlarged view of the gun actuating arrangement;

Fig. 10 is an enlarged view of the Geneva drive; and

Figs. 11 and 12 are enlarged views of the valves according to the invention.

In this application, the word "paint" is used interchangeably with the generic term "coating" and is meant to cover all similar coating materials. Also, "cloth" as used is intended to cover all similar fabric and sheet materials.

General description of the machine

Now with more specific reference to the drawings, an automatic painting machine 10 is shown having a frame 11 with a cover 12 thereon. A painting station 13 and a wiping station 14 with a polishing station 15 are provided. The painting station 13 has a paint gun 16 of special design which will later be described. The paint gun 16 is enclosed in a cover 17 with an access door 18a hingedly connected thereto. The paint gun 16 has an actuating air hose 18 attached thereto and a paint supply hose 19. The paint gun 16 itself is supported on brackets 20 which are fixedly connected to supports 21, the supports 21 being swingingly connected to the fixed frame 11 at 22. An air cylinder 23 shown in the schematic diagram in Fig. 2 is fixed to the frame 11 and has its piston rod 24 connected to the bracket 20 to cause the gun 16 to swing around the pivot 22 to bring the nozzle of the gun 16 into engagement with the article to be painted.

The wiping and polishing stations 14 and 15, respectively, have back-up members 25 and 26, respectively, which are supported on piston rods 27 and 28, respectively. The piston rods 27 and 28 are disposed in cylinders shown schematically in Fig. 2 and are urged toward the articles by a regulated air supply in the cylinders. The wiping back-up members 25 and polishing back-up members 26 may have rubber towel engaging members 30 and 31 with corrugated towel engaging surfaces which have been discovered do a more desirable job of polishing than smooth metal towel engaging back-up members. A towel 32 is supported on spools 33 and 34 with a bight portion 35 therebetween. The towel 32 is indexed by means of a cylinder 37 having a piston 38
therein attached to a piston rod 39 which is connected to an actuating member 40 which in turn has a pawl 41 swingably attached thereto and is spring urged by means of a spring 43 which engages a ratchet wheel 44 to advance the towel 32 when the piston 38 is reciprocated.

A table 45 is supported on a central axis 46 which is driven by a suitable Geneva drive 47 having a one revolution clutch 48 which is actuated when a pin 49 is pulled by a piston rod 50 which is in turn actuated by air supply 51. The operation of the air circuit will be described hereinafter.

Table and article supports (Fig. 1)

The table 45 has six spaced article support stations 52, 53, 54, 55, 56, and 57 radially movable thereon. Each article support station has an article receiving cavity shaped as a counterpart of the particular article being finished. Each article support is carried by one of the carrier plates 60 which have ways on the bottom thereof and are slideable on a base 61 and may be freely slideable inwardly and outwardly when not opposed by an opposing force.

Six spaced, horizontally disposed cylinders 64 are fixed to the table 45 and have pistons 65 operable therein. The pistons 65 have piston rods 66 attached thereto. The piston rods 66 will be held by constant air pressure in the cylinders 64 applied through a pipe 68 which has branch pipes 69 communicating with the inside of the pistons 65. The outer ends of the rods 66 engage the carrier plates 60.

Air is supplied through the pipe 68 from a main line source 70 through a pressure regulator 4La so that the pressure exerted by the back-up members 25 and 26 on the articles supported in the article supports can be maintained constantly and at a predetermined pressure at all times. This makes more accurate control thereof.

Cylinders 71, 72, and 73 oscillate the article supports as they are indexed to the painting station, the polishing station, and the painting station, respectively; that is, the cylinders 71, 72, and 73 have pistons operable therein attached to piston rods 74, 75, and 76, respectively. The inner ends of each piston rod engage the outer edge of one of the article carriers as it is indexed to a position adjacent the piston rod and the piston rod forces the article carrier in toward the center of the table 45 against the force of the air in the cylinder 64. Therefore, when air is applied through the pipe 68, the article carrier is all held in the outward position. As the table 45 indexes, the article carrier comes to the painting, wiping, and polishing stations, respectively. When each article carrier reaches one of these stations, it is pushed inwardly; in the case of the painting station, under the gun, and in the case of the wiping and polishing stations, under the towel 32.

The article support plates 60 as aforesaid are held out in the outward position by the pistons 65 in the cylinders 64 which are connected to the main air supply 70 through the regulator 4La which applies a constant pressure to the pistons 65. This pressure can be preset by adjusting a regulator member 120 on the regulator 4La. By using the air cylinders 64 to hold the article supports in the outward position instead of using springs, a much longer stroke of the piston is possible for a given length of cylinder because a spring can only be deflected a percentage of entire length whereas the air in air cylinders can be caused to move almost throughout their entire length.

The back-up members 25 and 26 are urged downwardly by means of pistons attached to the piston rods 27 and 28 actuable in the cylinders 73 and 174. The cylinders 73 and 174 receive air through pipes 751 and 761 respectively, which engage valves 73a and 74a to regulators 73c and 74c respectively. Therefore, when air is applied to timers T1 and T2, it is also applied to the cylinders 73 and 174 and the back-up members are forced down against the towel 32. The piston attached to the back-up member holds the towel 32 in firm engagement with the article in the article support stations 52, 53, 54, 55, 56, and 57. Then when the supply 74 and 75 force the article supports inwardly and the back-up member holds the towel 32 in engagement with the article, thereby causing a wiping action as the article support directs the article therearound.

Stale a short time elapsing between the time a particular article is wiped at the wiping station 14 and polished at the polishing station 15, the paint left by the wiping operation dries and becomes "chalky." By the time the article wiped has reached the polishing station 15, the paint thereon is dry and the article can be polished.

Paint or coating gun (Figs. 1, 3, 4 and 9)

For use with the machine disclosed herein, a special paint gun is used. The paint gun is made up of the gun body 16 having a needle valve 30 axially movable therein and actuated by means of a piston 81 which is slideable in a cylinder 82. The space between a seat 83 and the piston 81 is connected when air is applied through the pipe 137 and when a pin 49 is pulled by a piston rod 50 which is in turn actuated by air supply 51. Therefore, when air is applied to the cylinder 82, it pulls the needle valve 30 out of engagement with its seat 86, thereby allowing paint from a pipe 87 to be forced through a nozzle opening 88 which communicates through a resilient nozzle 89 and applies paint to the article.

The gun 16, as aforesaid, is mounted on the bracket 20 swingable to the frame 11 at 22 and the cylinder 23 is connected through the piston rod 24 to the gun 16 through the pivot 22. The gun 16 can swing around the pivot point 22 from the position shown in Fig. 1 above the article into engagement with the article. Therefore, when air is applied to the cylinder 23, it will flow through a pipe 92 and swing the gun 16 down into engagement with the article in the support 52 directly below the gun 16. Since air is also simultaneously applied to the piston attached to the paint position article moving piston rod 76, the piston rod 76 will force the article carrier 60 inwardly. Also, since the nozzle of the gun 16 has been forced down into engagement with the article support therein, the article will be moved under the gun 16 and the paint from the gun 16 will be allowed to flow onto this article as the article is slid forward, under and in engagement with the nozzle of the gun 16 by the piston rod 76.

A pilot piston 147 of a valve 130 is pushed toward the pipe 70 when a timer valve T3 opens. This admits air behind the piston on the rod 24 and pushes the piston 147 against the force of a spring 23a until the opening of the piston 147 aligns with the pipe 70 and the interior of the cylinder 23. This aligns the opening through the member 24a of the valve 130 with the pipe 70 and allows air at line pressure to flow behind the piston attached to the rod 24 and thus operate the rod 24 to move the gun 16 down into engagement with the article. The gun 16 will thus be held down in engagement with the article while the oscillating piston attached to the rod 76 is moving inwardly and outwardly. The gun 16 will be allowed under until the timer valve T3 closes. This will stop the flow of air through the pipe 92 and the spring 23a will force the piston 147 to the right and stop the flow of air through the piston 147. A spring 128 will return the piston rod 24 and lift the paint gun 16.

Detailed operation of cloth index (Figs. 2 and 8)

The cloth index cylinder is shown in Fig. 6. Between cycles of operation, pressure from the pipe 70 builds up in chambers 37a and 37b at the ends of the piston 24a through small passages 37c and 37d so that each said chamber is at substantially the same air pressure as when the table 45 indexes and a cam 23 trips a poppet valve 23a, the pressure in the chamber 37a will be released through a pipe 23j and the chamber 37b will force the valve piston 24a to the position shown in Fig. 6. This
will align the reduced size portion of the piston with the pipe 70 and an orifice 142a and allow air from the pipe 70 to drive a piston 37f outward, carrying with it the pawl carrying member 40.

The cam 23f holds the valve 23g open only momentarily; it passes the cam 23f up each movement of the table 45 and as soon as the valve 23g begins to flow to the passage 37c and pressure begins to build up in the chamber 37a. Then when the pawl carrier is brought into engagement with a poppet valve 40b as it reaches the end of its stroke, it will open the valve 40b and allow pressure in the chamber 37b to reduce. The pressure in the chamber 37a, having now built up, will return the piston 24e to the dotted line position to align the reduced size portion of the cylinder with the pipe 70 and with a pipe 37c. This will cause the piston 37f to be driven back to its original position, carrying with it the pawl 41 to rotate the ratchet wheel 44.

**Timer valve components (Fig. 5)**

The circuit which operates the machine contains three timer valves T1, T2, and T3. These valves are identical and can only be shown by way of example in Fig. 5. A main line of air is connected from the pipe 70 to their respective outlets through normally closed valves which are each operated by a piston 135; that is, when a piston 141 of a drive operated valve 117 is momentarily moved by a cam 139 on the shaft of the drive unit 47, air is compressed in the chamber 142a and trapped therein by a check valve 342. The piston 135 of each timer valve is driven downwadrs and a valve 142 in each timer valve is held open, thus allowing air to flow from the pipe 70 to an outlet T1. Immediately, the air begins to bleed out through a needle valve 242 at a predetermined rate determined by the setting thereof. As the air bleeds out, a spring 142c forces the piston 135 and valve members 142 toward a closed position. The time during which air flows from pipe 70 to the outlet T1 is determined by the time the valve 142 is held open by the pistons 135. The time the valve 142 is held open is determined by the time required for air trapped in the chamber 142a, after air has been admitted thereto, to escape through the valve 242 and during the time that the air in the chamber 142a is under pressure, it will exert a pressure on the pistons 135 at the time that the pressure in the chamber 142a diminishes to a pressure of less value than that exerted by the spring 142c. The spring 142c will force the valve 142 a closed. The time for the air to escape the chamber 142a and, therefore, the time of flow of air from the pipe 70 to the outlet T1 can be adjusted by means of the valve 242.

**Article oscillating means (Figs. 2 and 8)**

As mentioned supra, the articles supported in the supports 52, 53, 54, 55, 56, and 57 are urged radially outwardly by a constant pressure exerted by the pistons 65 from a regulated air supply through the regulator 41a.

In Fig. 8, a portion of the air circuit for accomplishing this is shown in an enlarged view. The pusher circuits for the painting station, the wiping station, and the polishing station have similar valve pistons 140. The wiper station pusher cylinder and associated parts are shown in Fig. 8. The piston rod 75 has a cam arm 75a integrally connected thereto. The cam arm 75a engages poppet valves 75b and 75c to hold them open when the cylinder 72 is not actuated. The poppet valve 75c is connected to the main supply through pilot valves P1 and P2. The pilot valve P1 is normally closed by its spring 70a and is held closed when the timer valve T1 is actuated. The pilot valve P2 is held closed by air from the pipe T1 when the timer valve T1 is actuated.

**Machine index**

In order for the machine to index, air must flow from pipe 106, the pilot valve P1, poppet valve 75c, members 74c and 76c, and pilot valve P2 to the cylinder 51 which has a piston with a piston rod 50 connected to the actuating member 40 on the Geneva drive 47 for the table 45 and four conditions must be satisfied:

(1) The timer valve T1 must be timed out so that air pressure will be taken off of the pilot valve P1.

(2) All of the pusher cylinders for the painting, wiping, and polishing stations must be retracted so that the poppet valves 75c, 74c, and 76c are held open by the cam arms 75a, 74a, and 76a, respectively, and the painting timer T3 must be timed out so that the pressure will be relieved on the pistons actuating the pilot valve P2 so that the pilot valve P2 will be opened. Then it will appear that a complete circuit will be open from the pipe 70 to the piston in the cylinder 51.

(3) If any of the cam arms corresponding to the cam arm 76a are off of their respective poppet valves, the machine cannot index.

(4) The painting, wiping, and polishing cycles must have been thoroughly completed in order for the machine to index as appears supra.

The poppet valve 75b is connected to the timer T1 through the pipe T3. Another poppet valve 75d is connected to the main air supply 70 and to the other side of the cylinder housing the piston 65. Air from a pipe 72a. Therefore, when the table 45 indexes and the cam 139 on the main machine table drive shaft actuates the pilot piston 141 to charge the timer T1, the valve 142 will open and air will flow through the pipe T2.

In addition, since the cam arm 76a is resting on and holding the poppet valve 75b open, air will flow through the valve 75b and drive the piston 100 to the left, thus allowing air to flow from the pipe 70 against an end 100b of the piston 100, driving the piston 100 from the position shown in Fig. 8 and aligning the piston 100 with the pipe 70 and an orifice 106c. The piston 72a will drive the piston rod 72 toward the article carrier 60, forcing the article carrier 60 radially toward the center of the table 45 against the force of air in the cylinder 64 on the piston 65.

As the piston 72a moves its cam arm 76a inwardly, its cam 75a finally strikes an actuating member 75b on the poppet valve 75d. This will open the valve 75d and air will flow from the pipe 70 through a pipe 72a to the space on the left side of the piston 72a. The piston 100 will be driven to the position shown in Fig. 8 and air will be shut off from the pipe 70 through the piston 100 to the cylinder 72 and air from the cylinder 72 will be exhausted through a pipe 72e and a valve 72f at a predetermined rate. This will allow the air in the cylinder 64 to force the article carrier 60 and the piston rod 75 radially outwardly, thereby moving the piston 72a to the position shown in Fig. 8. The rate at which the piston 72a will be moved outwardly will be controlled by the setting of the throttling valve 72f.

As soon as the piston 72a has returned to the position shown in Fig. 8, the article supported on the article carrier 60 will have made one complete inward and outward oscillation or cycle of movement in contact with the light portion 35 of the towel 32. Then if the valve 142 of the timer valve T1 is still open when the piston 72a has returned to the position shown in Fig. 8 and the cam arm 76a is in engagement with the poppet valve 75b, air will again flow through the pipe T1 and the valve 75b into a space 100b, driving the piston 100 to the left and allowing air to flow from the pipe 70 through the reduced size portion of the piston to the space behind the piston 72a. The piston will again move the article support radially in and it will again be pushed out by the piston rod 75 as previously described. It will continue to repeat these in and out reciprocations until the valve 142 of the timer valve T1 has closed; that is, until all the air from behind the piston 135 has bled out through a throttle valve 143. The time for the air to bleed out will be determined by the setting of the throttle valve 143. Therefore, the number of strokes of the wiping cylinder and, likewise, the num-
ber of strokes of the polishing cylinder can be controlled by adjusting the throttle valve 143 to make one stroke or two or more strokes.

The operation of paint cylinder 173 is similar to that of the wiping and polishing cylinders described; however, the timing of the paint cylinder 173 is controlled by the timer valve T3.

**Back-up clamping member**

When the timer valve T3 is charged by the table 45 indexing as described above, air is sent through the pipe T3 into a valve 174a and pressure below a piston 174b forces the piston 174c up against the force of a spring 174d to align the opening thereto with the pipe 76l and allows air to flow from the pipe 76 to a regulator 174e to a piston 174f, forcing the piston rod 174g down and bringing the member 30 into engagement with the right portion 35 of the table 32 and urging it into engagement with the article supported thereunder. The valve 174a will stay open as long as the orifice 14a of the timer valve T3 is charged and when the timer valve T3 closes, the spring 174d will close the valve 174c, thereby stopping the flow of air to the piston 174f and allowing the piston to move out of engagement with the article.

**Timer valves**

The timer valves accomplish the following:

- **T1**: (1) Controls the time that the wiping and polishing back-up members are engaged with the table.
- (2) Controls the number of strokes of wiping and polishing the article oscillating piston.
- (3) Determines the time in which the paint indexes.
- **T2** controls the amount of paint deposited on an article.
- **T3** (1) Prevents the table from indexing until the paint cycle is complete.
- (2) Determines the number of oscillations of the oscillation cylinder.

**Operation of the machine**

The operator will preferably stand in front of the machine shown in Fig. 1 and load parts on the article support 57 and remove articles from the article support 56 after they have been carried past the painting station, wiping station, and polishing station and have been painted, wiped, and polished. A source of compressed air will be connected to the pipe 76. When the operator has placed an article on an article support 59 of the station 45, he will set the switch on the foot switch 111 to allow air to flow through the paint valve 20.

As the table 45 indexes, its shaft will rotate with it, rotating the cam 139 thereon. The cam 139 will momentarily engage a poppet valve 76a which will reduce the pressure in the pipe 23 and cause the valve connected to the cylinder 37 of the tower index mechanism to actuate it in the manner described in connection with the tower 32 and the paint valve and, therefore, bring a fresh piece of cloth into operative position over the painting and wiping stations. As the table 45 driven by the shaft with the cam 139 thereon continues to rotate and the cam 139 moves around, a cam 140 of the valve 142 will be engaged and a piston 141a will move to line up its opening through piston 117 with a pipe 118 and pipe 134. This will charge the timer valves T1, T2, and T3. Air from the timer valve T2 will:

a. Close pilot valve P1;

b. Move the pilot piston 147 of the valve 130 so that air may flow from the pipe 70 to the piston to cause the valve 130 to be actuated which will, in turn, cause the paint gun cylinder 23 to extend its piston and piston rod 24, bringing the paint gun 16 into engagement with the article which has been moved thereunder; and

c. Move the pilot piston 147 of the oscillating valve cylinder 101 so that the article will be moved in and out to apply paint thereto.

The setting of the needle valve on the timer T3 will determine how many strokes the piston rod 76 makes. Air from the timer valve T3 will open the valve in the pipe 16 and cause it to apply a predetermined amount of paint to the nozzle 89 which will, in turn, apply it to the article.

The timer valve T2 will allow air to flow through the pipe T3 which will move the pilot piston on the valves 75a and 174b to their open position and air from regulators 172c and 173c will cause the hold-down cylinders 73 and 174 to clamp the articles. The pilot valve P1 will close so that the table 45 cannot be indexed again until the timer valve T1 has timed out. This will prevent indexing until the painting, wiping, and polishing cycle is complete. In addition, the cylinder 72 will push the article on the support 55 inward the table center and since the article supported on the carrier 60 is urged radially outwardly, the piston rod 75 will oscillate the article in and out. The same will occur at the painting station 15.

As soon as the articles have moved to their extreme inward radial positions by the oscillating cylinder 71 at the three stations of the machine, the cams attached to the piston rods of the oscillating pistons will engage their respective poppet valves 75d, 76d, and 122. This will reverse the pistons 100 on the oscillating valve control cylinders and cause the part oscillating pistons to move outwardly, urged by the article positioning pistons 65.

The poppet valves, being all the same, will exhaust all air in the line ahead of them as soon as they close. Then, if the timer valves T1, T2, and T3 still have pressure holding the valve members thereon open at this time, air pressure will still be provided on the pipes T1 and 133 and the member 137. Also, as soon as the poppet valves 121 and 76b are struck by the cams carried by the rods of the oscillating pistons, the part oscillating pistons will again move the articles supported on the article carrier 60 inwardly against the force of the piston 65. If the timers have closed by this time, no air pressure will be present on the pipes T2 and 122 and, therefore, the particular oscillating cycle will not be repeated. When the timer valves T1, T2, and T3 have timed out and the article supports have moved to their extreme radial outward positions, the table 45 will be ready to again index.

It will be noted that the cloth index takes place when a roller 92a on a clutch 192 strikes the valve 23b. Then, as the clutch 192 continues to rotate approximately one hundred eighty degrees, it strikes an actuating member 140a. Therefore, the table is indexing as the table clutch rotates. If the timer valves T3, T2, and T1 are set for short time intervals, the clutch 192 may rotate continuously through the table 45 will only be driven during about one half revolution of the clutch 192; that is, while the roller 92a is in engagement with a Geneva wheel 292.

The foregoing specification sets forth the invention in its preferred practical forms but the structure shown is capable of modification within a range of equivalents. Without departing from the invention which is to be understood is broadly novel as is commensurate with the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A painting machine for decorating articles of manufacture comprising a frame having a plurality of equivalent article supporting members thereon, a painting station, a wiping station, and a polishing station disposed at spaced locations around said frame, and means to move said article supporting members progressively from said
painting station to said wiping station and then to said polishing station, means to apply paint to articles supported on said article supporting members at said painting station, means to wipe excess paint applied at said painting station from said articles, means to polish said articles at said polishing station, said machine having means to cause said article supporting members to dwell between said painting station and said wiping station whereby paint thereon dries slightly before reaching said wiping station, said machine having means to cause said article supporting members to dwell between said wiping station and said polishing station whereby said paint residue left by said wiping means on articles supported on said article supporting members dries further before being polished by said polishing station.

2. The machine recited in claim 1 wherein said means to apply paint to said articles comprises a paint gun supported on said frame at said paint station.

3. A painting machine for decorating articles of manufacture comprising a table, means to intermittently rotate said table, said table having six spaced article supports carried thereon, a painting station supported at a fixed location on said table, a wiping station supported at a location generally diametrically opposite said painting station, a polishing station also located at a location spaced from said wiping station, means to oscillate said articles, means to move a paint gun into engagement with an article adapted to be supported on said article supports, means to oscillate said article supports in a generally horizontal plane with said articles thereon whereby said articles are moved relative to said paint gun when in engagement therewith, cloth means at said painting station and said polishing station, means to oscillate said articles adapted to be supported on said article supports at said painting station and said polishing station, and means to hold said cloth means in engagement with said articles at said painting station and said polishing station.

4. The machine recited in claim 3 wherein said means to oscillate said article supports comprises air cylinders having pistons thereon having means engaging said article supports urging said article supports radially outwardly, and a regulated air supply providing air pressure to said cylinders.

5. The machine recited in claim 4 wherein an air cylinder having a piston is fixed to said table above said painting station and said wiping station, back-up members are attached to said piston, and air means provides compressed air between said cylinder and said piston to urge said back-up members into engagement with said article and said cylinder being supplied thereto by means of a regulated air supply.

6. A painting machine for decorating articles of manufacture comprising a table, indexing means provided for moving said table intermittently, article supports radially slidable on said table, each said article support having the piston rod of a piston engaging said article support, said pistons each being disposed in a cylinder disposed radially on said table in a plane, and a painting station, a wiping station, and a polishing station disposed at spaced locations around said table, each of said painting, wiping, and polishing stations having an article oscillating cylinder having a piston rod in general alignment with said piston rod of said article support engaging piston and in the same plane therewith, said article oscillating cylinders at said painting, wiping, and polishing stations being selectively attached to a supply of compressed air whereby said pistons push articles on said article supports in against the force said table whereby said articles supported on said article supports are oscillated.

7. The machine recited in claim 6 wherein said painting station has a paint gun having a nozzle made of resilient material thereon, means to move said gun down to bring said nozzle into engagement with said articles adapted to be supported in said article supports when each said article support is moved into said painting station, and means to hold said nozzle in engagement thereon while said articles are being oscillated by said pistons whereby paint from said nozzle is deposited on each said article in turn on the outward stroke of said article support and said paint is spread on the inward stroke thereof.

8. The machine recited in claim 7 wherein a clamping cylinder having a piston therein is supported on said machine above said painting station and another piston is supported above said polishing station, the pistons being disposed in a plane perpendicular to the plane of said table and said oscillating cylinders and adapted to move down into engagement with a cloth to hold said cloth in engagement with said article while articles thereon are in engagement with a paint gun.

9. A painting machine comprising a rotatable table having a plurality of spaced article support urging cylinders supported thereon and extending radially from the center thereof, article supports slidable supported on said table, said article support cylinders each having a piston rod engaging said article supports, a regulated air supply connected to said article urging cylinders whereby said article supports are urged outwardly at a constant force, means to move said article supports under a paint station, and means to oscillate said article supports whereby articles thereon are in engagement with a paint gun.

10. A painting machine comprising a painting station, a wiping station, and a polishing station disposed at spaced points around said machine, a table on said machine with spaced article supports thereon, said painting station having a paint gun supported on a swingable arm on said machine and adapted to swing down into engagement with an article supported in one said article support, means to index said article support to a position under said painting station, a table having a hinged portion supported above said wiping station and said polishing station, a back-up member supported above said wiping station and said polishing station, said back-up member having a piston connected thereto disposed in a cylinder thereon connected to a regulated air supply, said back-up member being adapted to be forced down by said regulated air supply into engagement with said article whereby said back-up member engages said article support in said article support cylinder having a piston rod in a piston rod disposed radially in the article at said piston rod, said piston being disposed at said article support in said article support in a particular station whereby said article support is oscillated inwardly against the force of said regulated air supply and moved outwardly by said pistons in said cylinders connected to said air supply, and timer means for controlling the amount of paint supplied to said paint gun by a paint supply.

11. The painting machine recited in claim 10 wherein said oscillating pistons for said wiping station and for said polishing station are supplied air by means of a timing valve, said timing valve being adapted to be preset to supply air to said oscillating pistons over a predetermined time interval to provide a predetermined number of oscillations with each said article in engagement with said table.

12. The painting machine recited in claim 11 wherein said table is connected to an index mechanism and an air supply is provided for said index mechanism, said index mechanism moving said table intermittently to bring said article supports to said stations, said air supply flowing through poppet valves connected in series one each at said painting, wiping, and polishing stations, said valves being held open when said oscillating pistons are in their unactuated position, said air supply being further controlled through said timing valve in series with said poppet valves, said valves preventing said table from indexing until said...
2,878,391 oscillating pistons are at rest and the preset time of said timer valve has expired.

13. A painting machine comprising a table rotatable in a horizontal plane, article supports supported on said table and spaced around the periphery thereof, radially disposed first cylinders attached to said table and having pistons movable in a plane parallel to said table and urging said article supports to slide outwardly to an extreme outward position, a wiping station and a polishing station on said machine, wiping means disposed above said article supports, said wiping means comprising two spaced spools rotatably supported on axles disposed in a plane parallel to the plane of said table and having a continuous piece of cloth wrapped thereon and extending therebetween, back-up members supported above said cloth and having cylinders attached to said table with pistons thereon attached to back-up means engaging said cloth and moving said cloth down into engagement with articles supported on said article supports, and a part oscillating cylinder disposed in a painting station and in said wiping station, said oscillating cylinder having a piston engaging said article supports and urging said article supports intermittently inwardly against the force of said pistons supported on said table.

14. A process of applying coating comprising providing an article to be coated, moving a device having a resilient nozzle thereon relative to said article and into engagement with said article, supplying a predetermined amount of coating to said nozzle, moving said nozzle and said device relative to said article in a first direction, applying said coating to the engaged surface of said article, and moving said device back over said engaged surface of said article in a second direction with said nozzle in engagement therewith whereby said coating is spread.

15. The process recited in claim 14 wherein means is provided to bring a part of the coated surface of said article into engagement with a piece of cloth after said coating is applied to said article and means is provided to slide said article into engagement with said cloth relative thereto whereby the excess coating applied is removed.

16. The process recited in claim 15 wherein said article is allowed to dry a predetermined time after said coating is applied before said excess coating is removed.

17. The process recited in claim 16 wherein said article is brought into engagement with another material surface after a predetermined time following its engagement with said cloth and moved relative to said cloth in engagement therewith whereby residual coating is polished from said article.

18. A process of painting and polishing articles of manufacture comprising depositing a predetermined amount of paint on an article, allowing said article to dry a predetermined time, bringing said article into engagement with a strip of polishing material, moving said article into engagement with said material whereby excess paint is removed from said article, allowing said article to dry a predetermined time whereby said residual paint not removed by wiping is allowed to dry, bringing said article into engagement with another said material, and moving said article relative thereto whereby said residual paint is removed from said article and said article is polished.

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