

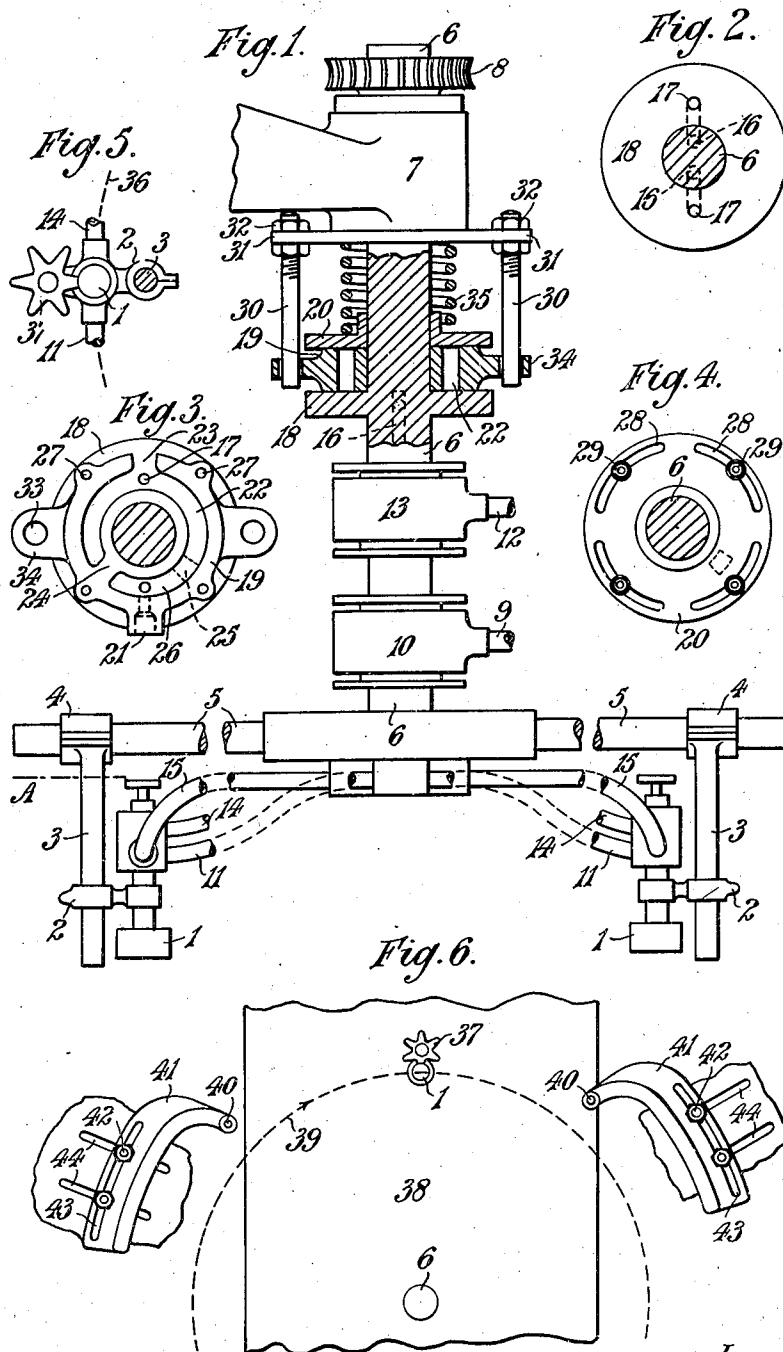
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APPARATUS FOR APPLYING A LIQUID COATING TO A MOVING OBJECT

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APPARATUS FOR APPLYING A LIQUID COATING TO A MOVING OBJECT

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This invention relates to a method of and apparatus for applying a liquid coating to a travelling flat object and has for its object an improved method and apparatus for applying an even coating.

The invention will be described with reference to a horizontal travelling strip, which may be continuous or composed of a succession of plates or sheets.

A spray gun of ordinary type is employed, in which air is used to form the spray, and the gun contains a valve which can be opened or closed to start or stop the spray. This spray control valve is commonly operated pneumatically and the invention will be described firstly with reference to such a valve, but it is applicable to guns having valves operated electrically or mechanically.

According to the invention, the gun is carried on a spindle and is rotated thereby in a plane parallel to that of the travelling strip in a circle of substantially greater diameter than the width of the strip and the controlling valve of the gun is operated intermittently, so that the gun delivers a spray only during either one or both of its two passages over the strip in each revolution.

If the diameter of the circle of rotation of the spray gun were equal to the width of the strip, the edge of the strip would receive a much thicker coating than the centre. The coating, however, is of substantially even thickness if the diameter of the circle of rotation is substantially greater than the width of the strip, so that the arc during which the gun is over the strip during each passage is substantially less than 180°.

The invention further comprises means whereby the arc during which the gun delivers a spray can be adjusted to any desired length.

In the accompanying drawing:—

Figure 1 is an elevation, partly in section, of the apparatus;

Figures 2, 3 and 4 are plan views, partly in section, of portions of the air valve device;

Figure 5 is a plan view of the modification, partly in section, of a gun with spray

control valve adapted for mechanical operation, and

Figure 6 is a diagrammatic plan view of the modified form of the gun adapted for mechanical operation and showing the travelling strip.

In the apparatus as shown in Figures 1 to 4, two spray guns, diametrically opposite each other, are used, but the operation of one gun is similar to that of the other.

The guns 1 are attached by clips 2 to rods 3 which are attached by clips 4 to radial arms 5 projecting from the spindle 6. By means of the clips 2 and 4, the guns may be adjusted respectively in height and in radial position. The spindle 6 is rotatably supported in a bearing 7 and is rotated by the worm wheel 8.

The liquid to be sprayed is supplied through the pipe 9 and sleeve 10 to passages in the spindle (not shown) to which are connected flexible pipes 11 leading to the guns. The air for spraying the liquid is supplied through the pipe 12 and sleeve 13 to passages in the spindle (not shown) to which are connected flexible pipes 14 leading to the guns.

The spray gun valves are operated by air pressure delivered through pipes 15 and passages 16 in the spindle terminating in holes 17 in the plate 18 on the spindle, as will be clear by reference to Figures 1, 2 and 3.

An air valve controlling the supply of air pressure consists of three parts, the plate 18, the air valve body 19 (Figures 1 and 3) and the cover 20 (Figures 1 and 4). The air under pressure is led to the air valve body 19 by a flexible pipe attached at 21, whence it is led to the annular space 22. The space 22 is closed below by the plate 18 and above by the cover 20. The passages 16 to the spray control gun valves open into the space 22 at 17. The space 22 has an opening 23 to the atmosphere and it is divided into two portions by the web 24.

The air valve comprising 18, 19, 20, as shown is provided with means for varying the arc through which the gun is operated to spray. In certain cases, however, as, for instance, when the object to be coated, is always

of the same width, it is not necessary that the arc of operation should be variable. The action of the air valve will be described first on the assumption that it provides only for a fixed arc of operation. In this case the annular space 22 is bridged by a second web 25, shown in dotted lines in Figure 3, forming with the web 24 a closed space 26. In the position shown in Figure 3, this space 26, under air pressure from the inlet 21, is connected with one of the guns by the hole 17, and the gun is then operating to spray. As the spindle 6 with its plate 18 rotates, for example, clockwise as seen in Figure 3, when the hole 17 passes under the web 25 and opens into the space 26, the gun starts to operate. When the hole 17 comes under the web 24 and opens into the long annular space on the other side of the web, it is in communication with the atmosphere through the opening 23, whereby the air pressure is released and the gun ceases to operate. The arc of operation is therefore determined by the length of the space 26 between the webs 24 and 25.

In the air valve as shown the arc of operation is made variable as follows:—The piece 25 is not a web integral with the walls of the annular space 22 but is fixed to the underside of the cover 20, as shown in dotted lines in Figure 4. This cover is capable of being turned relatively to the body 19, being held in any desired relative position thereto by studs fixed in the holes 27 of the body 19, which enter slots 28 in the cover 20 and are locked thereto by nuts 29.

By turning the cover 20 relatively to the body 19, the position of the piece 25 is varied and therefore the point at which the operation of the gun starts is varied.

Now the body 19 is held in position by rods 30 which are locked by nuts 32 to a plate 31 fixed to the bearing block 7, the rods 30 entering holes 33 in lugs 34 on the body 19. The rods 30 pass through circular slots in the plate 31, so that, on slackening the nuts 32, the body 19 can be turned to any desired position. By so turning the body 19, the position of the web 24 is varied and therefore the point at which the operation of the gun ceases is varied.

Since the cover 20 turns with the body 19, the adjustment is effected in practice by first turning the body 19, to adjust the point at which the gun ceases to operate and then turning the cover 20 to adjust the point at which it starts to operate.

The cover 20 is pressed against the body 19, and this against the plate 18 by the spring 35.

In the embodiment of the invention illustrated in Figures 5 and 6 an arrangement is provided wherein the spray gun is controlled by a mechanically operated valve. This form of apparatus utilizes a rotating mechanism similar to that employed in the embodiment of Figure 1 but with the omission of

the air control valve comprising 18, 19, 20.

Figure 5 is a horizontal section of one gun as taken along the line A of Figure 1, but with the gun held on the far side of the rod 3 from the centre of rotation, the path of the gun being the dotted line 36.

The valve of the gun is operated by partial rotation of the star wheel 37, successive movements of the star wheel through 60° opening and closing the spray gun control valve.

Figure 6 is a diagrammatic plan view showing the gun 1 with a control valve operated by star wheel 37, 6 being the spindle, 38 the strip to be coated, and 39 the path of the gun. At each side of the strip 38, pins 40, supported on brackets 41 are held in position to engage the star wheel 37. The brackets are fixed to the framework of the strip conveyor by bolts 42 engaging circumferential slots 43 in the brackets 41 and approximately radial slots 44 in the framework. The pins 40 can thereby be adjusted in position to cause operation of the gun through any desired arc of contact.

If the arc of travel of the gun be fixed, such as would be the case, for example, in the embodiment of Fig. 1 if the gun control valve 18, 19, 20 was not adjustable it is still possible to operate the apparatus for varying widths of strip, by varying the radial position of the gun. This, however, is inconvenient in practice because the thickness of coating is varied thereby, and this can be corrected only by varying the travelling speed of the strip. This, again, varies the overlap of the successive bands of liquid sprayed, and the overlap has to be corrected by varying the speed of rotation of the spindle.

When, however, the arc of operation is variable, as in the apparatus shown, variation of this arc is the only adjustment which has to be made for varying widths of strip.

The arc of operation of 100°, as shown approximately in Figure 6, is found to give substantially uniform thickness of coating and the arc can be increased beyond this to give a coating sufficiently uniform for many purposes.

If, in increasing the arc of operation to suit increasing width of strip, the permissible limit of arc would be passed, the necessary adjustment must be made by increasing the radius of the gun.

It is therefore preferable that the speed of rotation of the gun and the speed of travel of the strip should be variable.

It is generally more convenient that the gun should be operative to spray during only one of its passages over the object in each revolution, but it may be made operative during both passages to give a double coating.

Having described my invention, I declare that what I claim and desire to secure by Letters Patent is:—

1. Apparatus for coating a traveling flat object, comprising a gun for spraying the

coating liquid, means for moving the gun over the object, said gun having a valve to control its operation, a rotary spindle, an arm secured to the spindle and carrying the gun at a radius substantially greater than half the width of the object, means for rotating the spindle to move the gun in a circular path in a plane parallel to that in which the object is moved, and means coaxial with said spindle and mounted thereon for actuating the controlling valve to operate the gun only during the part of the revolutionary movement of the gun when it travels over the object.

2. Apparatus for coating a traveling flat object including a gun spraying the coating liquid by air, means for moving said gun over the object, comprising a spindle carrying the gun at a radius substantially greater than half the width of the object, means for rotating the spindle to move the gun in a plane parallel to that in which the object is moved, a valve on the spindle for controlling the operation of the gun, means also on the spindle for actuating the controlling valve to operate the gun only during one of its passages over the object in each revolution, and means for adjusting the length of arc on each revolution during which the gun is in operation.

3. Apparatus for coating a traveling flat object comprising a gun spraying the coating liquid by air, a pneumatically actuated valve for controlling its operation, means for moving the gun over the object, comprising a spindle carrying the gun at a radius substantially greater than half the width of the object, means for rotating the spindle to move the gun in a plane parallel to that in which the object is moved, and a valve mounted on the spindle whereby a passage in the spindle communicating with the controlling valve is alternately, by rotation of the spindle, put into communication with a source of air under pressure other than atmospheric and with the atmosphere.

4. Apparatus as in claim 3 in which a sleeve in the valve on the spindle is adjustable to vary the relative time during which the controlling valve is in communication with the source of air under pressure other than atmospheric and with the atmosphere.

5. Apparatus for coating a traveling flat object including a gun for spraying coating, a stationary member, a rotary spindle supported by the stationary member, an arm secured to and rotatable with the spindle carrying the gun for movement over the object along a curvilinear path in a plane parallel to the path of travel of the object, means to rotate the spindle, a valve on said spindle for controlling operation of the gun, and means also on the spindle for actuating the control valve to render the gun operative

only during the part of its cycle of movement when it travels over the object.

6. Apparatus for coating a traveling flat object including a gun for spraying coating, a rotatable spindle supporting the gun, means to move said gun over the object along a curvilinear path in a plane parallel to the path of the object, a valve controlling operation of the gun, and means on the spindle and operated by the rotation thereof for actuating the control valve to render the gun inoperative during movement over designated parts of its path.

7. Apparatus for coating a traveling flat object with a uniform thickness of coating, including a gun for spraying the coating, means to support the gun for movement over the object in a plane parallel to the path of travel of the flat object, said supporting means including a rotary spindle, means for rotating the same, and a rigid arm secured to and rotatable with the spindle and projecting radially therefrom, said gun receiving its entire support from said arm and being secured thereto whereby its path of travel in each cycle will be a circle, said circular path extending beyond the edges of the object and having a radius substantially greater than half the width of the object, and control means for the gun and means for actuating said control means whereby the coating is applied to the traveling object during movement of the gun over a part of its path in the form of successive curved stripes defined by the arc of a circle of substantially greater diameter than the width of the object.

8. Apparatus for coating objects comprising a gun for spraying the coating liquid, a pneumatically actuated valve controlling operation of the gun, supporting means for the gun including a rotatable spindle, means for rotating the spindle to move the gun in a path about the spindle, a valve mounted on the spindle communicating with the gun actuating valve, and means in said valve operable upon rotation of the spindle to put the gun actuating valve in communication alternatively with a source of air under pressure and with the atmosphere.

In witness whereof I have affixed my signature hereto.

LEWIS JEX-BLAKE FORBES.