PROCESS AND APPARATUS FOR THE SEAMLESS COATING OF PRINTING ELEMENTS, SUCH AS PLATES AND CYLINDERS

Fig. 2

Fig. 3

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PROCESS AND APPARATUS FOR THE SEAMLESS COATING OF PRINTING ELEMENTS, SUCH AS PLATES AND CYLINDERS

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This invention relates to the application of a seamless coating of a photosensitive solution to printing plates, especially cylinders.

Various methods of applying a seamless coating of photosensitive material to printing plates, particularly to printing cylinders, have heretofore been tried. For example, the printing cylinder is sometimes dipped in the upright position into a tank full of coating liquid and the liquid then allowed to drain slowly out of the tank. This method produces a variable fluid pressure, making the attainment of a thin, even coating uncertain, especially on cylinders of considerable length, such as those used for printing textiles. Another procedure for coating printing cylinders is to draw the cylinder through a packing ring and a superimposed vessel containing the solution. This method of applying a coating has also been found unsatisfactory because as soon as the cylinder has passed through the packing ring, the solution suddenly drains away downwardly, thus causing a variation in the thickness of the coating being applied.

Attempts have also been made to achieve a better result by placing the printing plate vertically into an empty vessel, with the photosensitive solution then allowed to rise in the vessel upwardly from the bottom, until the printing plate is completely immersed in the solution. The coating plate is then withdrawn from the vessel in a direction parallel to its length, while the surface of the solution is maintained at a constant level. When the length of the printing cylinders varies, this method requires that the length of the vessel should also vary. This is not only troublesome but also involves expense in time and labor. Still another disadvantage is that when the vessel is filled below with photosensitive solution, it is almost impossible to avoid the formation of very fine air bubbles, leading to uneven coating. Apart from the air bubbles there is a risk that dust particles may settle on the freshly applied coating before it is dry, possibly producing the so-called halo ("little sun") effect on the image.

The primary object of the invention is to provide a process and apparatus for applying a seamless coating to printing plates or cylinders free from defects such as indicated above. It is distinguished by the fact that during the immersion of the printing plate in the bath and during its withdrawal from the bath filtered air above the surface of the solution is blown against the surface of the said printing plate or cylinder. The air shield, produced by the air blast, may advantageously be directed at the printing plate or cylinder at an oblique angle. This air shield protects the liquid of the vessel against the penetration of dust particles, when the cylinder is being lowered or raised, so that no dust can attach itself to or mingle with the coating.

Good results may be obtained if care is taken to ensure that the flow conditions for the air shield, produced by the introduction of filtered air, remain constant while the printing cylinder is introduced into and withdrawn from the vessel. In accordance with the invention this may be achieved by keeping the liquid surface constant both while the printing plate is being immersed in the vessel and while it is being withdrawn therefrom. This method simultaneously prevents the development of suction, when the printing plate is introduced into the vessel, and thus the attraction of dust particles and the like.

Apparatus for carrying out the process according to the invention may advantageously be so formed that the upper edge of a tank is surrounded by a ring-shaped channel, through which the photosensitive coating is introduced. The bottom of the tank takes the form of a plunger, freely movable in the longitudinal direction of the tank, which can be raised and lowered together with the printing plate. The upper edge of the tank then serves for filling the tank with solution, while the printing plate is being simultaneously introduced, and as a peripheral overflow, while the printing plate is being withdrawn from the tank. In this way the surface of the liquid in the tank may be kept constant at each step in the movement of the printing plate.

Around the perimeter of the tank there may advantageously be situated a chain of jets, disposed in a circle and directed radially against the periphery of the printing plate. Before and during the raising and lowering of the printing plate and at each stage of its movement the shield of filtered air, formed of air blown through the openings or jets, passes over the printing plate liquid surface, which is kept at constant level, thus ensuring constant conditions for the coating action and protection from dust.

One form of invention, given by way of example, will now be explained in more detail with reference to, and illustrated in the accompanying drawings, in which:

FIG. 1 is a side elevational view of the device constructed in accordance with the invention, and being partly in vertical cross-section;

FIG. 2 is a sectional view corresponding to FIG. 1 and illustrates the action on withdrawing the printing plate, to which a seamless coating is being applied; and

FIG. 3 is a top plan view of the device shown in FIG. 1.

As shown in the accompanying drawings a coating device constructed in accordance with this invention comprises an open-ended cylinder 1 herein referred to as a tank with a jacket 2, in which a liquid may be held at a prearranged temperature. The bottom 3 of the tank is in the form of a plunger and is free to move in the longitudinal direction of the tank. At the upper edge of the tank there is an encircling channel 4 of roughly V-shaped in cross-section, and through which runs a known photosensitive solution 5 such as that disclosed in Patent No. 2,159,588 granted to Josef Goring on May 23, 1939. The channel 4 may be connected with a storage vessel 8 by way of the inlet-outlet 6 into a flexible feed 7, it being possible to displace the supply vessel 8 vertically according to the particular state of the coating process.

There is provided an inverted frusto-conical wall 12 extending downwardly from the outer edge of the V-shaped channel 4 adjacent the air feed line 9 and is sealed at its lower end to the wall of the jacket 2 of the tank 1 to provide an air chamber 12a. This circular feed 9 may be fitted with individual openings, or circular slits, extending around its perimeter, or jets 10, directed against the periphery of the coating cylinder 11, to be mounted on the plunger-type tank bottom 3. The jets may be directed against the periphery of the printing cylinder 11 in radial fashion. The jet 10 may alternatively be directed along a chord of the tank or tangentially to the edge of the tank. In the latter case, there results an air shield, which runs around the printing cylinder 11 on a roughly helical path. The ring of jets 10 and chamber 12 are connected to a pump 15 or to a filtered air supply tank. The filtered air is kept under pressure by an air blower 16, so an air blast is produced. This supply chamber 12 forms a ring around the tank 2, so that an even supply of filtered air to the peripheral jets 10 is ensured. A convenient way
of securing the printing cylinder 11 to the plunger-type tank bottom 3 is to lead the shaft of the printing cylinder 11 through the tank bottom 3 and fasten it with a nut 13 on the underside.

The coating process is as follows: First, the loose bottom 3 is secured to the lower end of the printing cylinder 11 and mounted in the tank in such a way that the upper edge of the plunger bottom coincides with the edge of the tank. In this position the supply channel 4 is filled with photosensitive solution from the vessel 8 to a level controlled by raising the vessel to the upper edge of the tank 1. The plunger bottom 3 is then lowered together with the cylinder 11. The photosensitive solution is simultaneously allowed to overflow out of the supply channel 4 into the ring-shaped space between the cylinder 11 and the tank 1 at such a rate as to keep the ring-shaped space 14 at all times full to the upper rim of the tank. In this way, any risk of dust being drawn into the annular space 14 is avoided.

Before the cylinder 11 is lowered and, also while it is being lowered and subsequently raised, filtered air is blown against the periphery of the printing cylinder 11 in the direction of the arrow 15 from the jets 10 in the ring-shaped feed 9. The filtered air shield, thus produced, furthermore keeps dust laden air out and keeps away from the printing cylinder. The flow from the supply vessel can be regulated by one or more pinch-cocks 16. Using a pinch cock has the advantage that the shut-off point in the flexible tube 7 can be easily and quickly cleaned, so that no blockage can be caused by residual solution. After the whole length of the printing cylinder 11 has been immersed in the photosensitive solution in the tank 1, the cylinder 11 is caused to travel upward together with the plunger 3. At the same time the liquid surface at the upper edge of the tank 1 is kept constant by liquid running evenly back into the supply channel 4 and flowing out of the latter through the outlet 6 and the flexible tube, which may be divided at the intermediate section 17, the supply vessel 8 having been lowered. In this connection it is advantageous to provide for the filtration of the solution entering vessel 8 by means of a filter 80 fitted on top of the latter. During the raising of the cylinder 11 also, filtered air from the supply chamber 12, entering through the jets 10, is blown against the periphery of the cylinder 11. This air shield simultaneously effects the immediate drying of the coating applied to the cylinder 11, so that dust particles are prevented from settling on it. The supply chamber 12 may be connected to a device which compresses and simultaneously filters the air, such as the pump 18. The outlet slits or jets 10 may be opened or closed individually or by means of a ring-shaped slide. To avoid any dust being deposited in the channel and/or on the printing solution, which it contains, both when the printing cylinder 11 is being raised, the channel 4 may be filled with a frusto-conical cover, shield or guard 19 above the jets 10. This cover may advantageously consist of a disc-shaped ring of transparent material, e.g. of plastic, so that the overflow of the printing solution can be observed. If, before the printing solution is allowed to flow into the channel 4, filtered air is blown in beneath the protective cover 19, any dust which may possibly be present in the channel, will be carried away, giving a good prospect of a dust-free coating.

In the same way the device in accordance with the invention, flow and coating conditions remaining constant at all times, permits the use of cylinders of different lengths in the same tank, which may be as long as is desired. To determine the immersion depth of the printing cylinder no aids on the outside of the tank are required, e.g. a measuring scale or a riser indicating the immersion depth, as is the case with enclosed tanks, since the immersion depth is visible at all times. The printing solution is fed in simply, surely and uninterruptedly.

What is claimed is:

1. The process of applying a seamless coating of photosensitive solution to a printing cylinder, consisting of immersing the cylinder in a bath of photosensitive solution, directing a blast of filtered air upward at an inclination to the direction of movement of the cylinder against the outer side of the same, and then above the solution to remove all dust therefrom before immersion and blowing a blast of air against the cylinder above the solution and in the same direction as the aforesaid blast of filtered air during its withdrawal from the solution to effect a seamless coating and expedite drying of the coated cylinder.

2. A process of applying a seamless coating of photosensitive solution to a printing cylinder comprising the steps of immersing the cylinder in a bath of photosensitive solution while directing a protective blast of filtered air completely overlying the bath and upwardly at an inclination to the downward direction of movement of the cylinder to remove all dust from the cylinder immediately prior to immersion while maintaining the surface of the bath dust free, and withdrawing the cylinder from the bath while directing a protective blast of filtered air above the bath and in the general direction of withdrawal of the cylinder to protect the bath and the freshly coated surface of the cylinder and to promote drying of the cylinder.

3. The process of claim 2 wherein the level of the bath is constant during the cylinder coating.

4. Apparatus for applying a seamless coating of photosensitive solution to a printing cylinder comprising a cylindrical tank, a plunger piston reciprocable in said tank for the support of the cylinder to be coated, an angular wall structure at the outer side of the upper end of the tank forming a solution channel encircling the upper end of said tank and arranged for the overflow of solution into the upper end of the tank and a lower air chamber, means for supplying photosensitive solution to the channel, means for supplying filtered air to the air chamber and air escape means in the air chamber for directing filtered air onto the printing element above the solution in the channel and at an upward inclination.

5. Apparatus as in claim 4, wherein the printing cylinder is a cylinder of less diameter than the tank to form a solution area around the cylinder.

6. Apparatus as in claim 4, wherein a shield above the channel confines the air blast to the printing cylinder.

7. Apparatus for applying a seamless coating of photosensitive solution to a printing cylinder, comprising a cylindrical tank, a plunger piston reciprocable in said tank for the support of the cylinder to be coated, an angular wall structure at the outer side of the upper end of the tank forming a solution channel encircling the upper end of said tank and arranged for the overflow of solution into the upper end of the tank and a lower air chamber, means for supplying photosensitive solution to the channel, means for supplying filtered air to the air chamber and air escape means in the air chamber for directing filtered air onto the printing element above the solution in the channel and at an upward inclination, the solution supplying means including a storage vessel vertically shiftable relative to the cylinder and means forming communication between the upper and lower ends of the storage vessel and the solution channel for gravitationally feeding the solution from the lower end of the storage vessel to the channel and upper end of the tank during lowering movement of the cylinder in the tank and reversely from the tank and channel back to the storage vessel at the upper end thereof when the latter is lowered relative to the tank and the cylinder and piston are raised in the tank.

8. Apparatus as in claim 4, wherein a shield above the channel confines the air blast to the printing cylinder, the solution supplying means including a storage vessel vertically shiftable relative to the cylinder and means forming communication between the upper and lower ends of the storage vessel and the solution channel for gravitationally feeding the solution from the lower end of the
storage vessel to the channel and upper end of the tank during lowering movement of the cylinder in the tank and reversely from the tank and channel back to the storage vessel at the upper end thereof when the latter is lowered relative to the tank and the cylinder and piston are raised in the tank.

9. Apparatus as in claim 4, wherein the printing cylinder is of less diameter than the tank to form a solution zone around the cylinder, the solution supplying means including a storage vessel vertically shiftable relative to the cylinder and means forming communication between the upper and lower ends of the storage vessel and the solution channel for gravitationally feeding the solution from the lower end of the storage vessel to the channel and upper end of the tank during lowering movement of the cylinder to the tank and reversely from the tank and channel back to the storage vessel at the upper end thereof when the latter is lowered relative to the tank and the cylinder and piston are raised in the tank.

10. Apparatus as in claim 4, wherein the printing cylinder is of less diameter than the tank to form a solution zone around the cylinder, the air escape means in the air chamber comprising a circular series of jet openings at the upper end of the air chamber and a frusto-conical guard at the upper end of the tank for confining the air blast to the outer side of the cylinder above the tank during immersion and withdrawal movements relative to the tank.

11. Apparatus as in claim 4, wherein the printing cylinder is of less diameter than the tank to form a solution zone around the cylinder, the solution supplying means including a storage vessel vertically shiftable relative to the cylinder and means forming communication between the upper and lower ends of the storage vessel and the solution channel for gravitationally feeding the solution from the lower end of the storage vessel to the channel and upper end of the tank during lowering movement of the element into the tank and reversely from the tank and channel back to the storage vessel at the upper end thereof when the latter is lowered relative to the tank and the cylinder and piston are raised in the tank, the air escape means in the air chamber comprising a circular series of jet openings at the upper end of the air chamber and a frusto-conical guard at the upper end of the tank for confining the air blast to the outer side of the cylinder above the tank during immersion and withdrawal movements relative to the tank.

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