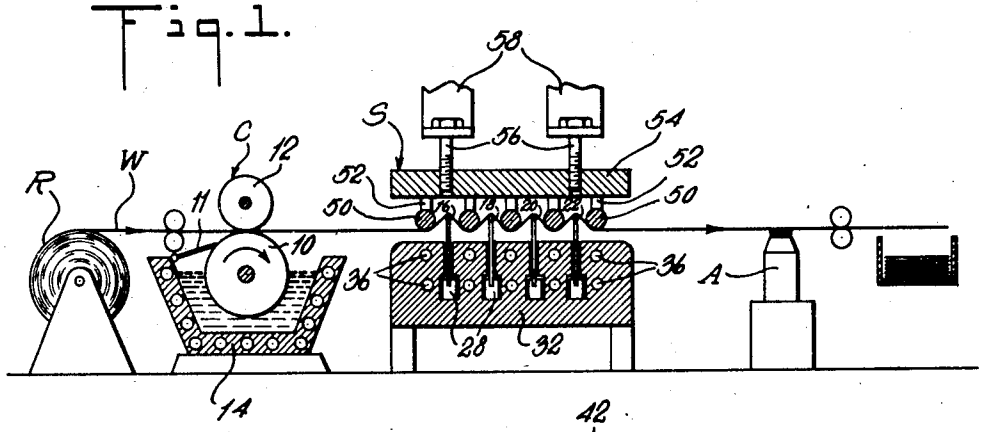
Sept. 10, 1946. A. M. WICKWIRE, JR 2,407,335

APPARATUS FOR SMOOTHING HOT MELT COATINGS

Original Filed Dec. 31, 1941

Fig. 1.



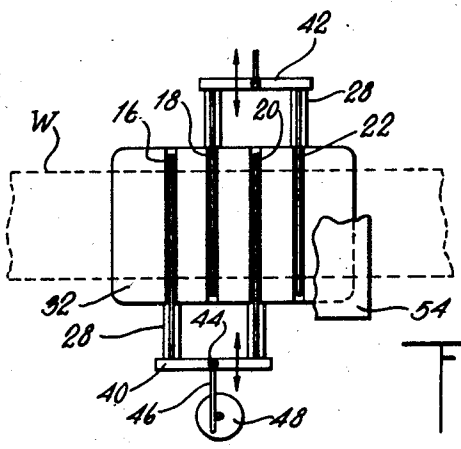
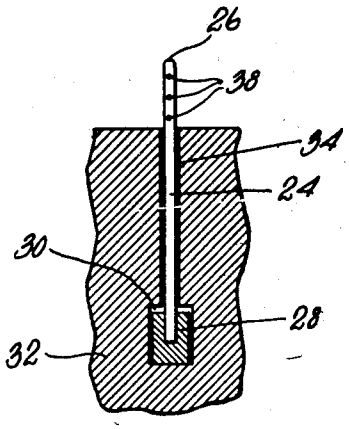


Fig. 2.

Fig. 3.



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APPARATUS FOR SMOOTHING HOT MELT COATINGS

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3 Claims. (Cl. 91—53)

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This invention relates to the continuous coating of webs or sheets of paper and like material with thermoplastic or hot melt coatings which are solid at normal room temperatures and become liquid when heated to an elevated temperature. More particularly, the invention contemplates the provision of an improved apparatus for smoothing such materials after they have been applied to a web with a rotogravure cylinder. The present application is a division of my copending application Serial #425,211 filed Dec. 31, 1941.

Due to the fact that a rotogravure cylinder having an all-over screen pattern on the printing surface thereof provides a means of accurately regulating the amount of coating material applied, such cylinders are now being used rather extensively in the continuous application of coating materials to webs of paper and the like. When the coating composition applied is a thermoplastic or hot melt material, it is usually necessary to provide some means of smoothing and leveling the small dots of material applied by the gravure cylinder in order to produce a glossy and smooth surface. Various forms of apparatus have been suggested for this purpose and most of them involve the use of a heated bar or shoe having a smooth surface for contacting and heating the applied coating material so that it may be smoothed as the web passes thereover. While many of these are now being used successfully, they do not always function efficiently over wide ranges of speed and with coating materials having comparatively high melting points.

I have discovered that smoothing of hot melt coating materials applied with a gravure cylinder is most effectively accomplished when the heated smoothing bar or other smoothing means is reciprocated back and forth as the coated web passes over it; and I have invented an improved apparatus for smoothing a wide variety of hot melt coatings at considerably higher speeds than were heretofcre obtainable.

In accordance with my invention, hot melt coatings are applied to one surface of a moving web by means of a rotogravure cylinder which deposits the material in a multiplicity of regularly spaced uniform dots or quantities. The thus coated surface is smoothed into a glossy film of uniform thickness by passing the web angularly over a reciprocating heated smoothing device which acts to re-melt the material if it has solidified and spread and laterally sweep the small dots out sidewise and in all directions so as to fill all the spaces and produce a continuous

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level film. I have also found that the reciprocation tends to dislodge any foreign matter that may be present on the coating or on the smoothing device and, therefore, eliminates the minute scratches caused by such matter. One form of smoothing device embodying the principles of my invention includes a plurality of substantially vertically arranged, closely spaced heated smoothing bars or scraper blades which preferably have narrow rounded faces for contacting the coated surface and are reciprocated back and forth as the web passes over them. When a plurality of blades are provided, it is desirable to have them arranged so that alternate blades move in opposite directions during their reciprocation. The effectiveness of the action of the blades or bars may be increased by providing breaker bars or rollers adjacent the uncoated side of the paper and arranged between the blades so that the angle and pressure of contact of the web with the blades may be suitably adjusted for different speeds and different coating materials.

The above and other features and objects of my invention will become apparent upon consideration of the following detailed description and the accompanying drawing, in which:

Fig. 1 is a somewhat diagrammatic elevational view, partly in section, showing a complete coating apparatus in which my invention has been embodied;

Fig. 2 is a plan view of the smoothing apparatus showing the disposition of the blades and their manner of reciprocation; and

Fig. 3 is an enlarged fragmentary vertical sectional view showing the construction and manner of mounting the individual smoothing bars.

As shown in the drawing, a web W of paper or other material to be coated is fed from a suitable supply roll R to a rotogravure coating apparatus C where the hot melt coating material is applied to the under surface of the web in the desired quantity. The coating apparatus C in the form shown comprises a rotogravure coating or printing cylinder 10 having a conventional screen pattern etched over its entire surface, a doctor blade 11 for removing excess coating material from the cylinder prior to its contacting the web, and a cooperating impression cylinder 12. Coating cylinder 10 is arranged to rotate in the bath of the coating material which is contained within a suitable heated fountain or housing 14. As the web W leaves the coating apparatus C, it has the coating material applied to the under surface thereof in a multiplicity of regularly and closely spaced uniform quantities

or dots and is passed through a smoothing apparatus S constructed in accordance with the principles of my invention and adapted to smooth and level out the closely spaced uniform dots into a continuous film. The web may then be cooled in any convenient manner such as by means of an air blast A and cut into sheets or fed to any other desired web treating or handling apparatus.

Smoothing apparatus S comprises a plurality of substantially vertically arranged bars or blades 16, 18, 20 and 22. I have shown four smoothing bars or blades in the present instance but it will be understood that depending upon the type of coating material and the speed of movement of the web W, more or less blades may be used, as desired. Each of the blades, 16, 18, 20 and 22 is identical in construction and, as shown in Fig. 3, consists of a thin, flat metal blade or bar 24 having an upper rounded web-contacting edge 26 and mounted in a slotted rectangular holding member 28. Holder 28 is slidably received in a horizontally-disposed recess 30 provided in a heating block 32 and opening into a substantially vertically disposed slot or opening 34 through which the blade extends.

The heating block is provided throughout the spaces between the passages 34 with openings 36 for the insertion of any suitable heating means such as electric strip heaters; or, if desired, they may be connected with a heating system for circulating a heating fluid through them. In any event, the heating means provided should be sufficient to heat the block 32 so that the smoothing bars may become heated to an elevated temperature. Consequently, it is desirable to have the bars placed as closely together as possible in the heating block so that they may be properly heated and so that the web will not cool appreciably in passing from one to another. Should the blades themselves be constructed of heavy enough stock, it is desirable to mount heating means 38 directly in the upper ends thereof which project beyond the top surface of the heating block 32.

Referring to Fig 2, it will be noted that the smoothing bars 16 and 20, or at least the holders 28 thereof, project beyond one side of the heating block 32 and are connected to an actuating member 40. Similarly, the smoothing bars 18 and 22, or the holding members 28 thereof, project beyond the other side of the heated block 32 and are connected to an actuating member 42. Each of the actuating members 40 and 42 is operatively connected to some suitable reciprocating mechanism which is adapted to cause all of the smoothing bars 16, 18, 20 and 22 to be reciprocated back and forth as the web W passes over them. For example, actuating member 40 may be pivotally connected at 44 to a link 46 which has its other end pivoted at the edge of a rotating disc 48 so that, as said disc rotates, it will cause the actuating member 40 to be reciprocated back and forth a distance substantially equal to the diameter of the disc.

In order that the web W may pass over each of the smoothing bars or blades at an angle, I have provided a plurality of breaker bars or rollers 50 which are arranged above the web to cause it to be passed angularly upwardly and then downwardly in traveling over each smoothing bar, and are preferably provided with some suitable internal heating means so that the web may be

maintained in a proper heated condition in its passage through the smoothing apparatus. These breaker bars are connected, as by means of supporting rods 52, to an adjustably mounted holding or supporting member 54 which is arranged to be moved upwardly and downwardly in any conventional manner. As shown, the supporting member 54 is supported on downwardly extending screws 56 which are threaded in brackets 58 attached to a suitable side frame structure (not shown).

From the foregoing description, it will be understood that I have provided a method of and apparatus for smoothing hot melt coatings which is particularly advantageous in leveling out such coating material that has been applied to a moving web with a rotogravure cylinder, though obviously my invention is not restricted in its use to such application of the coating material. Due to the fact that each heated smoothing bar is reciprocated as the coated web passes over it, the individual regularly spaced dots of coating material are spread both longitudinally with the movement of the web and laterally with a sweeping action produced by the reciprocation, and thus merged or integrated into a smooth film of uniform thickness, and the minute scratches caused by the presence of foreign matter on the coating or on the smoothing bar are eliminated. The similarly acting smoothing bars or blades supplement each other in their effect on the coating and in the production of a smooth and properly regulated and leveled film.

While I have described one preferred embodiment of the apparatus features of my invention, it will nevertheless be understood that various changes may be made in the construction and certain features thereof employed without others, without departing from my invention or sacrificing any of its advantages.

1. Apparatus for smoothing thermoplastic coating material that has been applied to the surface of a sheet or web, comprising a plurality of spaced bars having smooth curved surfaces for contacting the coating material, means for heating each of said surfaces to an elevated temperature, means for causing the material to pass through an angular path in contacting each of said bars, and means for reciprocating said bars while the coating material is in contact therewith.

2. Apparatus for smoothing thermoplastic coating material that has been applied to the surface or a sheet or web, comprising a plurality of spaced bars having upper smooth curved surfaces for contacting the coating material, means for heating each of said surfaces to an elevated temperature, a plurality of breaker rollers disposed in the spaces between said bars in a position below the curved surfaces of said bars, and means for reciprocating said bars while the coating material is in contact therewith.

3. Apparatus for smoothing thermoplastic coating material that has been applied to the surface of a sheet or web, comprising a plurality of spaced bars having smooth curved surfaces for contacting the coating material, means for heating each of said surfaces to an elevated temperature, and means for causing adjacent bars to be reciprocated in opposite directions while the coating material is in contact therewith.

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