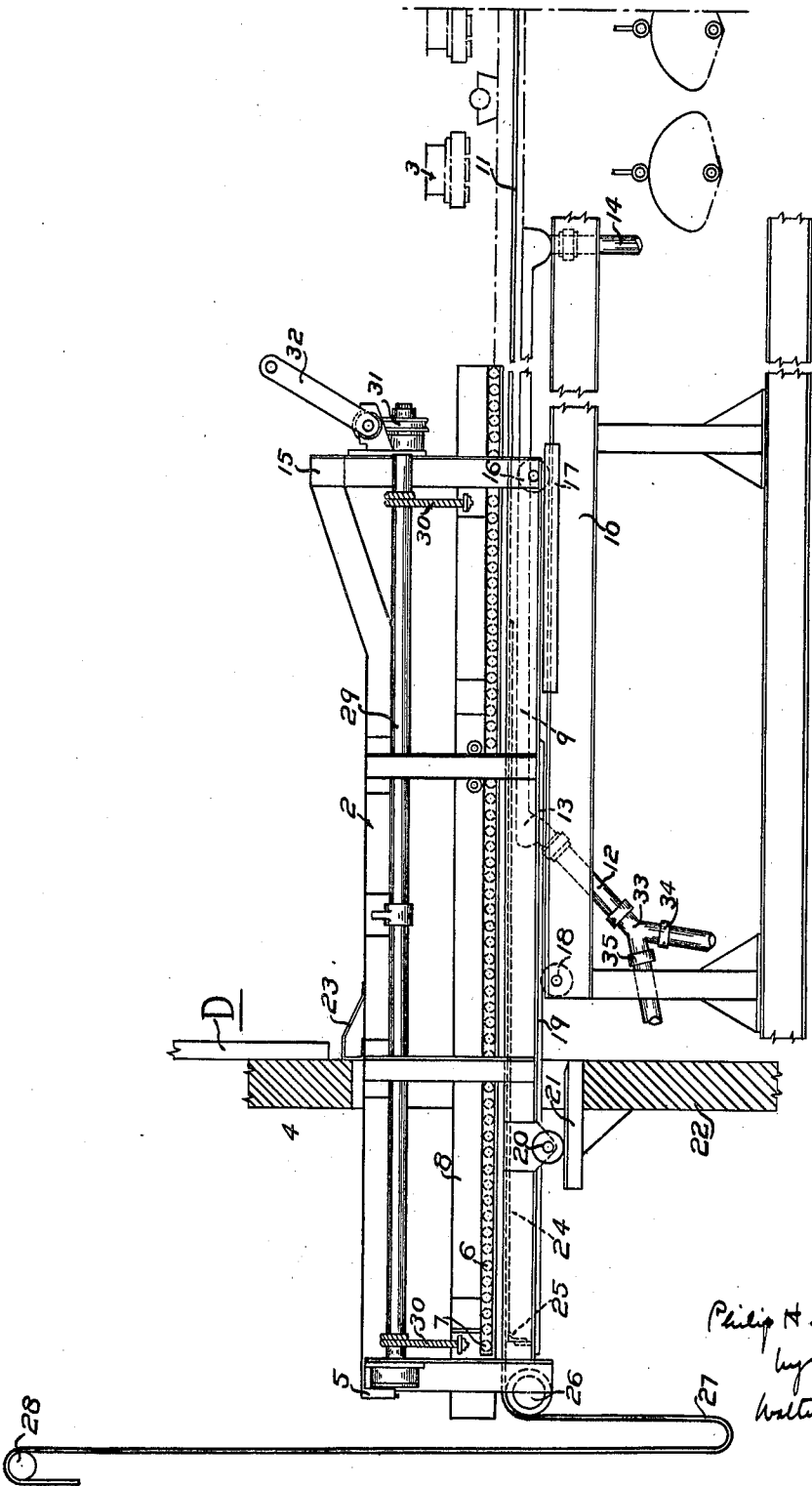


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APPARATUS FOR PRESETTING WEAR FILMS
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APPARATUS FOR PRESETTING WEAR FILMS

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6 Claims. (Cl. 34—152)

My invention relates to an apparatus for pre-setting wear films and is directed particularly to an apparatus for use in presetting a printed film of paint of appreciable thickness to serve as a wear surface for floor and other surface coverings. In the manufacture of printed coverings of this class, there are a number of factors which at the present time militate against the observance of certain fundamental criteria, known to the skilled paint technician as being essential to the formation of a high quality wearing surface from the four most essential standpoints, namely, abrasion resistance, acid and alkali resistance, smoothness and planeness of surface, and finished gloss. These factors arise by reason of the unusually heavy film of paint which must be applied in a single application in order to be economically practicable, and by the fact that curing or stoving of the film must be effected to properly condition the film for use as a wear surface. This necessitates that the base, which is generally in the form of a continuous web, with its applied coating paint, must, at some time almost immediately after application of the paint film, assume an inclined or vertical position. These problems, which are inherent in the application of a heavy film of slow drying paint and in the stoving thereof, are amplified when the curing is effected in the "festoon stoves" commonly employed in the floor covering industry, wherein the material, as it emerges from the printing machine, is directed into a curing chamber and hung therein in vertically extending festoons or cylindrical battens, the length of the festoon generally being in the order of forty-five feet, although similar problems are present when flat rack stoving is utilized. In such operation, the material must assume a substantially vertical position while being directed from the bed of the machine to those racks which lie above or below the plane of the bed, and paint runs are as common in flat rack stoving as in festoon stoving.

Contrary to one of the fundamental prerequisites of satisfactory wear film formation, it has been common practice in the printed floor covering industry to "body up" the paint to prevent paint runs. This has been effected by incorporating relatively large amounts of pigments or other filling agents into the paint. It has been the theory that in such paints the reduction of flowability is due to increased interfacial frictional resistance built up by the pigment particles within the film. In some instances the proportion of pigment has been as high as 44% by volume of the nonvolatile portion of the paint, whereas it has long been known that the ideal pigmentation for wear films should be approximately 30% by volume of the nonvolatile portion of the paint. Any increase in pigmentation inevitably results in lowering of the wear, alkali

and acid resistance of the formed film. An equally acute problem is encountered with "bodied up" paints where the covering material is printed in design. The paint film which is formed by printing with paints having high pigment concentrations will not level out satisfactorily after application but "stands proud," taking the outline of the printing member which applied the film and leaving relatively sharp ribs or ridges where contiguous color patches abut. This condition is aggravated by the use of peg or line block printing members of the type commonly utilized in the printing of floor coverings to provide air relief. Another disadvantage arising out of the use of high pigment concentration paints, lies in the difficulty of obtaining a glossy surface. Gloss is imparted to the surface of the film primarily by the vehicle overlying or surrounding the pigment particles and disposed at the surface of the film. If the pigment concentration is too high, there is insufficient vehicle to adequately wet and coat the pigment particles and, as a result, the dried film is dull and has no appreciable sheen. In addition, the cost of the paint is increased proportionately with any increase in proportion of pigment to vehicle.

The use of "bodied up" paints has minimized paint runs but has not eliminated them completely since the pigment particles will, by their gravitational forces, tend to orient themselves readily upon reduction of viscosity of the vehicle induced by heat, and, the material being subjected to such heat while in a vertical plane, the tendency still remains for the particles to gravitate downwardly, thus forming regions of thick and thin films. While the print paints heretofore employed have possessed some thixotropic body inherent in pigmented vehicle structures, movement of the material through a vertical path has been effected so soon after the printing step, which applies shearing forces to the paint and thus reduces the viscosity thereof, that any material thickening by thixotropic action cannot be availed of prior to movement of the material into the stoves or curing racks, for, under ordinary temperature conditions, such thixotropic action is so slow that it would require a commercially impracticable time period between printing and stoving to avail of such action.

It is an object of my invention to provide a mechanism whereby leveling of a film of thixotropic bodied paint, which may be of the usual characteristics and high pigment concentration, or low pigment concentration and of the type more completely described in my copending application, Serial No. 92,295, filed July 24, 1936, of which this application is a division, wherein there is provided in the film of coating material particles having the characteristic of micelle formation, which particles are selected from a group

consisting of oil gel, resinoid and flocculent pigments, and which film, when applied, is of such character that running will occur if the web be disposed in a substantially vertical plane, may be accomplished, paint runs eliminated and a level, high gloss surface obtained.

According to a preferred embodiment of my invention, the wear film is applied in design by a flat block printing machine of the type commonly employed in the floor covering industry and immediately thereafter the foundation web, with the applied coating, is heated while maintained in a horizontal plane to reduce the viscosity of the vehicle of the coating to thus enhance micelle formation, with consequent thickening and stiffening of the film to a degree sufficient to permit hanging in festoons or movement in a vertical plane substantially immediately after completion of the printing operation without danger of paint runs, and to induce leveling of the film into a smooth, plane surface.

I have found, particularly with paints including oil gel, resinoid and/or pigment particles which have the characteristic of micelle formation that such particles, being disposed throughout a vehicle in a metastable condition, begin to form into micelles immediately after shearing forces, such as those resulting from the printing operation cease to be applied. This micelle formation is believed to be a direct result of the combined force of the particles, some of which are of an anisotropic character, and gravitational forces. It is probably true that the resinoid and oil gel particles, if such be used, have some affinity for each other and for themselves and if the pigment be properly chosen, the particles thereof also will have a tendency to group themselves with the other particles when in the film. Concomitantly with micelle formation, there is a general thickening of the applied film. The reaction is not completely understood but it is believed to result from the fact that with the first formation of micelles, there is immediately an enormous increase in the specific surface of the particles to be wetted and concomitantly, a diminution of the liquid or vehicle available for wetting. There immediately follows, therefore, a general thickening and stiffening of the whole structure. In order to accelerate this formation, I purpose to apply heat to the paint film disposed upon the surface being treated, while the material rests in a substantially horizontal plane in which running of the applied film will not occur. By the application of heat, the viscosity of the vehicle is reduced and the particles in the paint film are released for proper and immediate orientation.

My present invention is directed particularly to an apparatus for accomplishing such heating and to such apparatus in combination with coating and stoving equipment.

I have found that when a film formed as above described is applied to a foundation web of saturated felt of the type commonly employed in the manufacture of felt base floor covering, a general thickening and stiffening of the applied film and satisfactory leveling may be accomplished if the temperature of the web be elevated to 165° F., and maintained at that temperature for a period of thirty seconds while the material rests in a substantially horizontal plane. By heating to this temperature, a relatively short heating time is necessary. The web may then be immediately transferred to a substantially vertical plane without danger of running.

In the accompanying drawing there is illus-

trated, in side elevation a presetting device positioned at the exit end of a flat block printing machine and adapted to properly condition a paint film prior to passage of the web into a curing chamber.

The presetting device 2 is positioned between a flat block printing machine 3 and a curing chamber 4, and is of relatively short length. The exit end 5 of the presetting device may be positioned within the curing chamber 4 as shown. The presetting device comprises a bank of steam coils 6 fed by a header 7 communicating with a suitable source of steam supply. In the embodiment shown, the coils 6 extend transversely of the bed of the printing machine and are secured to supporting frame-work 8. A second battery of steam coils 9 is disposed in a plane parallel to the bed of the printing machine 3 and these coils are secured between the printing machine frame members 10. The coils 9 are preferably formed of flattened pipes in order to present a relatively flat surface to support the web of decorated material 11 during its travel from the printing machine 3 into the curing chamber 4. It will be observed that the coils 9 lie in a position in advance of the coils 6 in order that the web 11 may be brought to the desired temperature prior to the application of radiant heat to the decorated surface of the web by the coils 6. The coils 9 are provided with a steam inlet 12 feeding into a header 13 to which the coils are connected. A return line 14 is also provided for drainage purposes.

The radiating coils 6 and the supporting frame-work 8 are mounted for movement in a longitudinal direction parallel with the web in order that, upon the filling of the curing chamber, the mechanism may be moved out of the curing chamber and the door D closed. In order to provide a conveniently movable mechanism, end frame members 15 are provided with rollers 16 engageable with tracks 17 attached to the printing machine frame. A roller 18 is secured to a machine frame and engages a track 19 on the supporting frame-work 8. A supporting roller 20, secured to the frame-work 8, rides on a track 21 attached to wall 22 of the curing chamber 4. A stop 23 is provided to limit movement of the exit end 5 into the curing chamber.

From the foregoing, it will be clear that after decoration of the web 11 by the printing machine 3 which applies a relatively heavy layer of paint, the web passes over the heating coils 9 whereby the temperature of the web is elevated. The material then passes beneath the heating coils 6 which apply radiant heat to the paint film. The temperature of the web and the applied film is raised to approximately 165° F. and, after equilibrium temperature has been reached in the web as it moves through the presetting device, radiant heat from the coils 6 is relied upon to maintain the desired temperature in the film and web. After the web 11 leaves the flat surface of the coils 9, it rides upon a plate 24 secured at one end to the frame-work of the presetting device by an angle 25, the other end resting freely upon the coils 9. The decorated material then passes over a batten roll 26 through a vertically extending dip 27 to an upper batten 28 from which it hangs in a festoon in the curing chamber 4 where sufficient heat is applied to properly set or coagulate the vehicle, and, when a paint of my preferred type is employed, to effect conversion of the resinoid with the oil of the vehicle to form a wear resistant surface which

has good gloss characteristics and is stable, tough, flexible, and alkali-resistant.

It sometimes happens in printing machine operation that block chokes, shimmying adjustments and other causes require stopping the machine for a period of time greater than desirable for the application of heat to the decorated web in the presetting device. In order that the radiant heat applied to the surface may be rendered less intense, and further in order to avoid the application of heat to the base web during such shut downs, means are provided whereby the radiant heaters may be moved away from the surface of the web a distance to render them sufficiently ineffective, and means are provided for injecting cooling fluid through the steam coils 9. In the embodiment illustrated, the frame-work 8 supporting the coils 6 is suspended from shaft 29 by cables 30, two shafts 29 and four cables 30 being provided. Each shaft 29 is rotatable by a worm wheel 31 engaged by a worm operated by a handle 32, whereby the cables 30 are wound therearound and the radiant heaters 6 are elevated away from the surface of the decorated web. The connections from the source of steam supply to the header 7 should preferably be made flexible to permit of such movement without the necessity of disjoining of pipes and fittings.

Any suitable connection may be made to the line 12 of the heating coils 9 for the passage of cooling water or other fluid therethrough. For example, a Y connection 33 may be used and a steam line 34 connected to one side thereof and a water line 35 connected to the other side. Valves should be provided in each of these lines to effect proper control.

An electrically heated presetting device may be conveniently formed along the same general lines as those disclosed in the drawing, radiant heating coils being substituted for the steam coils 6 and an electrically heated platen replacing the coil 9. The mechanism for elevating the coils 6 may then be dispensed with and a control switch provided to cut off the heating current in the event of a shut down of the printing machine.

The presetting device could utilize heated air if the time period for presetting were long enough. Care should, of course, be taken to insure that the velocity of the air coming into contact with the wet film is not so great as to cause rippling or deformation of the applied pattern.

The presetting device illustrated in the drawing has been found to operate very satisfactorily with floor covering paints, both of the pigment "bodied up" type and of the type in which a false body is created by gel particles, resinoid particles or anisotropic pigment particles or combinations thereof. In the former type, the presetting device effects proper orientation of the pigment and whatever minor amount of micelle formation which may be inherent in any oil paint film, and in the latter type the device operates to effect rapid micelle formation and concomitant thickening and stiffening of the film induced thereby.

While I have illustrated and described certain preferred embodiments of my invention, it will be understood that the invention is not so limited but may be otherwise embodied within the scope of the following claims.

I claim:

1. In an apparatus for presetting a wear film of coating composition carried on a base web, the combination of means for applying heat to the uncoated side of a web to heat the web to a predetermined temperature while it is disposed in a substantially horizontal plane, a radiant heater adapted to heat directly a wear film disposed on said web only after said web has been heated to a predetermined temperature by said heating means, said heater being disposed above the plane of said heating means in position to heat the wear film after the web has passed across a portion of said heating means, and means for moving said web past said heating means and said heater while it is disposed in a substantially horizontal plane.

2. In an apparatus for presetting a wear film of coating composition carried on a base web, the combination of a heating platen disposed in a substantially horizontal plane adapted to heat a web to a predetermined temperature, a web support disposed adjacent said platen adapted to support the web after it has passed over said platen, a radiant heater disposed above said platen and said web support adapted to heat a wear film disposed on the web, said heater being disposed above the plane of said platen in position to heat the wear film after the web has passed across a portion of said platen, means for moving said heater toward and from the horizontal plane of the platen to increase and to decrease the amount of radiant heat applied to the film, and means for moving the web over said platen and past said heater and over said web support.

3. In an apparatus for presetting a wear film of coating composition carried on a web, the combination of a plurality of coils disposed in a substantially horizontal plane adapted to support a web, means adapted to inject heating fluid into said coils, a substantially horizontal plate disposed adjacent said coils adapted to support the web after it has passed over the coils, a radiant heater disposed above said coils and said plate adapted to heat a wear film disposed on the web after the web has been heated to a predetermined temperature by said coils, means for moving the radiant heater toward and from the horizontal plane of said coils to increase and to decrease the amount of radiant heat applied to the film, and means for moving the web over said coils and past said heater and over said supporting plate.

4. An apparatus according to claim 3 in which said heater comprises a plurality of coils.

5. An apparatus according to claim 3 in which said heater moving means comprises a shaft, cables connecting the shaft to the heater framework, and means to rotate said shaft.

6. In an apparatus for presetting a wear film of coating composition carried on a base web, the combination of a plurality of coils disposed in a substantially horizontal plane adapted to support a web, means adapted to inject heating fluid into said coils, a radiant heater disposed above said coils adapted to heat a wear film carried on the web, said heater being disposed in position to heat the wear film only after the web has passed across a substantial portion of said coils, and means for moving the web over said coils and under said heater.

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