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PANEL BOARD COATING APPARATUS

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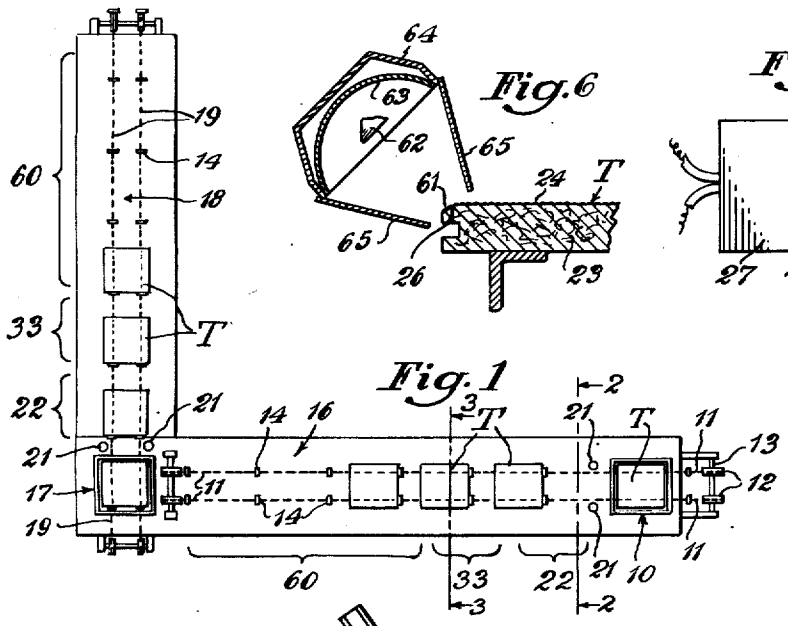

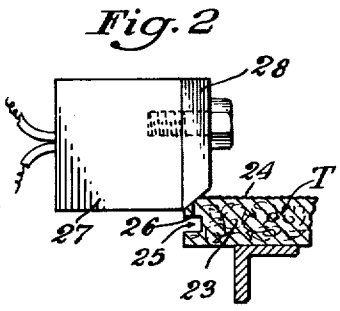

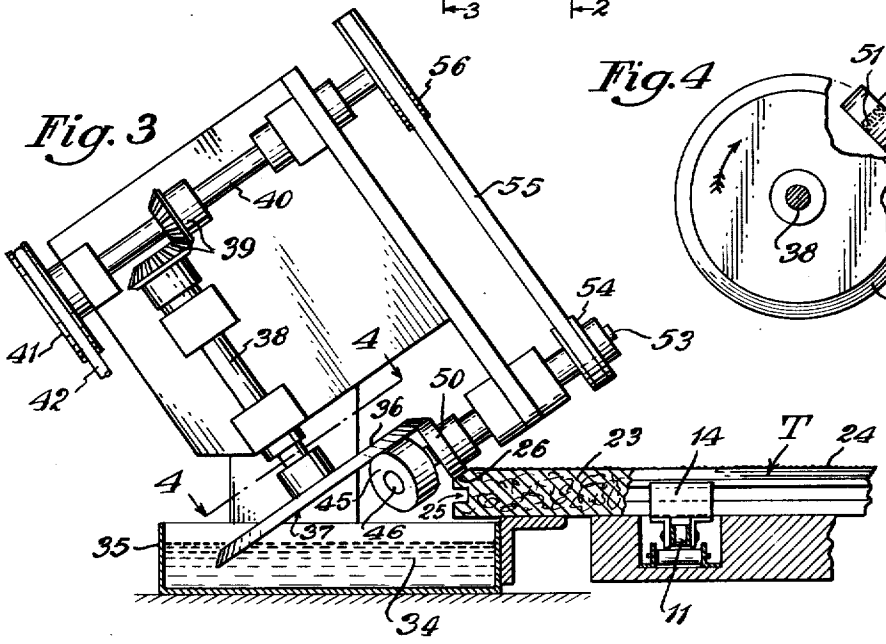

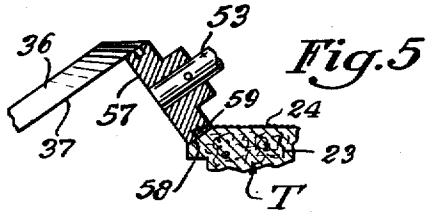

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PANEL BOARD COATING APPARATUS

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The present invention relates to coating methods and apparatus and, in particular, to coating raw beveled edges of surface-coated decorated panel material, such as insulation board.

Panel board for interior decorative use has long been available on the market. Processes have been employed for coating the decorative surface as a part of the process of manufacturing the board, as, for example, by coating machine-widths of the material, sometimes in the wet-mat form, in the case of insulation board, before cutting to panel lengths and drying, and sometimes on dried panel lengths.

To enhance the utility of such decorative board material, it has been cut into so-called plank or tile which are, respectively, board-like lengths, or rectangular pieces, such as acoustic squares primarily useful on ceilings. The acoustic squares commonly have a multiplicity of openings inwardly from the face for sound absorption.

In cutting plank and tile from coated machine-width panels, it has long been a practice to bevel the edges so that in edge-to-edge placement in a wall or ceiling there is formed by adjacent bevels a slight groove which is attractive to the eye, and yet functional to prevent an unsightly joint which otherwise would be formed from abutting square-cut edges.

One practical disadvantage in so cutting bevels at the edges of coated faces, is that the resulting exposed body is uncoated, and therefore in strong contrast in texture, and usually in color, to the coated face. The color of the exposed material in the bevel edge may attractively blend with the color of the coated surface when initially formed, but such color is not stable in the case of lignocellulose fibers. The latter change in color on exposure to light and air assuming new color values which are various mixtures of red, brown and yellow which are not attractive. Therefore, for stability of color in installed pieces of tile and plank it is most desirable that the raw beveled edges be coated with a stable color, and prefereably with a color which is of the same composition as that of the coated face.

The present invention aims to provide method and apparatus for quickly applying a coating composition to the exposed surface at the beveled faces of insulation board and other panel products.

It is an object of the invention to provide apparatus which limits application of the coating composition to the beveled faces, without spill-over or smear on the face of the panel.

It is also an object of the invention to provide apparatus which may be used in a continuous line of production.

It is a particular object of the invention to provide apparatus having a plurality of coating units for coating rectangular pieces on four peripheral beveled edges in a production line.

It is also an object to provide a coating unit having moving parts suitable for continuous operation and of

such character that the operating unit functions to coat only when material to be coated moves relatively past the unit in coating contact therewith.

Various other and ancillary objects and advantages of the invention will become apparent from the following description and explanation of the presently preferred embodiment of the apparatus and of the manner of using the same, as illustrated in the accompanying drawings, in which:

Fig. 1 is a diagrammatic view of equipment containing four coating units as it may be used to coat the four beveled edges of acoustic squares.

Fig. 2 is a view of the heated ironing element taken on the line 2—2 of Fig. 1 crossing the path of the tile and showing the tile in cross-section.

Fig. 3 represents in front elevation and partial cross-section on line 3—3 of Fig. 1 the general arrangement of a smoothing unit and a coating unit in contact with beveled edge unit of insulation board.

Fig. 4 is a view of the pick-up disk taken on line 4—4 of Fig. 3, the disk being partly broken to show the underlying structure.

Fig. 5 is a view partly in cross-section in a vertical plane through the axis of the transfer roll showing its contact with the portion being coated and its relation to the disk.

Fig. 6 is an enlarged detail view in cross-section showing the relation of drying lamps to the coated edge.

Insulation fiberboard is porous, and cross-cut surfaces of it have loose fibers and fiber ends which give the cut edge a velvety texture difficult to coat for yielding a smooth coated surface. The face of insulation board as ordinarily formed has a different texture and coats more smoothly than such a cut face. Where a coated cut face is desired to be smooth, this may be accomplished first by moistening or wetting the cut face and ironing the fibers into a smooth flat face prior to applying a coating composition. By spraying on water or by projecting steam onto the cut face and then ironing it under pressure with a smooth hot metal surface, the cut face may be suitably smoothed so that on application of a coating composition the resulting coated face is smooth.

Accordingly, in the apparatus for the present invention there is provided means for moistening or steaming the cut face to be coated, and means for ironing the moistened face, preferably by moving the article past and in contact with stationary elements including a hot smoothing iron. Where two parallel edges are coated simultaneously, two such ironing stations are provided, and a conveyer moves the board past the same.

Where the coating compositions to be employed are aqueous, it is not necessary to dry the ironed surface, and it may desirably be moist from the residue of water used in the ironing step. The face to be coated is then moved past a coating unit including contact with a rotating coating roll or disk having a cylindrical face which carries a film of coating composition. The thickness of the film of composition on the coating roll is predetermined so that on contact with a passing piece of board the proper amount of composition is applied with avoidance of excess. The character of the composition, the character of the board, the speed of rotation of the roll, and the speed of travel of board, are all factors, among others, in determining the thickness of the film.

To accomplish these and other objectives, the coating unit has been especially devised so that adjustments may be made for accommodating its operation to changing conditions.

In the preferred embodiment, the machine assembly is designed for coating the four bevel edges of acoustic squares, and it has two substantially duplicating sections at right angles to each other as appears in Fig. 1. There

is a stacker **10** for a pile of squares T and beneath it two conveyer chains **11** running over pulleys **12** on driving axle **13**. The chains have lugs **14** located to slide one tile T from the bottom of the stacker, and spaced to provide a succession of tiles T along leg **16** of the machine and to discharge them into a second stacker **17**. A similar leg **18** of the machine lies at right angles to leg **17**, but at a lower level, and it has conveyer chains **19** to remove the bottom tile from stacker **17**, for processing in the same manner as will be described with respect to leg **16**. One leg processes one set of opposing bevels, and the other leg the other set. Only one leg will be described in detail.

The processing as described for aqueous coating compositions involves the sequence of ironing, coating and drying. The ironing may be preceded by applying a jet of steam or a spray of water on the bevel surface, but this is not always necessary. The moisture content and composition of the tile body may permit ironing without such a preconditioning. The numerals **21** indicate nozzles for such jets.

The ironing region along leg **16** is designated **22** in Fig. 1, and in detail is illustrated in Fig. 2. Tile T has a fiber body **23**, a finishing coat **24** over its top face, a grooved edge **25** to match a tongued edge on the opposite side (not shown), and a raw bevel face or edge **26** to be coated. Numeral **27** indicates an electrically heated unit to which is removably secured an ironing element **28** of form to iron bevel face **26**. A like unit functions on the opposite bevel. The irons **28** are adjusted to match the dimensions of the tile T, which are uniformly sized with a minimum of tolerance for use in ceilings. The ironing units may be resiliently mounted for uniformly pressing tiles of non-uniform dimensions within a prescribed tolerance.

The coating region along leg **16** is designated **33** in Fig. 1 and is illustrated in details in Figs. 3 and 4. In general, it involves means for providing a supply of composition for forming a film on a rotating pick-up element, doctoring means to function on the pick-up element for limiting the supply available for a transfer roll which applies the composition to the bevel face.

The composition is first applied in excess to the pick-up element, as by a running stream or a pool, such as the liquid **34** of permissibly variable depth in open receptacle **35**. A rotating pick-up element has a face on which the composition is applied in excess of actual requirements. The preferred element is a disk **36** having its edge dipping into liquid to wet the peripheral zone of its flat face **37**. The face **37** is shown parallel to the bevel face **26** to be coated. The disk is rigid on shaft **38** and driven by gears **39** from power shaft **40** parallel to bevel face **26**. Driving pulley **41** on shaft **40** is connected by belt **42** to a drive shaft (not shown) common to the duplicating coating unit on the opposite side. The speed of rotation of the disk **37** is such that the film of composition picked up by it is not centrifugally discharged, for example, about 95 R. P. M. when the disk diameter is about 7 inches.

As a reference region of the disk face **37** leaves pool **34** it approaches doctoring means effective by its adjustment to pass a predetermined amount of the composition and to hold back and strip off the excess. The retained composition is in the form of a film of controlled thickness. The doctoring means may be a knife blade, but a roller has been found more satisfactory and is preferred for the reason that rotation of a doctoring roll effects removal of any undesired particles which otherwise would collect against a stationary doctor.

The preferred doctoring means is a medium hard resilient rubber roll **45**, idling on shaft **46** and driven by disk **36** as a result of slight pressure thereon. The pressure regulates the amount of film on disk **36** passing the doctor. The area of contact on the disk **36** may be anywhere from the edge inwardly and the location and width

are such that the hereinafter mentioned transfer roll has its active face lying in the film predetermined by the doctor. As illustrated, the doctoring roll is at the edge of the pick-up face **37**.

In Fig. 4, the preferred relations of the pick-up disk **36**, the doctoring roll, and a transfer roll **50** are illustrated in the plane of the disk face **37**. The dotted region **51** on the periphery of the doctor roll **45** represents the area of pressure contact between it and the disk face **37**. The region indicated by arrow **52** between the periphery of disk **36** and the inner dotted line represents the width of the film formed by the doctor roll **45** for presentation to the transfer roll **50**. The latter has a fixed axle **53** parallel with bevel face **26** (see Fig. 3) with driven pulley **54** connected by driving belt **55** to pulley **56** on the drive shaft **40**.

The transfer roll has a cylindrical face which takes coating composition from the controlled film on the pick-up disk and which applies it by contact with the bevel face **26** moving past it in tangential contact. The transfer disk rotates at a peripheral speed sufficiently low to prevent centrifugal discharge of the coating composition, for example, about 166 R. P. M. for a diameter of about 2 inches. As arranged and preferably operated, the transfer roll runs against the pick-up disk and hence against the direction of movement of the tile T. The transfer roll is generally cylindrical in character, and may have circumferential grooves or other depressions for increasing holding capacity for liquid. Such depressions are so formed that in the sliding of the tile past the transfer roll, the bevel face is not roughened or altered. A cylindrical groove is an example, as shown in Fig. 5, wherein transfer roll **57** has a cylindrical face **58** and a peripheral groove **59** in said face. The transfer roll **50** lacks such a groove.

Whether or not the transfer roll touches the disk **36** or is spaced from it depends on the structure of the transfer roll, the character of the composition, the character of the tile body, and other adjustments. The smooth transfer roll **50** preferably operates at a clearance in the range from .002 to .005 inch, to pick up a sufficient quantity for adequate transfer. When the transfer roll is grooved, as is roll **57**, the clearance may be reduced to substantial contact.

The width of the face of the transfer roll is at least as wide as the bevel face **26** to be coated, and preferably slightly wider, when the coating composition for the bevel is the same as forms the coat **24** on the tile face. When it is so wide, there is assurance of complete coating of the bevel face, and incidentally a slight spill-over especially onto the face coat **24**. In such case, air jets (not shown) operate to blow the excess away.

The drying region along leg **16** is designated **60** in Fig. 1 and in detail is illustrated in Fig. 6. On the tile T the numeral **61** indicates the coating composition applied to the bevel face **26** by a transfer roll, such as **50** or **57**. Along a portion of the length of leg **16** over the path of each bevel face is a drier. A suitable one has a source **62** of infra red light, a reflector **63**, a housing **64**, and deflectors **65**, thus directing the heat toward the wet coat **61** to dry it rapidly by the time it reaches the end of leg **16**. Then the conveyer chain **11** delivers the tile T to stacker **17**, from which it is taken in a right angular direction by conveyer chains **19** for repeating the procedure on the remaining two bevels.

Although the apparatus illustrated is adjusted for square units, it is to be understood that the components may be placed in different positions adapting the apparatus for oblong units. Various other modifications in the apparatus and method are contemplated as falling within the scope of the present invention as expressed in the appended claims.

I claim:

1. Apparatus for coating comprising a rotary pick-up disk, means for presenting to a face of said disk a supply

of liquid coating composition, said disk being arranged for rotation at a fixed speed such as to hold a film of said liquid on said face against centrifugal discharge, doctoring means positioned adjacent the said face of the disk in relation to reduce and control the thickness of film on the pick-up disk in the region beyond the doctoring means, a rotary transfer roll having a peripheral cylindrical face arranged to rotate with its said face substantially parallel to but spaced from the said face of the pick-up disk and lying in said film of reduced thickness, positive power means to rotate said transfer roll at a speed fixed relatively to the speed of the pick-up disk yet insufficient to effect centrifugal discharge of the fluid composition from its said cylindrical face, and means to effect movement of a body tangentially along the cylindrical face of the transfer roll, whereby to transfer fluid composition from its said cylindrical face to said body as a band of width not greater than the width of the cylindrical face of the transfer roll.

2. Apparatus for coating comprising a rotary pick-up disk, means for presenting to a face of said disk a supply of liquid coating composition, said disk being arranged for rotation at a fixed speed such as to hold a film of said liquid on said face against centrifugal discharge, doctoring means positioned adjacent the said face of the disk in relation to reduce and control the thickness of film on the pick-up disk in the region beyond the doctoring means, a rotary transfer roll having a peripheral cylindrical face arranged to rotate with its said face substantially parallel to but spaced from the said face of the pick-up disk and lying in said film of reduced thickness, positive power means to rotate said transfer roll in a direction against the rotation of the pick-up disk, the speed of rotation being fixed relatively to the speed of the pick-up disk and being insufficient to effect centrifugal discharge of the fluid composition from its said cylindrical face, and means to effect movement of a body tangentially along the cylindrical face of the transfer roll, whereby to transfer fluid composition from its said cylindrical face to said body as a band of width not greater than the width of the cylindrical face of the transfer roll.

3. Apparatus for coating comprising a rotary pick-up disk, means for presenting to a face of said disk a supply of liquid coating composition, said disk being arranged for rotation at a fixed speed such as to hold a film of said liquid on said face against centrifugal discharge, a rotary doctoring roll having a peripheral cylindrical face of resilient material positioned with predetermined pressure on said face of the disk whereby to effect rotation of said roll and to reduce and control the thickness of film on the pick-up disk in the region beyond the doctoring roll, the speed of the doctoring roll being insufficient to effect centrifugal discharge of fluid from its doctoring face, a rotary transfer roll having a peripheral cylindrical face arranged to rotate with its said face substantially parallel to but spaced from the said face of the pick-up disk and lying in said film of reduced thickness, means to rotate said transfer roll at a speed fixed relatively to the speed of the pick-up disk yet insufficient to effect centrifugal discharge of the fluid composition from its said cylindrical face, and means to effect movement of a body tangentially along the cylindrical face of the transfer roll, whereby to transfer fluid composition from its said cylindrical face to said body as a band of width not greater than the width of the cylindrical face of the transfer roll.

4. Apparatus for coating comprising a rotary pick-up disk, means for presenting to a face of said disk a supply of liquid coating composition, said disk being arranged for rotation at a fixed speed such as to hold a film of said liquid on said face against centrifugal discharge, a rotary doctoring roll having a peripheral cylindrical face of resilient material positioned with predetermined pressure on said face of the disk whereby to effect rotation of said roll and to reduce and control the thickness of film on the pick-up disk in the region beyond the doctoring roll, the speed of the doctoring roll being insufficient to effect centrifugal discharge of fluid from its doctoring face, a rotary transfer roll having a peripheral cylindrical face arranged to rotate with its said face substantially tangential to but spaced from the said surface of the pick-up disk and lying in said film of reduced thickness, means to rotate said transfer roll in a direction against the rotation of the pick-up disk, the speed of rotation being fixed relatively to the speed of the pick-up disk and being insufficient to effect centrifugal discharge of the fluid composition from its said cylindrical face, and means to effect movement of a body tangentially along the cylindrical face of the transfer roll, whereby to transfer fluid composition from its said cylindrical face to said body as a band of width not greater than the width of the cylindrical face of the transfer roll.

5. Apparatus for coating comprising a rotary pick-up disk, means for presenting to a face of said disk a supply of liquid coating composition, said disk being arranged for rotation at a fixed speed such as to hold a film of said liquid on said face against centrifugal discharge, doctoring means positioned adjacent the said face of the disk in relation to reduce and control the thickness of film on the pick-up disk in the region beyond the doctoring means, a rotary transfer roll having a peripheral cylindrical face arranged to rotate with its said surface substantially tangential to but spaced from the said face of the pick-up disk and lying in said film of reduced thickness, positive power means to rotate said transfer roll and said pick-up disk at fixed relative speeds, the speed of rotation of the transfer roll being insufficient to effect centrifugal discharge of the fluid composition from its said cylindrical face, and means to effect movement of a body tangentially along the cylindrical face of the transfer roll, whereby to transfer fluid composition from its said cylindrical face to said body as a band of width not greater than the width of the cylindrical face of the transfer roll.

6. Apparatus for coating comprising a rotary pick-up disk, means for presenting to a face of said disk a supply of liquid coating composition, said disk being arranged for rotation at a fixed speed such as to hold a film of said liquid on said face against centrifugal discharge, a rotary doctoring roll having a peripheral cylindrical face of resilient material positioned with predetermined pressure on said face of the disk whereby to effect rotation of said roll and to reduce and control the thickness of film on the pick-up disk in the region beyond the doctoring roll, the speed of the doctoring roll being insufficient to effect centrifugal discharge of fluid from its doctoring face, a rotary transfer roll having a peripheral cylindrical face arranged to rotate with its said face substantially tangential to but spaced from the said surface of the pick-up disk and lying in said film of reduced thickness, means to rotate said transfer roll and said pick-up disk at fixed relative speeds, the speed of rotation of the transfer roll being insufficient to effect contrifugal discharge of the fluid composition from its said cylindrical face, and means to effect movement of a body tangentially along the cylindrical face of the transfer roll, whereby to transfer fluid composition from its said cylindrical face to said body as a band of width not greater than the width of the cylindrical face of the transfer roll.

7. Apparatus for coating comprising a rotary pick-up element, means for presenting to a rotating surface of said element a supply of liquid coating composition, said element being arranged for rotation at a fixed speed such as to hold a film of said liquid on said surface against centrifugal discharge, doctoring means positioned adjacent the said face of the element in relation to reduce and control the thickness of film on the pick-up element in the region beyond the doctoring means, a rotary transfer roll having a peripheral cylindrical face arranged to rotate with its said surface substantially tangential to but spaced

from the said face of the pick-up element and lying in said film of reduced thickness, positive power means to rotate said transfer roll at a speed of rotation fixed relatively to the speed of the pick-up element yet insufficient to effect centrifugal discharge of the fluid composition from its said cylindrical face, and means to effect movement of a body tangentially along the cylindrical face of the transfer roll, whereby to transfer fluid composition from its said cylindrical face to said body as a band of width not greater than the width of the cylindrical face of the transfer roll.

References Cited in the file of this patent

UNITED STATES PATENTS

1,033,265	Patcher	July 23, 1912
2,068,141	Kramer	Jan. 19, 1937
2,165,210	Baldwin	July 11, 1939
2,351,565	Warren	June 13, 1944
2,632,918	Bergstein	Mar. 31, 1953

FOREIGN PATENTS

887,009	France	July 26, 1943