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MANUFACTURE OF LINOLEUM PRODUCTS

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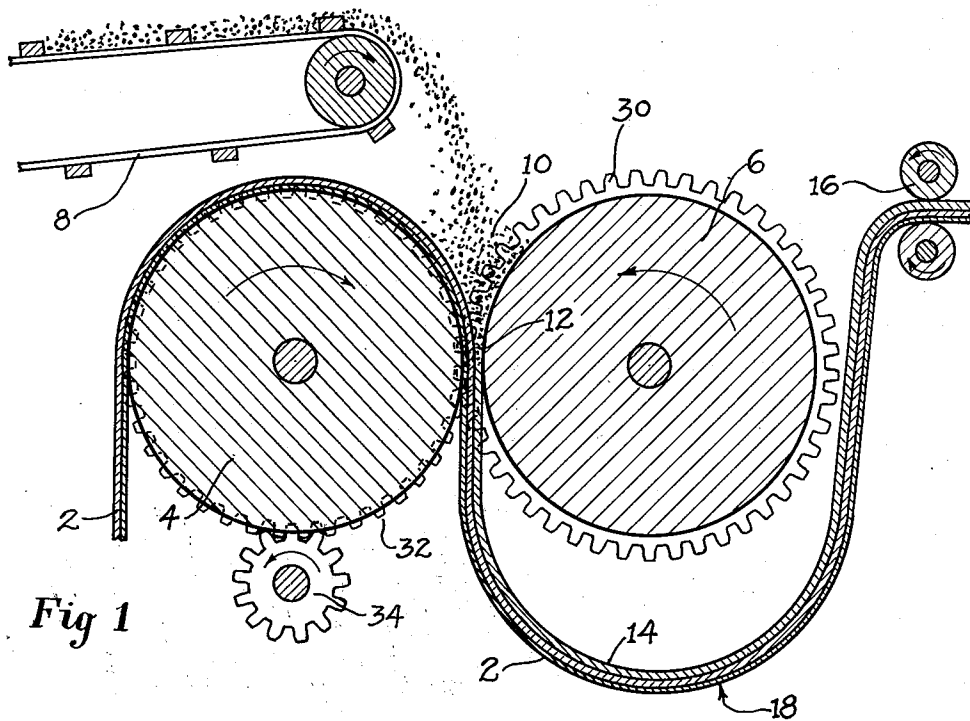


Fig 1

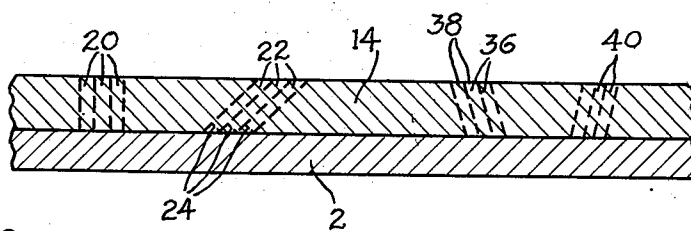


Fig 2

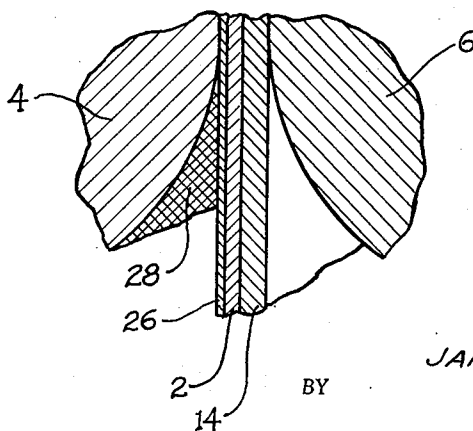


Fig 3

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MANUFACTURE OF LINOLEUM PRODUCTS

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5 Claims. (Cl. 154—20)

This invention relates to linoleum products such as floor coverings, and the like, and particularly to methods and means whereby linoleum compositions may be calendered directly onto a backing formed of relatively inelastic or unstretchable material such as felt or paper, which may or may not contain a saturant.

In the manufacture of burlap backed floor coverings of plain color or having a jaspe pattern it is usual to pass the burlap backing over the back roll of a calender and to introduce granules of linoleum composition into the space between the calender rolls. As the granules are carried toward the nip of the calender rolls by the backing and the front calender roll they are compressed and compacted into a wedge and are forcibly pressed against the backing and become firmly bonded thereto. However, the wedge of composition thus formed opposes forward movement of the portion of the web entering the nip of the calender rolls and the backing therefore tends to slip with respect to the back roll as the back roll continues to rotate. At the same time the portion of the burlap in and beyond the nip of the rolls is dragged forward by the composition and the front calender roll so that the burlap is subjected to severe tension during the calendering operation.

Because the burlap has an open mesh construction the composition generally penetrates through the backing to some extent and engages the back calender roll reducing the slippage thereof and preventing the application of excessive tension to the burlap backing.

Moreover, the burlap used possesses relatively high tensile strength and is sufficiently stretchable so that it is not torn or injured by the forces applied thereto during the calendering operation.

Materials such as felt and paper are cheaper than burlap and possess certain other characteristic advantages as a backing for linoleum compositions but they do not possess the open construction of burlap so that the linoleum composition does not penetrate therethrough and there is a greater tendency for such backings to slip with reference to the back roll of the calender. They are therefore advanced through the nip of the rolls primarily by the pull of the composition on the backing. Furthermore, felt and paper do not possess the high tensile strength or stretchability of burlap in that felts generally have a tensile strength of from about 50 to 90 pounds per inch of width and tear if stretched more than about 4% whereas burlap usually has a tensile strength of about 120 pounds or more

per inch of width and may be stretched up to 8% without tearing. Of even greater importance is the fact that felted material, paper and the like when stretched have very little recovery and are therefore permanently weakened by stretching. This is in contrast with burlap which is a woven product that recovers substantially completely after stretching and is therefore not permanently affected by stretching thereof. For this reason the stretching of burlap during the calendering operation does not materially weaken the finished calendered product, whereas the stretching of felt during a calendering operation may so weaken the backing that the finished product is unable to withstand the handling and usage to which floor coverings are subjected.

Experiments have shown that when the backing is formed of felt, paper, or felted materials, as distinguished from burlap and woven or textile materials, slippage of the backing with respect to the back roll amounting to more than about 1% almost invariably results in tearing of the felt. It is for this reason that practically all prior attempts to calender linoleum compositions directly onto backings formed of felt or onto similar non-stretchable or inelastic backings have been unsuccessful. Even when the backing is not broken, relative movement of the backing and composition resulting from the dragging of the felt through the nip of the rolls by the composition, frequently results in the formation of serious blisters and areas from which the linoleum composition has been peeled off the backing or picked out by adhesion to the front calender roll leaving the surface of the product rough and defective. The use of strong felts containing a high percentage of rag and the use of heavily saturated felts have been equally ineffective in resisting the strains to which the sheets are subjected. The use of linoleum compositions which are softened by the addition of more or softer binders thereto reduces the slippage and tension on the backing but the composition then becomes abnormally sticky, picking and blistering of the material is increased, and the curing time is lengthened to such an extent that the process becomes impractical. As a result of this experience it is generally recognized in the industry that linoleum compositions cannot be successfully calendered directly onto saturated felt or similar unstretchable backings to produce a satisfactory product.

In accordance with the present invention linoleum compositions are calendered directly onto relatively inelastic or non-stretchable backings

having a tensile strength not exceeding about 100 pounds per inch of width and which cannot be stretched more than about 4% without tearing. This is effected by reducing or eliminating the application of tension to the backing during the calendering operation or by compensating for slippage of the backing with reference to the back calender roll so as to relieve the backing and composition of those strains to which they would otherwise be subjected.

In the preferred form of my invention this result is attained by increasing the frictional contact between the backing and the back roll of the calender so that slippage of the felt does not exceed the permissible stretch of the felt. It is thus possible to insure movement of the felt with the composition as it passes through the nip of the rolls. I have found that it is also possible to relieve the tension and to prevent undue stretching of the felt by rotating the back roll at a speed slightly greater than that of the front roll so as to compensate for slippage of the felt thereon.

The principal object of my invention is to provide improved methods and means for calendering linoleum compositions onto inelastic or non-stretchable backing materials such as felt or paper which may or may not contain a saturant.

A further object of my invention is to reduce or eliminate those strains which have heretofore caused the backing to break or the composition to blister or pick off the backing when linoleum compositions have been calendered directly onto inelastic or non-stretchable backing materials.

Another object of my invention is to prevent substantial relative movement of the linoleum composition and backing material as they pass together through the nip of calender rolls in a calendering operation.

These and other objects and features of my invention will appear from the following description thereof in which reference is made to the figures of the accompanying drawing.

In the drawing:

Fig. 1 is a diagrammatic vertical sectional view through a typical calender embodying my invention.

Fig. 2 is an enlarged diagrammatic sectional view of a typical product embodying my invention, and

Fig. 3 is a perspective of a portion of a calender roll and linoleum product illustrating an alternative embodiment of my invention.

In calendering linoleum composition onto a backing, such as felt saturated with asphalt, for example, conventional calender rolls may be used and any of the conventional or commercially available felts may be employed.

As shown in Fig. 1 the felt 2, which forms the backing in the finished product, is passed over the back calender roll 4 and between said roll and the front roll 6 of the calender. The linoleum composition to be calendered onto the backing is fed in granular form from a conveyor 8 to the space between the rolls where it is shown at 10. The rolls in rotating carry the backing and composition to and through the nip 12 of the rolls forming a continuous calendered layer of composition at 14 on the face of the backing material. The product thus formed issues from the nip 12 of the rolls and preferably is passed to the drying or curing ovens over roll 16 leaving a long loop of loose material as shown at 18 in Fig. 1.

The product thus obtained has the form shown in Fig. 2 in which the felt backing 2 has a linoleum composition layer 14 applied thereto. This layer may be assumed to embody adjacent sections of composition as indicated by the dotted lines 20. When the felt and composition pass through the nip of the calender rolls at substantially the same speed, the composition is compacted and bonded to the backing and the sections 20 are reduced in height but are maintained substantially in vertical relation with respect to the backing material 2. However, if slippage of the felt with reference to the back roll of the calender takes place the felt will lag behind as that portion of the composition adjacent the front calender roll is advanced through the nip of the rolls. In that event the sections 20 will be displaced with respect to the felt and will assume some such form as that indicated at 22 in Fig. 2 in which the sections are distorted and elongated or stretched. The stretching of the composition imparts strains to the backing tending to stretch the backing and if such stretch exceeds the limits of stretch of the backing material it will break. Moreover, even if the limit of stretch is not exceeded the composition tends to pull away from the backing at 24 and may peel off the backing or become so loosened that it will be picked off by adhesion to the front calender roll. By advancing the backing through the nip of the rolls at the same speed as the composition these dangers are overcome.

In order to insure passage of the felt through the nip of the rolls at the same speed, or substantially the same speed as the linoleum composition, I prefer to employ means to increase the action of the back roll in advancing the felt. This is most readily accomplished by increasing the frictional force exerted upon the felt backing by the back calender roll either by providing means which increase the traction or by rotating the back roll at higher surface speed than the front roll of the calender. As shown in Fig. 3 the traction may be increased by applying a coating of friction material 26 to that face of the felt backing which engages the back calender roll. In the alternative the back roll itself may carry friction means in the form of a roughened or scored surface 28 to increase the resistance to slippage of the felt with respect thereto. If preferred both the felt and the backing may be provided with friction means, but I prefer to use a smooth back calender roll and to employ only a friction coating on the felt backing. A friction coating which has been found to be very satisfactory consists of a casein paint containing a filler chosen for its abrasive or frictional properties. This filler may incidentally include a pigment such as iron oxide and thereby improve the appearance of the backing. When desired the friction coating may be formed of or contain rubber, latex, plasticized resinous material or polymerization or condensation products or other compositions with or without filler substances capable of preventing or materially reducing slippage of the felt during the calendering operation.

Although the action of the back roll in advancing the felt through the nip of the calender rolls may be increased by increasing the traction as described above, it is possible in the alternative to increase the frictional driving effect of the back roll by increasing the surface speed thereof. As shown in Fig. 1 the back roll 4 of the calender may be driven at a surface speed which is slightly faster than that of the front roll 6 so as to com-

pensate for slippage of the felt on the back roll. Any suitable form of driving connection may be used for effecting this result and as shown the front roll 6 is provided with a gear 30 that is slightly larger than the gear 32 secured to the back roll 4. Gear 32 in turn is driven by suitable means such as the power actuated gear 34. The difference in diameter of the gears 30 and 32 will determine the relative speed of rotation of the rolls 6 and 4 respectively.

In this form of my invention the back roll is driven at a surface speed just sufficiently greater than that of the front roll to relieve the tension applied to the felt by its passage through the nip of the rolls and about the front roll and to prevent such distortion of the calendered layer of composition that blisters will be produced or the bond between the backing and composition weakened. If the linoleum composition is relatively soft the wedge of material entering the nip of the rolls will exert less retarding action on the felt and will place less strain thereon. On the other hand, if the frictional contact between the felt and back roll is great there will be less slippage of the felt with respect to the back calender roll and it will be carried through the nip of the rolls more effectively. Similarly, the thickness of the layer of composition will influence the strains applied to the backing reducing the strain as the thickness of the linoleum composition is increased.

It has been found that slippage of the felt relative to the back roll amounting to one-half inch in its passage halfway around a back calender roll forty inches in diameter, or in other words slippage of about 1%, is substantially the maximum permissible in continuous operation when using a conventional asphalt saturated felt having a tensile strength less than 100 lbs. per inch of width and a limit of stretch not exceeding 4%. Under these conditions I drive the back roll at a surface speed about 1% faster than the front roll of the calender or at such relative surface speed that although slippage of the felt relative to the back roll takes place the felt and composition travel through the nip of the rolls at substantially the same speed.

In some instances it is desirable to retain the linoleum composition in engagement with the heated front roll of the calender in order to improve the surface finish of the linoleum layer. This tends to stretch the backing as the product passes on about the roll due to the difference in radius of the arcs through which the inner face of the composition and the outer surface of the backing must travel. In such cases tension on the backing may be relieved by controlling the surface speed of the back calender roll so that the felt travels through the nip of the rolls slightly faster than the composition. As shown in Fig. 2 the sections of the composition, as they emerge from the nip of the rolls, may have the form indicated at 36 and as the product passes on about the front calender roll the difference in diameter of the surface engaged by the extremities 38 of the sections 36 and the diameter of the arc through which the felt 12 travels will cause displacement of the sections to a position such as that indicated at 40. In this way the application of excessive strains to the felt backing is prevented and excessive distortion and displacement of the composition with respect to the felt is avoided so that it is possible to avoid peeling of the composition from the backing or loosening thereof to such an extent that it will be picked

out by the front roll as the product passes over the roll 16 in proceeding to the drying or curing ovens.

Generally the slippage of the felt on the back roll will not exceed 1% but if the linoleum composition is very stiff it may be as high as 5%. It is then necessary to drive the back calender roll at a surface speed up to 5% faster than the front roll.

The operation of increasing the surface speed of the back calender roll to overcome slippage serves in effect to increase the frictional force exerted upon the felt by the back calender roll by imparting to the felt a greater positive force urging the felt onward through the nip of the rolls.

In some instances it is desirable to relieve the tension to which the backing is subjected by both increasing the traction between the backing and the back calender roll and also increasing the surface speed of the back roll. However, in most instances it is found that only one of the alternative means for increasing the frictional contact between the felt and back roll need be used to advance the felt through the nip of the rolls.

While I have shown and described various alternative constructions and methods for use in the practice of my invention, it will be apparent that other forms of mechanism and steps in the procedure may be employed without departing from the spirit and scope thereof. It should therefore be understood that the methods and apparatus described are intended for illustrative purposes only and are not intended to limit the scope of the following claims.

I claim:

1. A method of calendering linoleum composition directly onto a substantially non-stretchable backing which comprises the step of passing the backing and composition through the nip of calender rolls while advancing the backing faster than the composition.

2. A method of calendering linoleum composition directly onto a substantially non-stretchable backing which comprises the step of passing the backing and composition through the nip of calender rolls while rotating the roll engaged by the backing at a surface speed faster than the roll which engages the linoleum composition.

3. A method of calendering linoleum composition directly onto a substantially non-stretchable backing which comprises the step of passing the backing and composition through the nip of calender rolls while rotating the roll engaged by the backing at a surface speed from about 1% to 5% faster than the roll which engages the linoleum composition.

4. A method of producing linoleum products which comprises the steps of passing a web of backing material having a tensile strength not exceeding 100 pounds per inch of width through the nip of calender rolls with a linoleum composition while rotating that roll of the calender engaged by the backing at a surface speed faster than the roll engaged by the linoleum composition.

5. Mechanism for calendering linoleum composition directly onto a web of backing material which comprises a back calender roll, a front calender roll and means for rotating said back roll at a surface speed from about 1% to 5% faster than the front roll.

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