Oct. 30, 1962 R. W. SNYDER 3,060,502

APPARATUS FOR PRODUCING SHEET MATERIAL

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Fig. 1

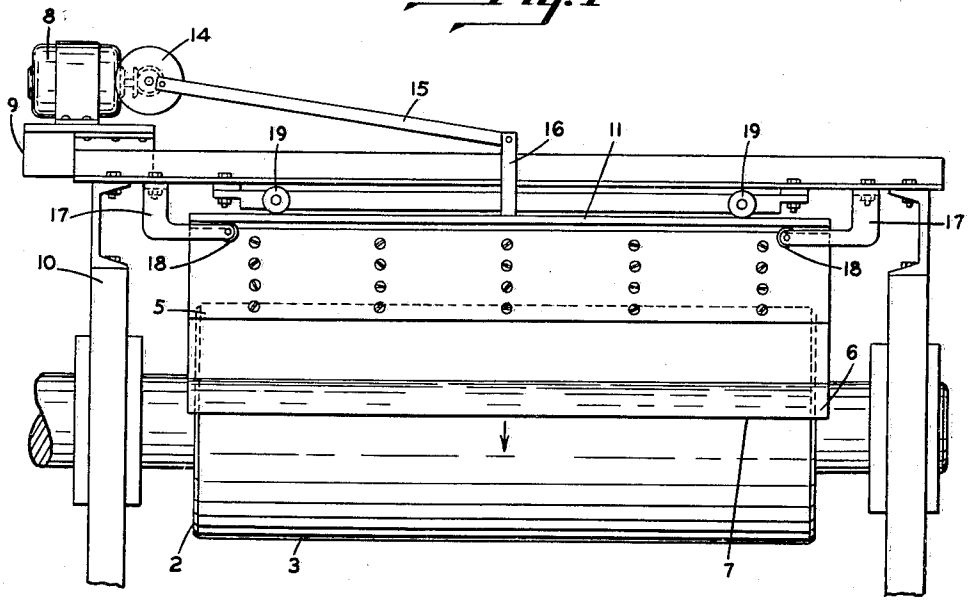
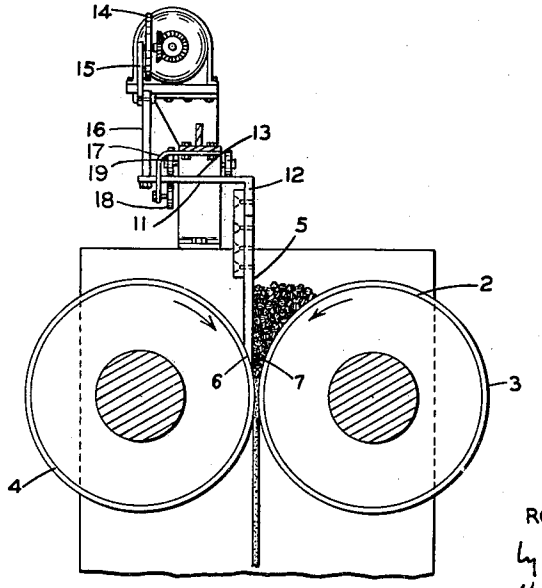


Fig. 2



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APPARATUS FOR PRODUCING SHEET MATERIAL

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Original application Dec. 21, 1955, Ser. No. 554,585, now Patent No. 2,908,042, dated Oct. 13, 1959. Divided and this application Aug. 12, 1958, Ser. No. 754,655

3 Claims. (Cl. 18—9)

This invention relates to apparatus for producing a continuous sheet of resilient material such as floor and wall covering. More particularly, this invention relates to apparatus for making a continuous sheet of resilient material having a nondirectional design.

This application is a division of my copending patent application Serial No. 554,585, filed December 21, 1955 now Patent No. 2,908,042.

In the manufacture of resilient floor and wall coverings, it has been common practice to produce certain pattern design effects on calender equipment. These design effects have certain definite limitations due to the extrusion effect produced by the intense pressures exerted on the color particles as they are drawn into and pass through the nip of the calender. Because of this extrusion effect, all the pattern designs developed for manufacture on calender equipment must, of necessity, include elements of a design elongated in the machine direction of the sheet material. An example of this is the jaspe pattern effect well-known in the resilient floor covering industry. This is produced from a background color composition having uniformly dispersed therethrough a plurality of color particles of a shade different from the background composition. The color particles so prepared are fed into the nip of a sheeting calender, and the extrusion effect produced on the color composition by the calender pressure draws the color particles into more or less elongated lines in the finished sheet.

A great many of the highly desirable pattern design effects in the resilient flooring industry today do not include design elements which can utilize this drawn-out extrusion effect. Typical of the design effects which cannot be produced on calender equipment is the well-known "Spatter" design, in which a plurality of spots of color composition are arranged in a background of a blending color. In a design of this type, any extrusion or elongation of the color particles is highly objectionable in that it destroys the character of the design. In order to produce designs of the "Spatter" type, it is necessary to resort to the molding process of making sheet material. In this molding process, the loose color composition is placed on a backing traveling on a horizontal plane and is consolidated by means of a flat-bed press which consolidates the color particles to one another and adheres the mass to the backing. In the molding operation, the quantity of granular material placed on the backing is sufficient to form a solid compacted sheet, but it is carefully controlled to prevent the presence of an excess of granular material in any given area of the sheet. With this close control of the quantity of material pressed on the backing, there is no possibility of extrusion resulting from the flat pressing operation. However, it will be understood by those skilled in the art that the molding operation is considerably slower than the calendering operation. The main difference being that by reason of the pressing operation, the molding production must be carried on in intermittent steps while the calendering operation is a continuous one and its speed is, therefore, considerably in excess of that of the molding operation.

For many years, the industry has been experimenting with apparatus for and methods of producing non-

directional designs on conventional calender equipment, and such attempts have resulted in methods which are impractical from a production standpoint because of the careful control required in feeding the color composition to the calender. The invention here under consideration has been developed to enable the controlled feeding of material to a calender operating at conventional calender speeds.

It is an object of this invention to provide apparatus for producing flexible sheet material having a nondirectional design on a calender at speeds substantially in excess of those heretofore attainable only for designs having directional design effects.

It is another object of this invention to provide a device for controlling the feed of granular color composition to a sheeting calender so that sufficient material is supplied to form a solid unitary sheet with no excess to cause extrusion.

In order that my invention may be more readily understood, it will be described in connection with the attached drawing, in which:

FIGURE 1 is an elevational view of a two-roll calender with one roll removed to more clearly illustrate the invention; and

FIGURE 2 is a cross sectional view of a two-roll calender including the invention.

Referring to the drawing, there is shown a calender 2 having a backing roll 3 and a facing roll 4. The direction of rotation of the calender rolls 3 and 4 is designated by the arrows. A plate 5 is provided in association with the facing roll 4. The positioning of the plate 5 is such that the surface 6, which is hollow ground to conform to the circumference of the facing roll 4, extends down toward the nip between the two calender rolls in such manner as to prevent the loose color particles fed from a bank positioned between the backing roll 3 and the plate 5 from coming in contact with the facing roll 4 until they pass the point 7 on the edge of the hollow ground plate 5. This edge 7 is positioned a predetermined distance above the narrowest point of the nip.

The extrusion effect which occurs ordinarily in the calendering operation of plastic material is caused by the pull-in effect of the two calender rolls working in cooperation with one another on the loose mix moving from the hopper into the nip. This pull-in effect draws more composition into the nip than is required to form a solid sheet. The excess material in the nip causes the finished sheet to be extruded from the calender. The elongated directional pattern is the result of such extrusion. In a device such as that shown in the drawing, this pull-in effect is substantially eliminated, inasmuch as the particles do not actually contact the one roll until immediately prior to their consolidation in the formation of the sheet caused by the pressure of the rolls as the color composition passes through the nip. It would appear from this observation that the extrusion obtained in previous calendering operations is caused by the pull-in effect produced by the two calender rolls operating in cooperation with one another to supply a greater amount of material to the calender than is necessary to form a solid sheet. By keeping the loose color particles away from one roll until the supply of composition has been controlled to such an extent that only sufficient granular material is engaged by the two rolls to form a solid sheet and no more, this extrusion effect is practically eliminated, at least to the point where it is no longer objectionable. It is obvious from this that in the sheet formed by this method the extrusion of the color particles is substantially eliminated, not only on the surface forming the decorative wear layer of the material, but throughout the entire sheet; and the uniform

configuration of the particles will be present throughout the sheet, resulting in a design which will be the same in worn traffic lanes as well as in other areas.

In the formation of sheet material on a device of this type, it is necessary that the color particles be supplied to the nip of the calender in sufficient quantity and under sufficient pressure to be consolidated into a solid unitary sheet with no voids. This problem does not arise in the conventional calendering operation by reason of the above-mentioned pull-in effect, which insures that color composition is supplied to the calender in sufficient quantity to form a uniformly consolidated sheet.

Since in the device here under consideration the pull-in effect is virtually eliminated or greatly diminished, means must be provided to insure supplying the color composition to the nip of the calender uniformly and in a quantity sufficient to form a uniformly compacted solid sheet. It has been found that by imparting motion to the color particles at the point where they come in contact with both calender rolls, the necessary consolidating effect on the particles is obtained and the sheet produced has substantially the same density characteristics as the sheet produced on conventional calendering equipment by reason of the fact that only sufficient color composition is supplied but no excess. This can readily be accomplished by imparting oscillatory motion to the plate 5. In determining the direction of the motion to be imparted to the plate 5, several important factors must be considered. It is essential if a uniform configuration of nondirectional design is to be produced that the distance between the point 7 on the surface 6 of the plate and the nip between the rolls remain constant. This means that in producing nondirectional design effects, it is desirable to oscillate the plate 5 in a direction parallel to the longitudinal axis of the calender roll 4 with which the plate 5 is in constant engagement. This movement of the plate introduces the particles into the nip in proper compacted form to form a solid sheet, and the color particles forming the face of the sheet do not contact the roll until they pass the edge 7, and the distance between the edge 7 and the nip will always remain the same.

The horizontal oscillatory motion referred to in this preferred embodiment of the invention is imparted to the plate 5 by means of motor 8 mounted on platform 9 built on the stationary framework 10 of the calender proper. The plate 5 is mounted on an inverted L-shaped mount 11, one section 12 of the L-shaped mount 11 being disposed on a vertical plane and the other section 13 being disposed on a horizontal plane. The motor 8 is provided with an eccentric 14 to which is connected a link 15. The L-shaped mount 11 is provided with an extension 16. One end of the link 15 is attached to the eccentric 14 and the other end is attached to the extension 16.

The L-shaped mount 11 is supported on hangers 17 which carry rollers 18 on which the L-shaped mount 11 moves. Guide rollers 19 are also provided on the framework above the L-shaped mount 11 to keep the mount 11 on an even horizontal plane.

By utilizing the invention here under consideration, it may be possible to create design effects having a greater degree of extrusion in certain areas than in other areas. This can be accomplished by providing a serrated surface 6 on the plate 5. Other unique design effects can be produced by imparting reciprocatory movement to the plate in such manner as to alter the distance between the edge 7 of the plate and the nip between the rolls. This can be accomplished by moving the plate in a direction normal to the longitudinal axis of the calender rolls, or at any angle ranging between a direction normal to the axis of the rolls and parallel to the rolls.

The proper distance between the nip and the edge 7 is determined by several factors, the most important of which is the size of the color particles being used and the gauge or thickness of the material being produced on the calender. Of course, the thickness of the material is governed by the distance between the two calender rolls at their closest point. The diameter of the calender rolls is another important factor in determining the proper positioning of the edge 7 with respect to the nip. Formulation also has an effect on this determination, inasmuch as some compositions, such as the newer vinyl type plastics, have different calendering characteristics from the conventional linoleum and asphalt tile compositions and, therefore, the positioning of the plate for different formulations may vary. All of these variables are within the scope of knowledge of the person skilled in the art. It is, therefore, a relatively easy matter to determine the proper position of the plate for a given set of conditions.

As a typical example, taking a conventional linoleum composition, the size of the color particles used to produce the "Spatter" effect are within a range of $\frac{1}{8}$" to $\frac{3}{16}$" in diameter, and the color particles which form the background of the composition are $\frac{1}{32}$" or less. In calendering a sheet of material .075" thick on a calender having 20" diameter rolls, the edge 7 of the plate 5 should be positioned about 2" from the nip between the calender rolls and the degree of movement of the plate in a horizontal direction parallel to the longitudinal axis of the calender rolls should be approximately 1". The above figures are given by way of example to show the approximate positioning of the plate for a conventional linoleum composition, and it will be understood that other positioning can be determined by one skilled in the art familiar with the composition being utilized. It is important that the distance between the edge of the plate and the opposite roll be greater than the size of the color particles being fed to the calender.

Because of the size of the plate, it has been found desirable to have the advantage of the reinforcing effect of the roll in engagement with the edge of the plate. In order to do this, the edge of the plate is hollow ground to conform to the shape of the roll so that the pressure caused by the bank of color particles urges the plate into engagement with the roll. It is not necessary so far as the invention is concerned to have the edge of the plate conform to the configuration of the roll; however, it has been found highly desirable to do so in order to keep the plate rigid and also the edge 7 will wear uniformly. Due to the fact that calender rolls are rather expensive to manufacture, it is preferable to have the plate 5 made of a metal which is softer than the metal of the calender rolls so that any wear will be on the edge of the plate which can be replaced and the calender roll will not be marred.

When larger color particles are used, it may be found desirable to move the plate further away from the nip in order to enable more of the particles to be compacted into the nip to form a unitary sheet. This can be determined by one skilled in the art in carrying out the invention.

With the device here under consideration, it is possible to produce a sheet of material having pattern design characteristics similar to the designs currently reproduced by the molded process and sold under such trademarks as "Spatter" and "Granette." These designs have a background of material with contrasting color compositions disposed therein in such manner as to give a polka dot effect without the extrusion effect currently encountered by calendering operations. It is highly desirable to carry out this method on a calender, inasmuch as the granular composition can be rapidly fed to the calender in the formation of a continuous sheet and there is no uniform repeat of the design. The design is uniform throughout the entire sheet. Another advantage, of course, is the speed of manufacture which introduces economies into the manufacture of sheet material, making it more desirable to the purchasing public from an economic standpoint.

I claim:

1. In a device of the type described, the elements comprising a pair of calender rolls for consolidating sheet material from a bank of granular color particles disposed above the nip of said calender rolls, means for

shielding said bank of granular color particles from engagement with one of said calender rolls, said shielding means terminating in a line parallel to the longitudinal axis of the calender rolls immediately above said nip, and oscillating means for imparting oscillatory motion to said shielding means in a direction parallel to the longitudinal axis of said calender rolls.

2. In a device of the type described, the elements comprising a pair of calender rolls for consolidating sheet material from a bank of granular color particles disposed above the nip of said calender rolls, a plate extending along the longitudinal length of one of said calender rolls for shielding the bank of granular color particles supplied thereto from engagement with said calender roll, said plate terminating in a line parallel to the longitudinal axis of the calender roll immediately above said nip, and means for imparting oscillatory motion to said plate in a direction parallel to the longitudinal axis of said calender rolls.

3. In a device of the type described, the elements comprising a pair of calender rolls for consolidating sheet material from a bank of granular color particles disposed above the nip of said calender rolls, a plate extending along one of the calender rolls for shielding the bank of granular color particles from engagement with one of said calender rolls, said plate terminating in a line parallel to the longitudinal axis of the calender roll immediately above said nip, and means for imparting reciprocatory movement to said plate in a direction parallel to the longitudinal axis of said calender rolls.

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