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METHOD OF WINDING THERMOPLASTIC RESIN SHEETING INTO ROLLS AND ROLLS OBTAINED THEREBY

Filed May 22, 1967

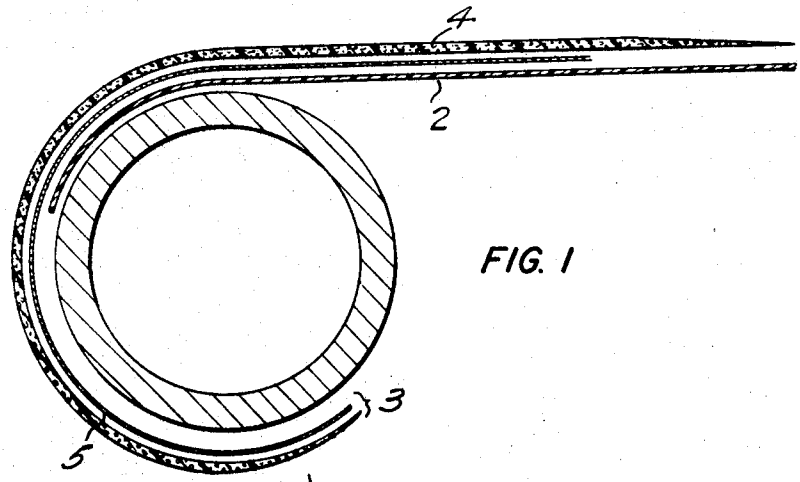

FIG. 1

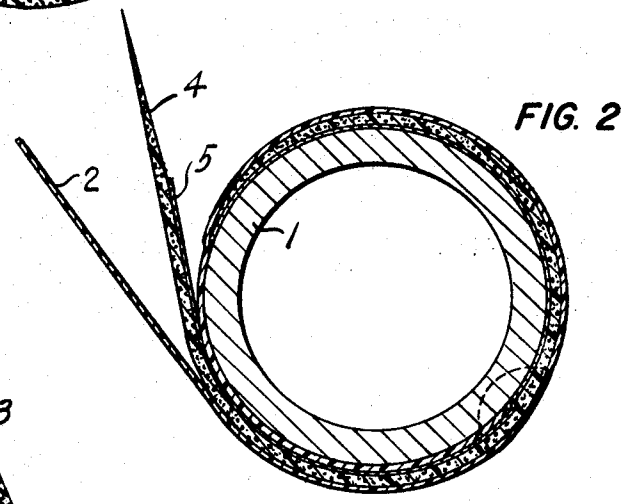

FIG. 2

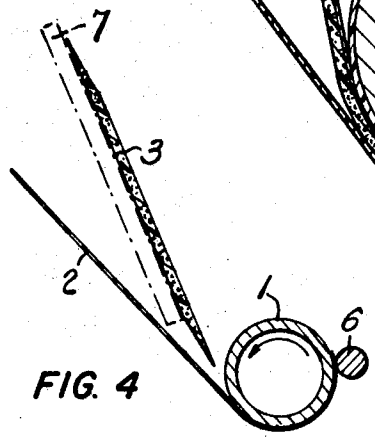

FIG. 4

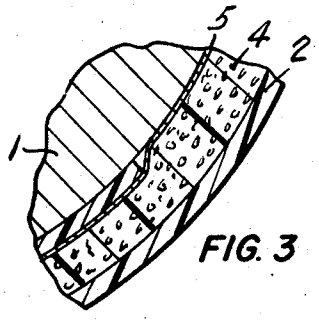

FIG. 3

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PATENT AGEN

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METHOD OF WINDING THERMOPLASTIC RESIN SHEETING INTO ROLLS AND ROLLS OBTAINED THEREBY

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12 Claims. (Cl. 206—59)

ABSTRACT OF THE DISCLOSURE

A roll of thermoplastic sheeting comprising in combination a core, a web of thermoplastic sheeting wound thereon and a resilient foam plastic insert between the leading end of the web and the second circumvolution thereof whereby damage of said second and successive circumvolutions of the web by said leading edge is prevented.

The present invention relates to an improvement in the art of winding thermoplastic sheeting, more particularly polyvinyl chloride sheeting, into rolls and to the improved rolls obtained thereby.

Polyvinyl chloride sheeting, hereinafter called vinyl sheeting, is usually sold in the form of rolls. In a conventional method of making the rolls, a web of sheeting of predetermined width is wrapped around and supported by a rigid tubular core which, most frequently, is made from paper such as cardboard or from any other suitable material such as wood, rigid plastic, etc. Because of its thermoplastic nature, vinyl sheeting tends to deform and as a result, a certain length of the wrapped sheeting in the layers nearest the core suffer surface damage in the form of distortion or marking, which makes it objectionable to the user. The most serious damage results from the overlapping of the leading edge of the web on the rigid core by subsequent layers of the sheeting. Even with a perfectly flat and uncreased starting edge, the character of this leading edge as well as irregularities in the surface of the core are permanently reflected in subsequent layers. In a roll, for instance, where a core of 3-inch diameter is used, the above-mentioned deformation can be observed in the unrolled sheeting for approximately 10 yards or 10 to 20% of the total length of the roll. Of course, both of the above causes of defects are enhanced by increased tension in winding the rolls or by any tendency of the sheeting to shrink after the roll has been put into storage.

While at least part of this surface damage can be removed by special treatment after the sheeting is unrolled, such treatment has been found impractical and efforts have been concentrated on finding a way to prevent the damage.

Another conventional method of making rolls of sheeting is that which uses cores known in the trade as "flapped cores." Such cores have a feather-edged paper flap attached thereto, and are available commercially. When using these cores, the leading edge of the sheeting is tucked behind the flap at the beginning of the winding operations. Thus the leading edge becomes covered by the flap and the subsequent convolutions of the sheeting are expected to be protected from ridge impression.

Although suitable for winding sheeting made of some other materials, the paper flap cores have proved unsuccessful for winding very pliable sheeting material such as vinyl sheeting with automatic equipment.

Indeed soft sheeting such as vinyl sheeting is necessarily wound under very low tension to avoid stretching. In order, however, to ensure dense laydown without voids, the paper flap of the core must be sufficiently pliable with

the result that it becomes incapable of protection against ridge impression. On the other hand, if the paper flap is sufficiently stiff for ridge protection, it does not readily conform to the curvature of the core and permits formation of voids during the first few convolutions of winding, which voids become compressed upon subsequent roll build-up and result in serious ribs and wrinkles.

Another disadvantage of the flapped core is that, while it is quite convenient when winding is started by hand, it presents serious difficulty when automatic operations for cut-off and transfer to a new core are desired. Furthermore the flapped core is not very versatile and is rather complicated to make and its attached flap is easily damaged during storage and handling.

It is a general object of the present invention to provide an improved roll of thermoplastic sheeting wherein any possibility of permanent distortion or marking of the sheeting is substantially eliminated.

A specific object of the invention is to provide an improved roll of thermoplastic sheeting wherein marking of the sheeting is prevented by means of a special foam insert.

Another object of the invention is to provide a method for making the aforesaid improved roll.

A further object of the invention is to provide a foam insert suitable for insertion in a roll of thermoplastic sheeting.

These and additional objects will become apparent upon consideration of the following description and accompanying drawings in which:

FIGURE 1 is an exploded cross-sectional view of an embodiment of the roll of the invention at the stage of winding thereon the first convolution of sheeting;

FIGURE 2 is a cross-sectional view of another embodiment of the invention illustrating the same arrangement as in FIGURE 1 but at a later stage of the winding operation;

FIGURE 3 is an enlarged view of the encircled part of FIGURE 2; and

FIGURE 4 is a cross-sectional view of an arrangement whereby the foam insert is automatically positioned in the roll.

The essential concept of the invention resides in the positioning in a roll comprising a plurality of circumvolutions of thermoplastic sheeting on a rigid core, of a compressible and pliable foam insert, in part in continuous relation with said core and in part over the leading edge of said sheeting on said core or between the first few circumvolutions of said sheeting in a masking relationship between said leading edge and the circumvoluting layers of said sheeting outwardly of said insert whereby the sheeting forming the outward circumvolutions is protected against damage by the leading edge thereof, the length of said insert being such as to form part of at least one circumvolution and the outwardly directed end of said insert being formed with a long-angled taper.

The principle of the invention can be used with advantage for the preparation of rolls of any thermoplastic sheeting which is susceptible of being permanently deformed when wound onto conventional cores as hereinbefore defined. Examples of sheetings which may advantageously be wound according to the principle of the invention are those made from rubber, polyethylene, polyethylene terephthalate, polypropylene, polyurethane, polyvinyl chloride, etc.

In all figures of the drawings where similar parts bear identical reference numbers, **1** is a rigid core in the form of a tube, **2** is a web of vinyl sheeting and **3** designates a combination of a compressible and pliable foam insert **4** and a backing **5**. In actual practice, the insert **4** is lightly adhered to the backing **5**.

The core **1** can be in the form of a tube or rod and must be relatively rigid and substantially cylindrical.

Such a core may be made of cardboard paper, wood, metal, rigid plastic or any other suitable material, cardboard paper in the form of a tube being preferred. The form and dimensions of the core are of course, a direct function of the machinery used and the nature of the sheeting to be formed into a roll.

The backing 5, although not constituting an essential element of the invention, is advantageously used as a support for the foam insert. It is preferably made of thin pliable cardboard paper but can also be constituted of any material which can be formed into a thin, flexible and substantially non-stretchable film, sheet or fabric. Such backing, when used, is subject to either one of the following restrictions: at its outwardly directed end, it must terminate substantially short of the corresponding edge of the foam insert or, if it extends beyond the end of the insert, it must be feathered.

The material suitable for making the insert 4 can be any synthetic resin capable of being formed into a compressible and pliable foam, such as polyethylene, polyvinyl chloride, polyurethane, etc. In all cases, however, the resin constituting the foam insert must be compatible with the thermoplastic resin of which the sheeting to be wound is formed. The thickness of the insert is a direct function of the degree of compressibility of the foamed resin of which it is made and also of the tension applied in winding the sheeting about the core. Such thickness must be generally in excess of that of the sheet to be wound so as to minimize penetration of the ridge formed by the leading edge of the sheet.

Suitable compressibility of the insert material under the conditions encountered permits sinking of the leading edge of the sheet into the insert (see FIGURE 3). Compressibility of the insert also allows some contraction of the sheeting after winding, thus reducing the stress and the resultant marking in the finished roll.

Pliability of the insert allows its conformation to the winding radius under the light tension involved, thus avoiding voids and creases.

An important characteristic of the foam insert 4 is that at least its outwardly directed end be tapered from its full thickness to feather edge. The feather edge or edges obtained by forming one or both ends of the insert with a long-angle taper whereby the thickness of the insert very gradually decreases to zero, is or are necessary to prevent damage to the wound sheet by one or both edges of the insert. Obviously where use is made of an insert longer than the circumference of the core, i.e., of an insert which overlaps itself, the quality of the inward edge is not as critical as that of the outward edge.

The width of the insert is obviously, substantially equal to that of the sheeting to be wound and its length is normally in excess of the circumference of the core. Although such length could extend several circumvolutions, it is preferred that it be superior to the circumference of the core by the length of the taper whereby the total thickness of foam is maintained substantially constant along the entire circumference. It should be understood, however, that in the case where the core has a perfectly smooth surface, i.e., where it is not necessary to protect the sheeting from being damaged by surface deformations on the core, the length of the insert may be less than the circumference of the core.

In an embodiment of the method for making rolls according to the invention, a cardboard tube is first provided, a vinyl foam insert is then wound around part of the circumference of the tube and then over the leading edge of the vinyl sheeting that is to be wound, and thereafter the sheeting and the insert are wound under tension in successive convolutions in a conventional manner, whereby the insert is sandwiched between the first and second circumvolutions of sheeting.

It can be clearly seen from FIGURE 1 that rolls according to the invention can be produced by first applying the edge of the combination 3 of the insert 4 and backing 5 to the core 1 and then winding the combination of insert and backing about part of the circumference of the core. The edge of a thermoplastic resin sheeting is then applied to the core in the nip between such core and insert. Counterclockwise rotation of the core 1 thereafter, results in winding of the sheeting into a plurality of circumvolutions whereby the foam insert is taken into sandwich partly between the core and the outwardly directed portion of the first circumvolution and partly between the first and second circumvolutions.

FIGURES 2, 3 and 4 illustrate another and preferred embodiment of the invention whereby a roll is made by first winding the sheeting around part of the core and then automatically positioning the insert in the nip between the core and sheeting without interruption of the winding operation. This embodiment is of particular advantage where it is desired after winding a full roll and cutting the sheet to transfer such sheet to a new empty roll.

Referring to FIGURE 4 where the automatic positioning of the insert is illustrated, the leading end of the sheeting 2 is engaged between the core 1 and the pressure roll 6 and when the winding has started, the insert 3, having been prepositioned on a suction table 7 is automatically released and allowed to wind in with the sheeting. A roll is then produced in which the sheeting and foam insert have the relative positions illustrated in FIGURE 2.

In making rolls according to the two above embodiments of the invention, vinyl sheeting was wound about a cardboard tube using a vinyl foam insert of about 3/32 inch in thickness, tapered at both ends and of a length superior to the circumference of the core. The obtained rolls were very satisfactory in that unrolled sheeting therefrom was substantially free of any deformations or markings. As clearly illustrated in FIGURE 3, these excellent results were made possible by the compressibility of the insert material 4 which allowed sinking of the leading edge of the sheet 2 into the insert.

What I claim is:

1. In a process for forming a roll of thermoplastic sheeting whereby a length of said sheeting is wound around a core into a plurality of circumvolutions, the improvement which comprises positioning a compressible and pliable foam insert in part in contiguous relation with said core and in part over the leading edge of said sheeting or between the first few circumvolutions of said sheeting in a masking relationship between said leading edge and the circumvoluting layers of said sheeting outwardly of said insert whereby the sheeting forming the outward circumvolutions is protected from damage by said leading edge, said insert forming at least part of one circumvolution and the outwardly directed end thereof being formed with a long-angled taper.

2. A process as claimed in claim 1 wherein the sheeting is wound around the core for at least part of one circumvolution, the leading edge of the insert is positioned at the nip between the core and the sheeting and the insert is then wound in with the sheeting.

3. A process as claimed in claim 1 wherein the insert is first wound around the core for at least part of one circumvolution, the leading edge of the sheeting is positioned at the nip between the core and the insert and said insert is then wound in with the sheeting.

4. A roll of thermoplastic sheeting comprising, in combination, a relatively rigid and generally cylindrical core of predetermined and fixed dimensions, a length of said sheeting wound around said core into a plurality of circumvolutions, and a compressible and pliable foam insert of a width substantially equal to that of said sheeting and of a thickness in excess of that of said sheeting, said insert being supported on a thin flexible and substantially non-stretchable backing and having at least its outwardly directed end formed with a long-angled taper whereby the thickness thereof at said end gradually decreases to near zero and being positioned in part in contiguous relation

with said core and in part over the leading edge of said sheeting or between the first few circumvolutions of said sheeting in a masking relationship between said leading edge and the circumvoluting layers of sheeting outwardly of said insert whereby the sheeting forming said outward circumvolutions is protected from damage by said leading edge, said insert forming part of at least one circumvolution.

5. A roll according to claim 4 wherein the foam insert has both of its ends formed with a long-angled taper.

6. A roll according to claim 5 wherein the foam insert is longer than the circumference of the core by about the length of the taper.

7. A roll according to claim 5 wherein the backing terminates substantially short of the outward end of the insert.

8. A roll according to claim 5 wherein the backing extends beyond the outward end of the insert and is feather-edged.

9. A roll according to claim 4 wherein the thermoplastic sheeting is polyvinyl chloride, the insert is made of polyvinyl chloride and has both of its ends formed with a long-angled taper, the thickness of the insert is substantially in excess of that of the sheeting, the length of the insert is longer than the circumference of the core by about the length of the taper and the backing terminates short of the outward end of the insert.

10. A roll according to claim 9 wherein the insert is positioned in contiguous relation with part of the circumference of the core and extends over the leading edge of the sheeting.

11. A roll according to claim 9 wherein the backing is made of paper.

12. A roll according to claim 4 wherein the backing is made of paper.

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