

TAPE ROLL LINER/TAB, APPLICATION APPARATUS AND METHOD

RELATED APPLICATIONS

This is a divisional application of application Ser. No. 08/812,346 filed Mar. 5, 1997, now U.S. Pat. No. 5,885,391, which in turn is a divisional application of application Ser. No. 08/473,286 filed Jun. 7, 1995, now U.S. Pat. No. 5,620,544.

BACKGROUND OF THE INVENTION

The invention relates to a process and apparatus for forming coreless rolls of pressure sensitive adhesive tape.

There are many known methods and apparatus for forming individual spools or rolls of web material. The web material is often supplied in bulk in roll form, which is then unrolled, slit longitudinally and wound into individual strips of web material about a plurality of pre-aligned cores of cardboard or plastic. In the case of pressure sensitive adhesive tape, for example, typical cores are formed of paper, cardboard or plastic. Because it is useful to provide such tape in different widths, an inventory of cores of different widths is thus also required. The winding of tape onto a core necessitates additional material handling (e.g., core loading) during the tape roll production process. In addition, it is imperative during tape roll production that there be no misalignment between the core and the advancing strip of web material during winding. Misalignment can cause tape telescoping during winding or an axial offset winding of the tape onto the core ("off core" winding), both of which can lead to product aesthetic issues and dispensing difficulties.

The use of a core presents additional material inventory scheduling and storage requirements, and results in extra shipping weight and volume for the tape roll product. In addition, the cost of the core itself, particularly for shorter length tape rolls, can represent a significant proportion of the product's cost. Further, the disposal of the core may present waste and environmental concerns when the supply of tape from the core has been depleted. Even if the core is formed from a material or composite that is recyclable, its use requires additional handling by the user in order to be salvaged for reuse or reprocessing. Under certain conditions over time (e.g., variable humidity and temperature), the discontinuity between the different core and wound tape materials can cause deformations to occur in the tape rolls, such as rippling or bulging, which are aesthetically undesirable.

Coreless rolls of pressure sensitive adhesive tape have been developed, along with processes for winding such rolls. One such process is disclosed in Hall et al. U.S. Pat. Nos. 3,770,542 and 3,899,075. A diametrically expandable and retractable mandrel is used for winding pressure sensitive adhesive tape thereon. Tape winding is initiated on this mandrel by leaving exposed a short segment of adhesive at the leading end of the tape. A next segment of the adhesive on the tape is covered with a backing sheet which presents a non adhesive surface to the mandrel for the remainder of the innermost wrap of tape about the mandrel. After a desired length of tape has been wound into a roll on this mandrel (in its expanded state), the tape is cut, winding stopped and the mandrel diametrically retracted. Rotation in an opposite relative direction between the mandrel and the tape then folds back the short adhesive bearing leading edge segment onto the backing sheet, thereby leaving no adhesive exposed on the innermost wrap of the tape roll. While this process results in a coreless roll of pressure sensitive adhe-

sive tape, it is necessary to periodically stop the advance of web material through the apparatus for indexing purposes during tape roll production, thereby inhibiting high speed and continuous manufacturing of a coreless tape product. In addition, the further processing on the tape roll (rotation reversal of the mandrel relative to the roll) is necessary in order to fully achieve an innermost wrap of the tape roll which is free of adhesive. As mentioned, this process also requires a mandrel which expands and contracts diametrically. A pneumatically expandable mandrel is disclosed, which, of course, requires pneumatic couplings and presents a more complex and expensive mandrel arrangement than desired.

SUMMARY OF THE INVENTION

The present invention includes a method of sequentially forming a plurality of coreless rolls of pressure sensitive adhesive tape, and apparatus therefore. The inventive method includes providing a first rotating winding mandrel in a first winding station, directing a leading edge of an advancing strip of pressure sensitive adhesive tape around and directly against the first mandrel, and winding the tape successively upon itself and the first mandrel to form an in process coreless tape roll. The first mandrel and in process coreless tape roll are advanced to a second transfer station while advancing a second rotating mandrel into the first winding station for engagement with the advancing tape. The tape is severed between the first and second mandrels to define a trailing edge with the tape wound upon the first mandrel and the tape is then wound on the first mandrel in the second transfer station until the trailing edge is also wound thereon to form a completed coreless tape roll on the first mandrel.

To facilitate the coreless winding of the tape on a winding mandrel, in one embodiment the winding mandrel is rotated about a tape winding axis in a first direction and at a first rate. A cinch roller assembly rotates in a second, opposite direction. A support for the cinch roller assembly is movable relative to the winding mandrel between a first position spaced from the winding mandrel and a second position wherein the cinch roller assembly is urged into contact with the winding mandrel. When the support is in its second position, the cinch roller assembly is rotated at a second, faster rate, and a leading edge portion of an advancing strip of tape is wound about the winding mandrel. In the preferred embodiments, the leading edge portion of the strip of tape has a liner sufficient to at least mask the adhesive on an innermost wrap of tape being wound on the winding mandrel. In one preferred embodiment, the support also has a strand feed roller assembly, which rotates in the second direction, at the second faster rate, when the support is in its second position.

In one embodiment of the winding mandrel, it includes a cylindrical shaft having an axis of rotation, with at least a portion of the shaft having a circumferential tape supporting segment adapted for receiving tape wound thereon. The circumferential tape supporting segment has a tape engaging surface portion that, in a radial orientation, is compressible yet sufficiently stiff to support the tape as it is successively wound about the shaft to form a tape roll, and that is sufficiently pliant to permit ready axial removal of a wound tape roll from the shaft.

In another embodiment, the process for sequentially forming a plurality of coreless tape rolls of pressure sensitive adhesive tape includes longitudinally advancing a web having first and second major surfaces, with one surface thereof