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APPARATUS FOR AND METHOD OF APPLYING ADHESIVE BANDS TO CORES

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Fig. 1.

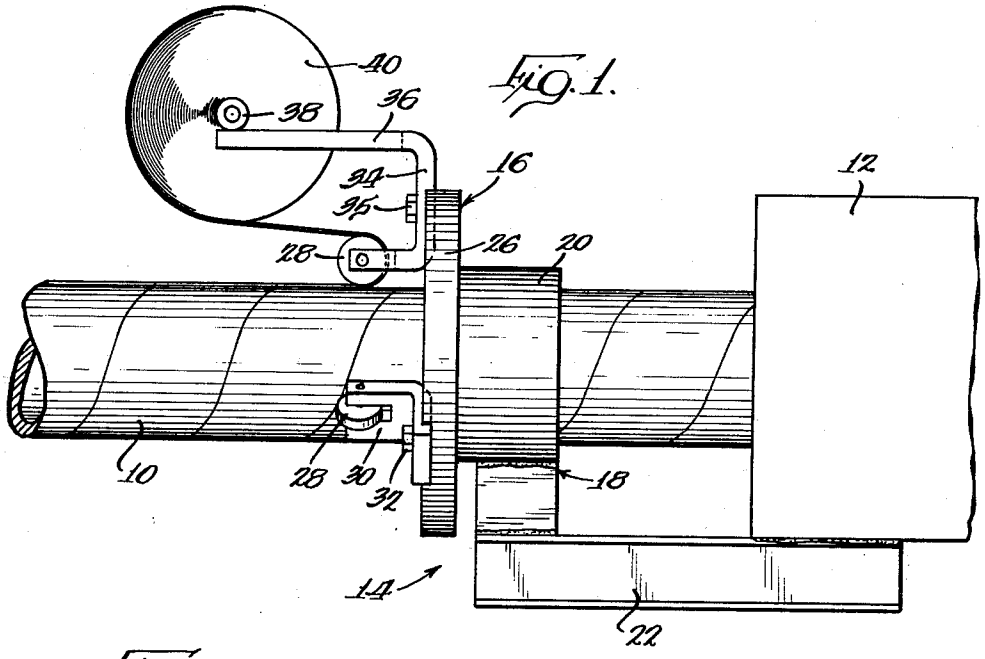


Fig. 2.

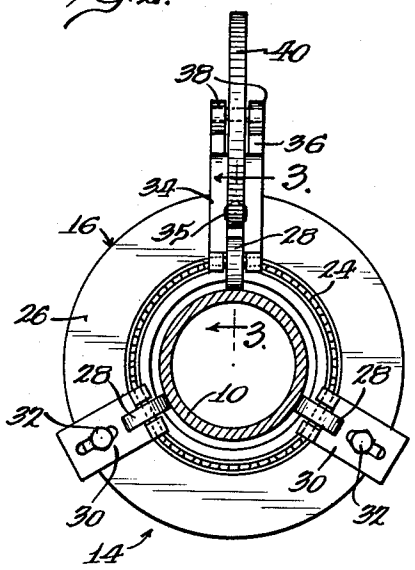
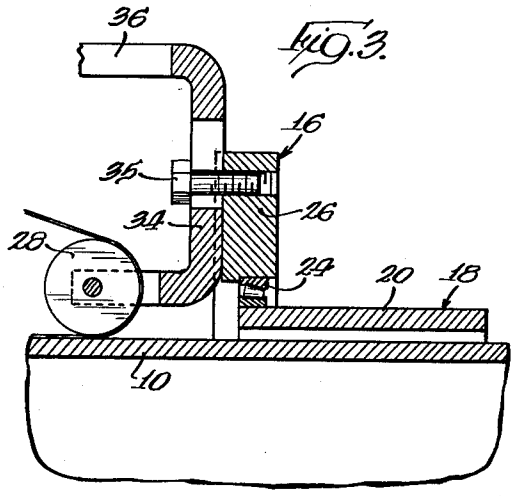


Fig. 3.



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APPARATUS FOR AND METHOD OF APPLYING ADHESIVE BANDS TO CORES

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The present invention relates to the tubular cardboard cores used as mandrels for rolls of paper webs, plastic films, metal foils, etc., and is particularly concerned with the provision of a method and means for applying to such cores during their manufacture a band of adhesive to facilitate starting thereon of the web, foil or film to be wound in a roll.

It is common practice to employ tubular paper or cardboard cores as economical disposal mandrels on which sheet materials, such as plastic films, metal foils, wrapping paper, toilet tissue, etc., may be wound. In the plastics field particularly, considerable difficulty has been encountered in starting the plastic film on the core in the winding machine. Some manufacturers have manually applied small pieces of tape along the length of the leading edge of the film to start it on the core, but this has proven tedious and impractical. In contrast, I propose that a band of adhesive be applied to the core, thereby to present a sticky band to the leading edge of the film to facilitate starting of the same on the core.

The tubes or cores are conventionally made in a spiral manner and are therefore rotating as they come off the end of the core making machine. Because of this, and the necessity for applying a straight line of adhesive, it was necessary heretofore to apply the adhesive in a separate operation following formation of the tubular core.

The object of the present invention is to provide a method of and apparatus for applying a straight band of adhesive directly to the rotating core as it issues from the core making machine, whereby the band is provided economically and conveniently without necessity for extra handling or processing.

It is also an object of the invention to provide a method of and apparatus for applying a straight band of adhesive directly to the rotating core and for covering the band of adhesive with a parting strip or tape that will preserve and protect the band of adhesive during handling and shipment, and that may readily be stripped from the adhesive just prior to use of the core to expose a sticky band to the leading edge of the film to facilitate starting of the same on the core or mandrel.

It is a particular object of the invention to provide a method and apparatus as aforesaid wherein the adhesive band and parting tape are applied simultaneously to the core; specifically, in the preferred embodiment of the invention, by applying to the core either a two-sided pressure-sensitive adhesive tape having a parting strip on its outer surface, or a transfer type of tape wherein the protective parting layer carries a band of adhesive that will adhere to the core and subsequently accommodate stripping of the parting material without stripping the adhesive off the core.

Another object of the invention is to provide a method of applying a longitudinally extending straight band of adhesive to a rotating core as it issues from the core-making machine, comprising the steps of conjointly rotating an adhesive applicator with the core by engaging the applicator with the core with freedom of relative longitudinal movement and frictional resistance to relative rotary movement, and holding the applicator to accommodate rotary movement and prevent longitudinal movement thereof.

A further object of the invention is the provision of an adhesive applying means which will accommodate longitudinal passage of the tubular core, but will rotate with the core, so that the adhesive may be applied in a straight line to the core as it discharges from the core-making machine without necessity for any separate drive means for the adhesive applying means.

Specifically, it is an object of the invention to provide an adhesive tape applying attachment for core-making machines comprising an annulus adapted to encircle the tube and having a plurality of tube-engaging wheels or rollers which will permit longitudinal passage of the tube but will couple the annulus to the tube for conjoint rotation therewith, a tape dispenser mounted on the annulus, and a stationary bearing or retainer assembly for holding the annulus against longitudinal movement while accommodating rotary movement.

Other objects and advantages of the invention will become apparent in the following detailed description.

Now, in order to acquaint those skilled in the art with the manner of practicing my method, and with the manner of making and using my improved apparatus, I shall describe, in connection with the accompanying drawing, a preferred embodiment of the apparatus and the preferred manner of making and using the same.

In the drawing:

FIGURE 1 is a side elevation of a tubular core issuing from a core-making machine and a preferred embodiment of my adhesive applying apparatus associated therewith;

FIGURE 2 is an end elevation of the apparatus; and

FIGURE 3 is a fragmentary vertical section taken substantially on line 3—3 of FIGURE 2 and on an enlarged scale.

Referring now to the drawings, I have shown a conventional tubular cardboard core 10 issuing from the discharge end 12 of a core-making machine. To apply a straight band of adhesive to the core, I provide the device indicated generally at 14 which in essence comprises a rotatable frame 16 mounted for conjoint rotation with the core 10 about the axis of the core, adhesive applying means mounted on the frame, and stationary retaining means 18 accommodating rotation of the frame but holding the same against longitudinal movement.

In the preferred embodiment of the invention as illustrated herein, the retaining means 18 comprises a tubular bearing support 20 mounted in fixed position concentric with the machine discharge 12, and thus with the core 10, by means of a beam 22 secured to the machine or any other stationary or fixed point. Adjacent its outer end, the tube 20 carries a combined radial and end thrust bearing 24, the inner race of which is press fitted or welded to the tube and the outer race of which is secured to the frame 16.

The rotatable frame 16 consists simply of an annular plate 26 journalled on the bearing 24 concentrically of the tube, and thus concentrically with the core. Preferably, the outer race of the bearing 24 is press fitted or welded into a stepped bore in the plate thereby to be protected against damage and to restrain the plate against axial movement while accommodating rotation thereof. At each of a plurality of circumferentially spaced locations thereon, the annular plate 26 adjustably mounts a core engaging wheel or roller 28, each of which is disposed in a plane radial to the axis of the plate and the tube and is journalled on an axis extending transversely, i.e., at right angles, to the axis of the tube. Preferably, three wheels are provided at equal circumferential spacings, but other numbers and spacings may be employed if desired. Two of the wheels are mounted on relatively simple brackets 30 each of which comprises an L-shaped strap having a bifurcated leg equipped with bearings within which the shaft of the respective wheel

or roller is journalled. The other leg of each strap or bracket parallels the plate **26** and is received in a radial slot in the face of the plate to be retained against other than radial movement relative to the plate. The latter leg of each bracket has a radial slot therethrough, and a bolt **32** is passed through the slot and threaded into the plate thereby to mount the bracket and the wheel for adjustment radially of the frame. The remaining bracket **34** includes a radially inward portion identical to the brackets **30** which, together with a bolt **35**, mounts the respective wheel **28** for adjustment radially of the plate. The bracket **34** also includes an axially extending radially outward portion comprising a long, bifurcated arm **36** which is provided at its outer end with transversely spaced and aligned bearings **38** for reception of the shaft or core of a roll **40** of pressure-sensitive tape.

It is a feature of the disclosed embodiment of the invention that the tape supporting bearings and one of the rollers or wheels **28** are mounted in the same plane. This affords the particular advantage that the tape on the roll **40** may be reeved from the roll around the respective wheel, whereby the latter in addition to its other functions serves as a pressure applying element for the tape.

In use of the apparatus, the tube-making machine is set in operation to cause discharge therefrom of a short length of the core **10**, which due to the coaxial disposition of the machine discharge, the tube **20** and the plate **26**, passes axially through the tube and the plate. The bolts **32** and **35** are then loosened to permit adjustment of the brackets **30** and **34**, whereupon the brackets may be moved radially inward to press the wheels **28** firmly against the periphery of the core. Since the wheels are adjustable, the device of the invention is conveniently applicable to a wide range of core sizes. The wheels preferably are formed of rubber, or have rubber tires, whereby the same will not mar the core but will still have firm frictional engagement with the same. Prior to final setting of the bracket **34**, the leading end of the tape is unwound from the roll **40** and reeved around the wheel carried by the bracket **34** in the manner depicted in FIGURES 1 and 3, and this wheel is then brought into firm engagement with the tape and the core.

The tape employed may be either a two sided tape, i.e., one having pressure-sensitive adhesive on both sides of a central carrier tape and a parting strip on the radially outer one of the adhesive surfaces; or it may be a so-called "transfer" tape which comprises a parting strip and a pressure-sensitive adhesive carried on the radially inner surface of the strip, the adhesive having a greater affinity for the core than the strip so that when the parting strip is removed the adhesive stays on the core. Since the parting strip is on the radially outer side of the tape on the roll, and the radially inward surface comprises pressure-sensitive adhesive, the tape will not stick to the wheel or roller **28**, but will be pressed firmly and adhesively against the surface of the core.

After the wheels **28** have been adjusted as described, the core-making machine is again set into operation whereupon the core **10** commences to rotate and to advance longitudinally. Since the rollers or wheels **28** are free to rotate in the direction longitudinally of the core, they present minimal resistance to core advancement so that the core may readily advance axially through the tube **20**, plate **26**, and wheels **28**. The bearing **24** and tube **20** of course restrain the plate against longitudinal movement. In the direction transversely thereof, i.e., circumferentially relative to the core, the wheels or rollers **28** present substantial frictional resistance to relative rotation of the core, whereby the wheels, the plate and the roll **40** of tape are driven by the core for conjoint rotation therewith. Thus, as the core rotates and advances longitudinally, the frame **16** and the roll of tape rotate conjointly with the tube, the wheel or roller carried by the bracket **34** presses the exposed pressure-sensitive side

of the tape onto the core, and the core in its longitudinal advance pulls the tape from the roll, whereby the tape is applied in a straight line onto the core. In the finished product, the band of adhesive extends longitudinally of the core and its outer surface is protected by the parting strip. Thus, the core may be cut to length, handled, packed, shipped, etc., in the manner conventional for these cores. When it is desired to use the core as a mandrel, the parting strip is removed and the leading edge of the film, web or foil to be rolled is pressed against the band of adhesive, thereby to start the web on the core.

As will be appreciated, the adhesive band may be of substantially any desired width for appjlication to the core. While normally a narrow band will suffice, a wider band may be applied. In the latter case, it would be preferable to employ a grooved roller or wheel **28**, the groove in which is formed on substantially the same radius as the core, to press the tape to the core across its full width.

Also, from FIGURE 1, it will be noted that the roll **40** of tape as initially supplied may be of a diameter half again as large as the roll illustrated, as sufficient clearance is provided within the bifurcated arm **36** and between the arm and the core to accommodate such roll. By simple variation in the length of the arm and the radial spacing of the same from the core, i.e., the radially inner surface of the wheel **28**, substantially any desired diameter of roll can be accommodated. Since the speed of rotation of the core and thus of the frame is not great, I have not found it necessary to provide counter-balancing means for the arm **36** or the roll. Such means could of course be provided if desired.

From the above description, it will be apparent that the method of my invention resides essentially in the steps of conjointly rotating an adhesive applicator frame with the core, restraining the frame against longitudinal movement with the core while accommodating rotary movement thereof, and engaging an adhesive applicator on the frame with the core. In practice of the method, I prefer to use pressure-sensitive tape, as in the disclosed embodiment of the apparatus, but I could also apply liquid adhesive; either to a parting strip that is then applied to the core, or directly to the core followed by application of a parting strip if that were necessary.

Irrespective of such variations as may be made within the skill of the art, my invention provides for the application of a straight, longitudinally extending band of adhesive to cores throughout a wide range of core diameters. The apparatus in its preferred form is driven directly from the core and requires no outside or separate power source. The adhesive is applied directly to the core during its manufacture, and requires no separate operations. Thus, the objects and advantages of the invention have been shown herein to be attained in a convenient, economical and practical manner.

While I have shown and described what I regard to be the preferred embodiment of my invention, it will be appreciated that various changes, rearrangements and modifications may be made therein without departing from the scope of the invention, as defined by the appended claims.

I claim:

1. A method of applying a longitudinally extending straight band of adhesive to a rotating core as it issues from the core-making machine, comprising the steps of conjointly rotating an adhesive applicator with the core, holding the applicator against longitudinal movement, and engaging the applicator with the surface of the core.

2. The method of applying a longitudinally extending straight band of adhesive to a rotating core as it issues from the core-making machine, comprising the steps of conjointly rotating an adhesive applicator with the core by engaging the same with the core with freedom of relative longitudinal movement and frictional resistance to relative rotary movement, and holding the applicator

to accommodate rotary movement and prevent longitudinal movement thereof.

3. A method of applying a longitudinally extending straight band of adhesive to a rotating core as it issues from the core-making machine, comprising the steps of disposing a roll of two-faced pressure-sensitive tape in a plane radial to the core, restraining the roll against longitudinal movement, conjointly rotating the roll with the core by engaging the same with the core, and accommodating relative longitudinal movement of the roll and the core by permitting rotation of the roll about its own axis and paying out of the tape on the roll.

4. Means for applying a longitudinally extending straight band of adhesive to a rotating core comprising a bearing concentric with the core, an adhesive applicator frame journalled on said bearing for rotation about the axis of the core, and a roller journalled on said frame and disposed generally in a plane radial to the axis of rotation of the core, the periphery of said roller being spaced from the axis of said bearing by a distance equal substantially to the radius of the core for engagement with the surface of the core, whereby the roller in the direction circumferentially of the core frictionally couples the applicator to the core for conjoint rotary movement and in the direction longitudinally of the core defines a bearing accommodating relative longitudinal movement of the frame and the core.

5. Means for applying a longitudinally extending straight band of adhesive to a rotating core comprising a rotatable adhesive applicator frame concentric with the core, a plurality of circumferentially spaced rollers journalled on said frame and disposed generally in respective planes radial to the axis of rotation of the core, the periphery of each roller being spaced from the axis of the core by a distance equal substantially to the radius of the core for engagement with the surface of the core, whereby the rollers in the direction circumferentially of the core frictionally couple the applicator to the core for conjoint rotary movement and in the direction longitudinally of the core define bearings accommodating relative longitudinal movement of the frame and the core, and retaining means for the frame accommodating rotation but preventing longitudinal movement thereof with the core.

6. Means for applying a longitudinally extending straight band of adhesive to a rotating core comprising an adhesive applicator frame concentric with the core, a roller journalled on said frame and disposed generally in a plane radial to the axis of rotation of the core, the periphery of said roller being spaced from the axis of said frame by a distance equal substantially to the radius of the core for engagement with the surface of the core whereby the roller in the direction circumferentially of the core frictionally couples the applicator to the core for conjoint rotary movement and in the direction longitudinally of the core defines a bearing accommodating relative longitudinal movement of the frame and the core, and retaining means rotatably supporting said frame and preventing longitudinal movement thereof.

7. An adhesive applicator for rotating cores comprising a rotatable applicator frame, a roller journalled on said frame and disposed generally in a plane radial to the axis of rotation of the frame, a support for a roll of adhesive tape mounted on said frame, said support being disposed in the plane of said roller and said roller comprising an applicator for the tape, and retaining means operatively associated with said frame accommodating rotation but preventing longitudinal movement thereof.

8. An adhesive applicator for rotating cores comprising a rotatable applicator frame, a plurality of circumferentially spaced brackets adjustably mounted on said frame for adjustment radially of the axis of frame rotation, a roller journalled on each bracket and disposed generally in a plane radial to the axis of rotation of the frame, and retaining means operatively associated with said frame accommodating rotation but preventing longitudinal movement thereof.

9. An adhesive applicator for rotating cores comprising a rotatable applicator frame, a plurality of circumferentially spaced rollers journalled on said frame and disposed generally in respective planes radial to the axis of rotation of the frame, a support for a roll of adhesive tape mounted on said frame, said support being disposed in the plane of one of said rollers and said one roller comprising an applicator for the tape, and retaining means operatively associated with said frame accommodating rotation but preventing longitudinal movement thereof.

10. An adhesive applicator for rotating cores comprising a fixed tubular bearing, an annular applicator frame journalled on said bearing, a plurality of circumferentially spaced brackets adjustably mounted on said frame for adjustment radially thereof, a roller journalled on each bracket and disposed generally in a respective plane radial to the axis of rotation of the frame, and means mounted on said frame for applying a band of adhesive to a core engaged by said rollers.

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