Aug. 18, 1970 W. H. HERMAN 3,524,539

MULTIPLE PLY WEB WINDING

Original Filed March 28, 1966 2 Sheets-Sheet 1

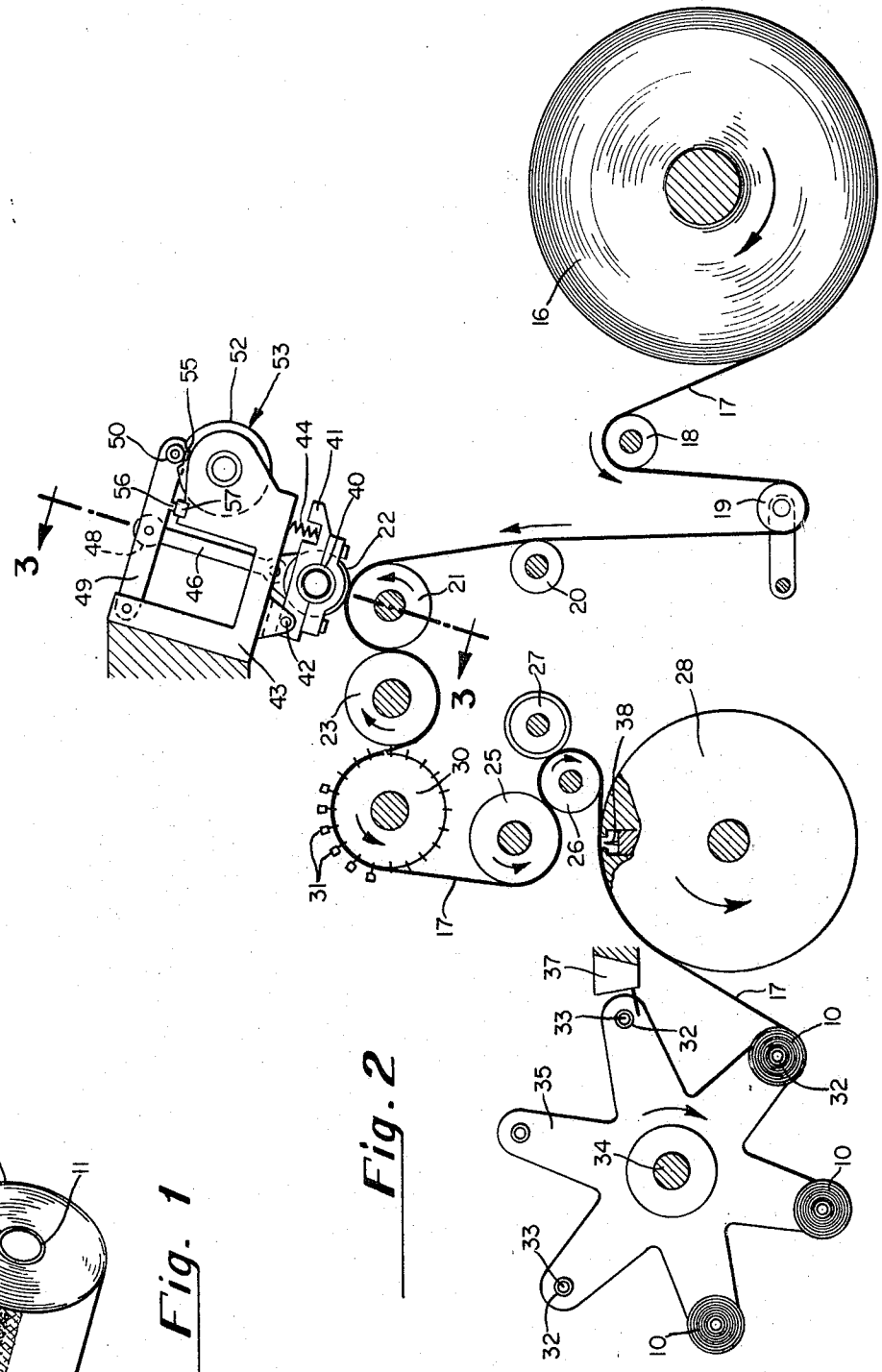


Fig. 2

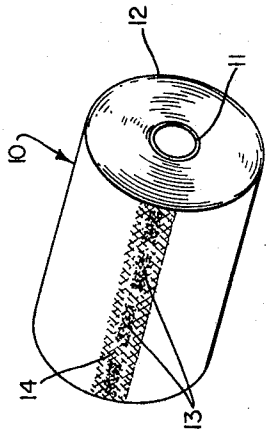


Fig. 1

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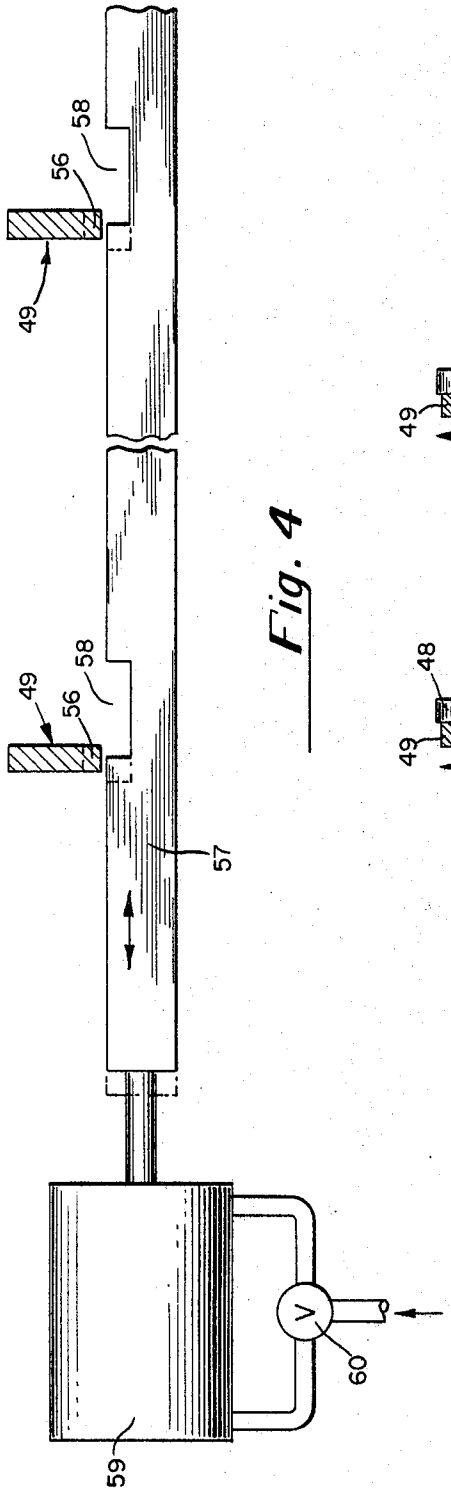
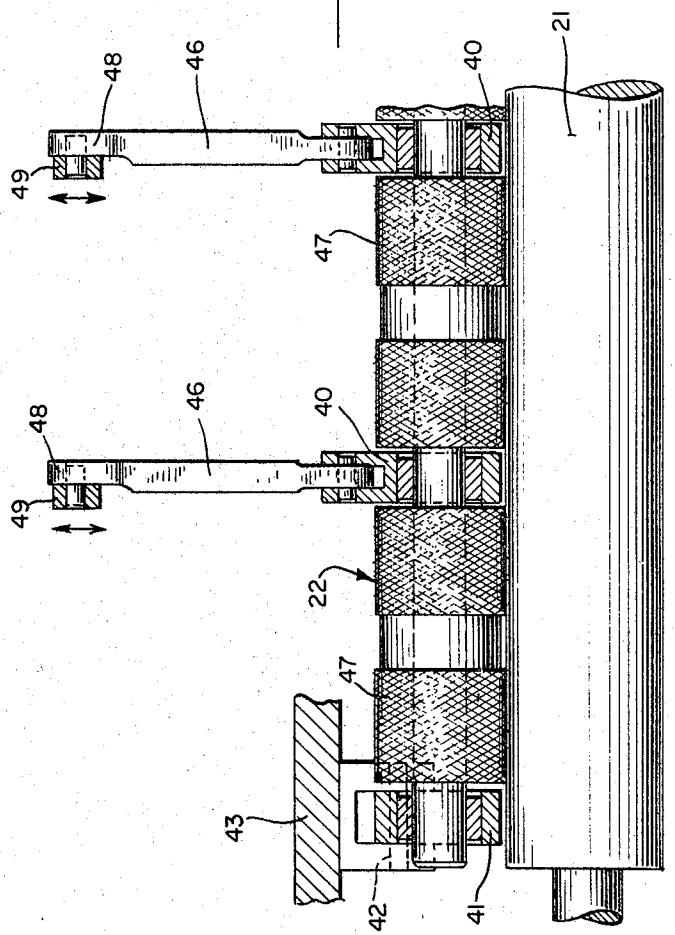


Fig. 4

Fig. 3



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3,524,539

MULTIPLE-PLY WEB WINDING

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Original application Mar. 28, 1966, Ser. No. 538,080, now Patent No. 3,470,052, dated Sept. 30, 1969. Divided and this application Dec. 31, 1968, Ser. No. 801,900
Int. Cl. B65d 85/672
U.S. Cl. 206—58 1 Claim

ABSTRACT OF THE DISCLOSURE

A wound web roll product in which a length of web having two plies generally contacting but being unattached to each other is wound on a hollow cylindrical core, both the end portion of the web adjacent the core having the inner ply adhered to the core, and the end portion of the web on the exterior of the roll adjacent the next succeeding web layer having the inner ply adhered to the next succeeding layer, the outer ply at both ends being physically attached to the inner ply, as by embossing.

This application is a division of U.S. Pat. 3,470,052, issued Sept. 30, 1969, and entitled "Method and Apparatus for Winding a Multiple Ply Web."

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to the art of winding two-ply webs and, more particularly, to a new and improved method and apparatus for preparing the ends of and accomplishing transfer and tail tying of lengths of webs having two-plies which are unattached to each other, and further relates to a product roll formed thereby.

Brief description of the prior art

The winding of roll products in the form of small consumer rolls of web material such as sanitary paper and paper toweling is commonly performed on automatic winding apparatus and often on so-called continuous winders. Such roll products are often placed in transparent wrappers through which sloppy or ineffective securement of the tail of the web to the roll is readily apparent to the customer. The smaller rolls are normally formed by rewinding a large parent or mill roll which is formed by modern high speed paper machinery.

A typical winding setup provides means for drawing a substantially continuous web from a large parent roll and means for feeding it over a rotating bed roll to one of a plurality of mandrels containing cores upon which smaller web rolls are wound. Upon the completion of the winding of one smaller roll, the web is severed, the tail formed thereby is secured to the completed roll, and the advancing free end of the web is attached to a fresh core carried by a rotating mandrel and advanced into winding position adjacent the bed roll. The completed roll is simultaneously moved out of winding position and the core containing the roll is stripped from the mandrel. The webs may be slit into a plurality of webs having lesser widths prior to winding of webs on the cores or the completed web roll or "log" may be cut after winding into a plurality of web rolls of lesser width.

Normally, the tail end of a severed length of web which has been wound is adhered to the last ply of the roll by means of adhesive or some other attachment means. Similarly, the free leading end of the severed web which represents the starting portion of the next length of web to be wound is fed into contact with a core carried on a rapidly rotating mandrel. The web is secured thereto to commence the winding of a second roll. Often adhesive is applied to the core to effect web attachment to the core although other means might be employed.

It is often desirable to form rolls of webs having two or more plies of thin paper web material which plies have a relatively low basis weight and are unattached to each other. These multiple-ply webs can be formed by rewinding thin webs of base tissue stock to form a large parent or mill roll of multiple-ply web material or by unwinding two or more single-ply parent rolls simultaneously on the product roll winder. There have been problems in converting such multiple-ply webs into smaller consumer rolls by normal high speed automatic winding equipment.

These problems generally center around the fact that the several plies of the web are unattached. Thus, when a free end is to be attached or handled such as in the step of transferring the leading end of the web to a new core or the step of tying the tail end of a wound web to a wound roll, the plies tend to separate. In some instances, the means for attaching the plies to a core or to a wound roll are effective only as to one ply and the outermost ply or the other ply remains free. This causes a fouling of the winder or results in an unattractive end product roll having a loose or unwinding tail.

In view of the above difficulties and shortcomings, it is the principal object of the present invention to provide a new and improved method and apparatus for winding multi-ply webs and especially webs having two plies of material unattached to each other.

It is an additional object of the invention to provide a new and improved method and apparatus for preparing end portions of a length of two-ply web to be wound to provide effective transfer and tail tying of a two-ply web in a winding process.

SUMMARY OF THE INVENTION

In accordance with the invention, a web having two plies generally unattached to each other is treated during the process of being converted into smaller consumer rolls so that areas of the web which will be adjacent the severed ends of the lengths of web wound have their plies physically attached to each other. In one embodiment, the web is embossed in these areas to provide after severance an embossed portion extending up to 2 inches or more from the line of severance of the web.

Difficulty has also be experienced in locating the end of a two-ply web and insuring that upon unwinding the roll both plies will be simultaneously grasped by a user. In accordance with the invention, it is an object of the invention to provide a new and improved product roll of two-ply paper web which eliminates the above problem and facilitates the starting of a new roll of two-ply web material.

DESCRIPTION OF THE DRAWINGS

Additional objects and advantages of the invention will become apparent from the following detailed description thereof when read in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of a typical product roll formed in accordance with the invention,

FIG. 2 is an elevation view of one type of apparatus for accomplishing web winding in accordance with the invention,

FIG. 3 is a partial sectional view taken along lines 3—3 of FIG. 2, and

FIG. 4 is a greatly enlarged elevation view illustrating a portion of the apparatus shown in FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIG. 1, a typical product roll **10** of the type sold to consumers is shown. Roll **10** has a core **11** about which is wound a two-ply paper web **12**, one

end of which is adhered to the core **11**, the other end of which is adhered to the exterior of the wound roll by areas **13** of adhesive application upon or beneath the tail end of web **12**. To avoid the problems caused by excess adhesive, adherence in each instance above is accomplished with respect to the innermost ply only; that is, the ply of the two-ply web which is nearest the core at the particular point being secured on the length of web being wound. Web **12** is further embossed in an area **14** at each of its ends as shown at the tail end, to attach two plies of the web **12** together.

FIG. 2 illustrates apparatus for forming rolls such as shown in FIG. 1 from a parent roll **16** of two-ply paper web material **17**. Web **17** is drawn from parent roll **16** and fed over a guide roll **18** and under a dancer roll **19** and upwardly over a bowed expander roll **20**. Dancer roll **19** serves to maintain a predetermined tension in web **17** during the winding process while allowing for slight variation in length and speed and while the web is being treated by expander roll **20**. In this regard, dancer roll **19** is arranged for movement relative to guide roll **18** and expander roll **20**. Expander roll **20** is employed to physically condition the web in a well-known manner so as to reduce the frequency of wrinkles as the web passes through the machine.

Web **17** is then fed between an anvil roll **21** and an associated embossing roll **22** arranged in accordance with the invention, after which it passes under a draw roll **23**, over a perforating roll **30**, under a second guide roll **25**, and over a slitter bed roll **26** which cooperates with a slitter roll **27**. At this point, the web is fed out onto a bed roll **28** and advanced toward one of a plurality of mandrels carried on the turret of an automatic winder.

Perforating roll **30** is employed to create transverse lines of perforations across the traveling web **17** and carries a plurality of perforating shear blades which operate in conjunction with a plurality of adjacent shear plates **31** in a manner well-known to those skilled in the art. If rolls of a product such as toilet tissue or paper toweling are to be formed, the lines of perforations are spaced at regular intervals along the web. In the embodiment shown, web **17** is slit prior to being wound onto cores and slitting is performed by passing it between the slitter bed roll **26** and a cooperating slitter roll **27** carrying a plurality of slitting knives arranged in spaced relation to each other along slitter roll **27** at intervals equal to the desired widths of the resulting webs. The slitter rolls employed may be of any of the well known types commercially employed in paper converting machinery.

Web **17** is fed in partial wrapping engagement over bed roll **28** after being slit into a plurality of webs of lesser width by slitter roll **27** and is further advanced toward a core **32** carried on one of a plurality of rotating mandrels **33** which are carried in revolution about an axis **34** by means of a rotatably mounted turret **35** (schematically shown). Upon the completion of the winding of one roll **10** on a core **32**, turret **35** is indexed by a Geneva cam or other suitable mechanism as is well-known in the art and revolves about axis **34** carrying roll **10** away from the bed roll **28** and a succeeding mandrel **33** having a fresh core mounted thereon is advanced into a pickup position for receiving the free leading end of web **17** for commencing the winding of a new roll.

Although many methods of accomplishing tail tying and transfer are known, one means shown in the embodiment of FIG. 2 represents a brush-type adhesive applicator **37** arranged adjacent a core **32** carried on a mandrel **33** prior to being advanced into the pickup position and adapted to apply a thin layer of adhesive to the core **32** which will secure the free leading end of a web **17** to the core upon contact to commence the winding of a new roll. Upon the completion of the winding of a predetermined length of web on a core **32**, a knife **38** mounted within the bed roll **28** is outwardly advanced through a cam system so that a cutting edge protrudes beyond the surface of bed roll **28** to sever the web at the predetermined spot. Operation of the knife may be performed by a sliding cam mechanism as is well-known in the art and disclosed in U.S. Pat. No. 2,769,600. A brush may be mounted behind the knife and adapted to move outwardly with the knife to press the free leading edge of the web into engagement with the core **32** when the brush passes the pickup position. The tail of the web is then attached to the exterior of the roll by application of adhesive to the exterior of the roll after which the tail end of the web is pressed into contact with the adhesive covered portion. The application of adhesive for tail tying may be accomplished by the apparatus and in the manner described in U.S. Pat. No. 3,096,948.

One of the problems experienced in the past has been that upon advancing the free end of the web **17** toward a fresh core **32**, the two unattached plies of the web **17** would separate, thereby often fouling the winder. Furthermore, upon attempting to secure the tail of the web to the wound roll, the inner ply only would be attached to the roll leaving the outer ply of the two-ply web **17** free, resulting in an unattractive product roll having a loose tail.

In accordance with the invention, by the insertion of rolls such as the anvil roll **21** and an associated embossing roll **22** in the manner illustrated in FIG. 2 to emboss a predetermined area of the web which includes the portion of the web where severance will be performed, it is possible to effect physical attachment of the two plies of web **17** at these widely spaced intermittent portions of the web in order to prevent the disengagement or separation of the two plies of web **17** during tail tying or transfer and after severance. Correspondingly, a feature of the invention is the apparatus employed to accomplish embossing at these spaced apart portions of the web **17** and the manner in which this apparatus is controlled to operate only at the desired portions or areas of the web, that is, in the general area within which severance will occur.

In this regard, the area of a multiple-ply web within which embossing is desired will vary depending on the particular web and type of product involved. With a roll of toilet tissue, upon which a length of web is wound having approximately 500 two-ply sheets which measure about 4.5 inches long, the area of embossing will comprise only a small portion at the beginning and the end of a roll, that is, up to about 2 inches from the severed ends of the wound web.

The nature of the embossed pattern may vary, it being important only to accomplish some physical attachment of the plies of the web to each other in accordance with the invention. This insures easier starting of the unwinding of a roll by a consumer as well as securement of the plies to one another during tail tying and transfer.

As shown in FIGS. 2, 3 and 4, embossing roll **22** is rotatably mounted and supported by journals **40** carried by a supporting assembly **41**. Supporting assembly **41** is pivotably mounted at pivot points **42** on main frame **43** and the opposite end of supporting assembly **41** is movable about pivot point **42**. Bias means such as springs **44** are arranged to press embossing roll **22** against anvil roll **21** or against a web **17** running thereover. Thus, springs **44** exert pressure against supporting assembly **41** and against a portion of main frame **43** to urge supporting assembly **41** and embossing roll **22** in a clockwise direction about pivot point **42** as shown in FIG. 2. The term "bias means" is also intended to include the arrangement of apparatus which, in some embodiments, provides for gravity force to act in pressing roll **22** against roll **21**. Thus, the weight of roll **22** is substantial in some embodiments and, if arranged as in FIG. 2, would be sufficient to accomplish embossing by gravity alone, without the use of springs **44**.

A yoke assembly **46** more clearly shown in FIG. 3 is arranged with connecting arms grasping the shaft of embossing roll **22** in rotation so that upon raising and

lowering yoke assembly **46**, the embossing roll **22** will be lifted into and out of engagement with a web running in partial wrapping engagement over anvil roll **21**. Embossing roll **22**, as can be seen from FIG. 3, is divided into a plurality of smaller embossing sections **47** of lesser width by spaced apart areas to which journaled connecting arms of yoke assembly may be attached. It will be obvious that single continuous embossing roll **22** could also be employed with success.

The uppermost end **48** of yoke assembly **46** is pivotably attached to one or more arms **49**, one end of which is pivotably attached to main winder frame **43**. The opposite end of arms **49** carries a follower wheel **50** which bears upon the camming surface **52** of one or more cams **53** which control the movement of the yoke assembly **46** and determine the operation of embossing roll **22** as will subsequently be described.

At this point, it has been discovered that several embodiments can be employed to control the movement of embossing roll **22** through arms **49** by means of cams **53**. It is possible to design cam **53** so that it will have a relatively long period of rotation equal to the length of time required to wind a predetermined length of web **17** onto a roll **10**. The cam **53** in that instance preferably has a depressed portion **55** at one point on its periphery which at the desired time will be located directly beneath the follower wheel **50** in order to allow the arms **49** to drop and, correspondingly, the embossing roll **22** to contact the web **17** and press it into engagement with the anvil roll **21** to secure together and physically attach the multiple plies of the web **17** within portions of the predetermined area along the length of the web **17**.

It will be apparent that with such an arrangement, if the rolls **10** have web material of substantial length wrapped thereon, the size of cam **53** would become impractically large since the depressed area **55** of the camming surface **52** must have a sufficient length relative to the entire length of the camming surface **52** to allow the accurate timing of the interval during which the yoke assembly **46** and embossing roll **22** are lowered. This is primarily because the accurate timing of this interval has an important effect on the positioning of the embossed area upon the overall length of web **17** and it would be highly undesirable in most products of this type to have an embossed area of undue length or located at positions other than at the extreme ends of the length of web wound.

Alternatively, therefore, a second embodiment is suggested for use in situations where the length of the web **17** to be wound on each roll **10** is substantial. As can be seen from FIG. 2 and more clearly in FIG. 4, arms **49** have an extension **56** downwardly depending therefrom which contact a reciprocably mounted support member **57** passing beneath one or more of arms **49**. Support member **57** has a plurality of recesses **58** therein adapted to receive the extensions **56** during certain portions of the operation of the apparatus. Support member **57** is slideably carried by the main frame **43** of the winder and is attached at one end to the piston of a double action air cylinder **59**. Double action air cylinder **59** is arranged to

be controlled by the operation of bed roll **28** and may be operably connected through a pressure valve **60** and a drive mechanism to the bed roll **28**. In this manner, reciprocation of support member **57** is accomplished after a predetermined number of revolutions of bed roll **28** which bear a direct relationship to the length of web wound on a roll **10**. It will be apparent to one skilled in the art that operation of air cylinder **59** to reciprocably move support member **57** could be controlled by the indexing mechanism of the winder turret assembly with equal success.

In any event, support member **57** is arranged to support the extensions **56** of arms **49** during a substantial portion of the winding of a web roll **10** so that cam **53** may be rotated through at least several revolutions without effecting any lowering or changing of the position of embossing roll **22**. However, during the portion of the winding process wherein embossing is desired, support member **57** is axially moved to a point where extensions **56** of arms **49** drop into recesses **58** of support member **57** and, accordingly, follower wheel **50** is free to follow the contour of the camming surface **52**. In this arrangement, the portion of the total camming surface **52**, which is allotted to the depressed portion **55** thereof, representing the interval during which embossing is desired, is much greater relative to the total length of camming surface **52** employed than in the previous arrangement. Thus, far greater accuracy in achieving positioning of the embossed areas on the web is achieved.

What I claim is:

1. A wound web roll product comprising a hollow cylindrical core, and a length of web wound on said core, said web having two plies generally contacting but being unattached to each other, both the end portion of the said web adjacent said core on the interior of said roll having the inner ply adhered to the core and the end portion of said web on the exterior of said roll adjacent the next succeeding web layer having the inner ply adhered to said next succeeding layer, the outer ply at both ends being physically attached by embossing to said inner ply.

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U.S. Cl. X.R.

206—59; 161—36, 139