# United States Patent [19]

**Mix**

[11] **3,836,090**

[45] **Sept. 17, 1974**


[54] **LONG YARDAGE TAPE CORE ASSEMBLY AND TAPE**


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[52] **U.S. Cl.** ..... **242/68.5,** 242/68, 242/68.7, 242/176

[51] **Int. Cl.** ..... **B65h 17/02**

[58] **Field of Search** ..... 242/68, 68.5, 68.6, 68.7, 242/173, 176



[56] **References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 250,430 | 12/1881 | Engisch et al. | 242/68.5 UX |
| 2,733,020 | 1/1956 | Keyser | 242/68.5 |
| 2,746,696 | 5/1956 | Tierney | 242/173 X |
| 2,840,320 | 6/1958 | Sutor | 242/68 |
| 3,025,015 | 3/1962 | Mix | 242/68.5 |
| 3,322,359 | 5/1967 | Dales et al. | 242/68 |



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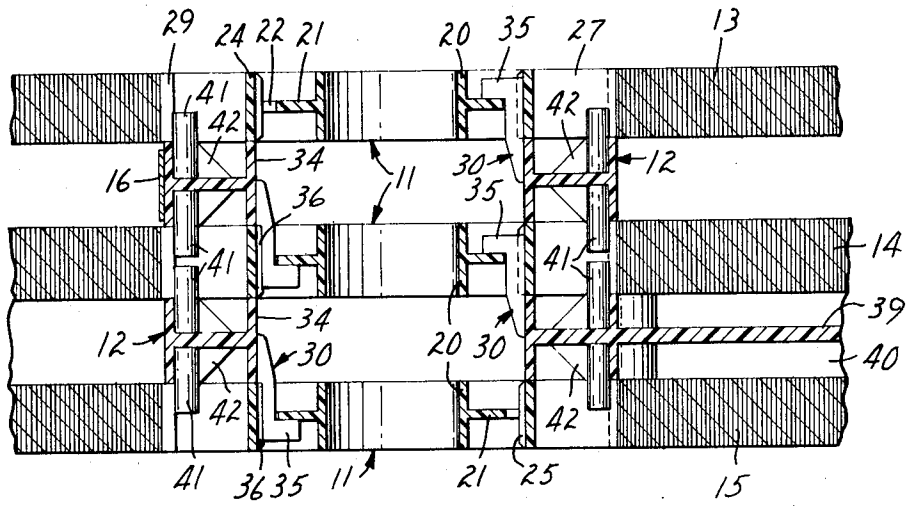
[57] **ABSTRACT**

An assembly for rigidly supporting a plurality of wound rolls of tape spliced together to form a continuous usable long yardage tape supply. The assembly comprises a plurality of tape cores which are placed into the wound rolls of tape and fan-shaped tape support members. The support members are secured between adjacent cores and form transition surfaces for the tape from the inside of the first roll to the outer convolution of the next adjacent roll without slack becoming present in the tape.


**8 Claims, 6 Drawing Figures**



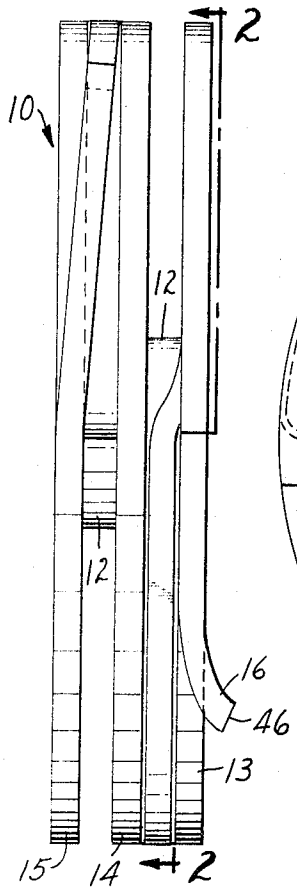



FIG. 1

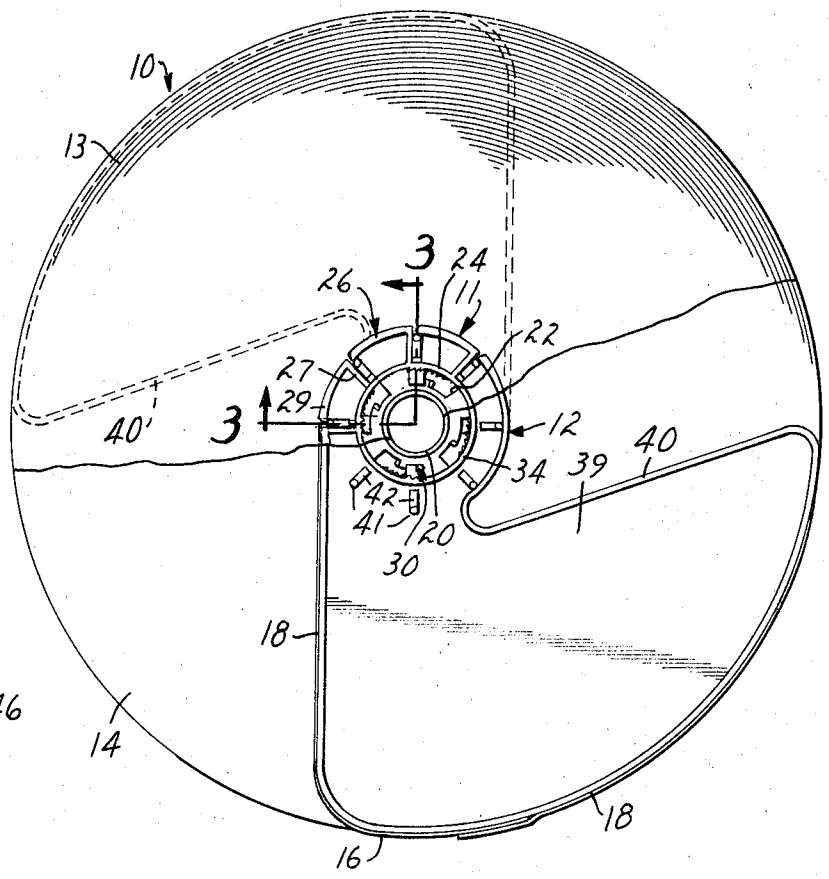



FIG. 2

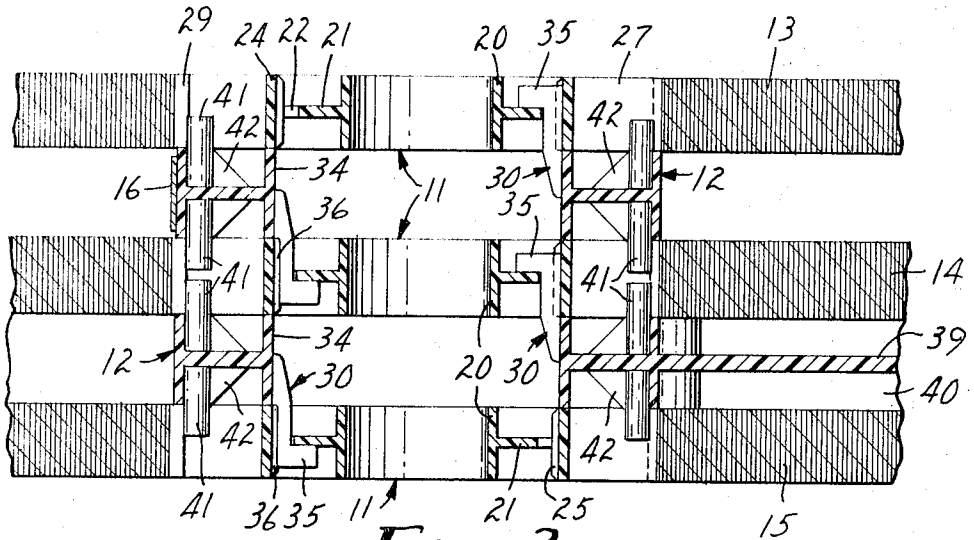



FIG. 3

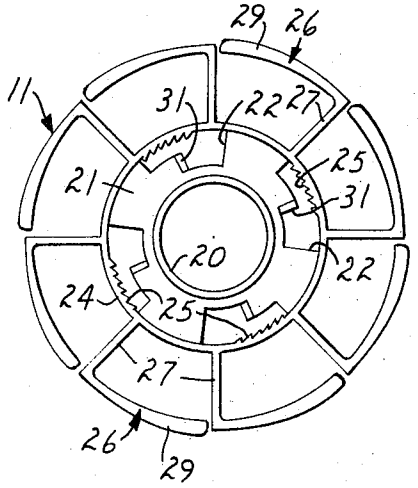



FIG. 4

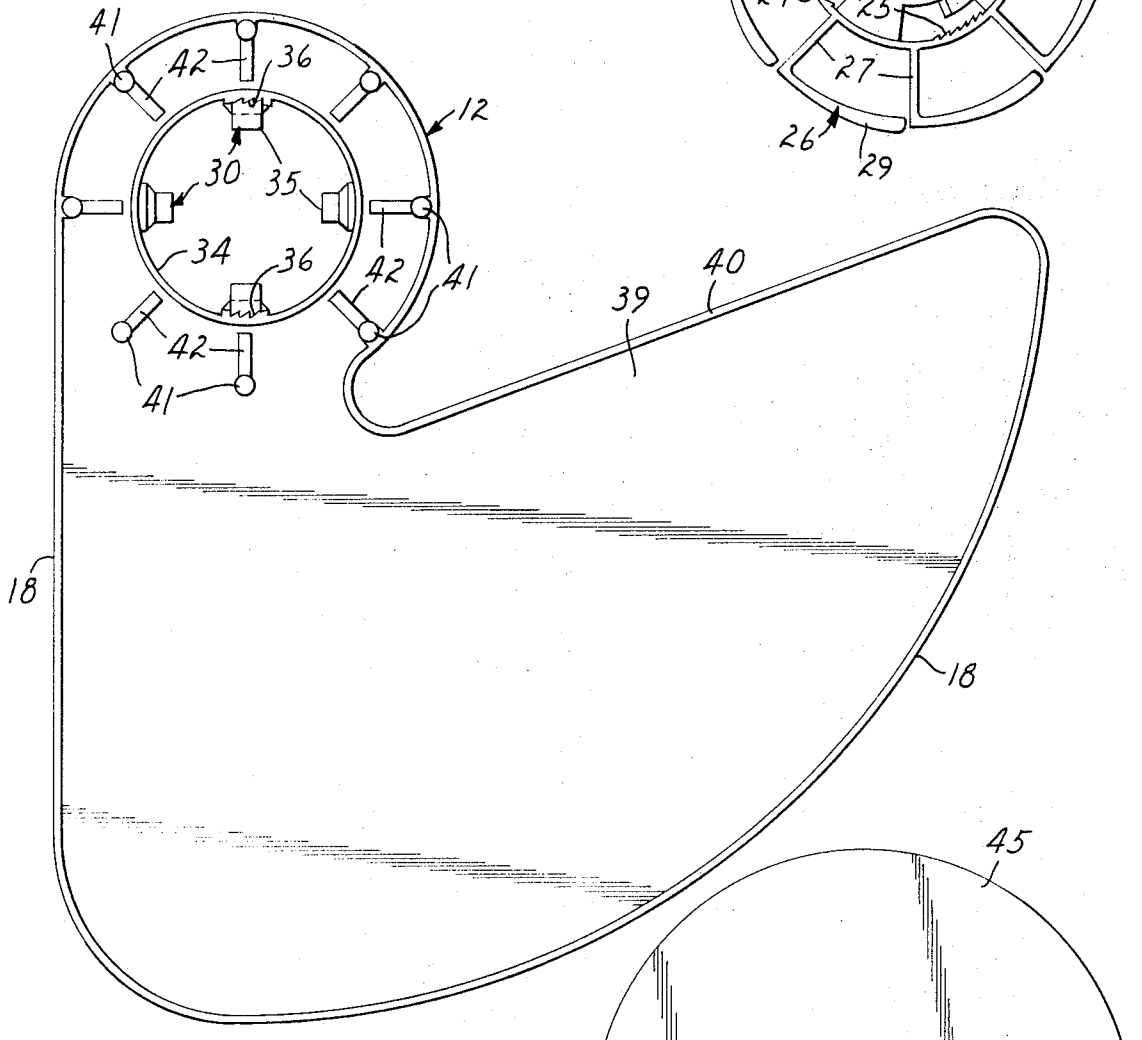



FIG. 5

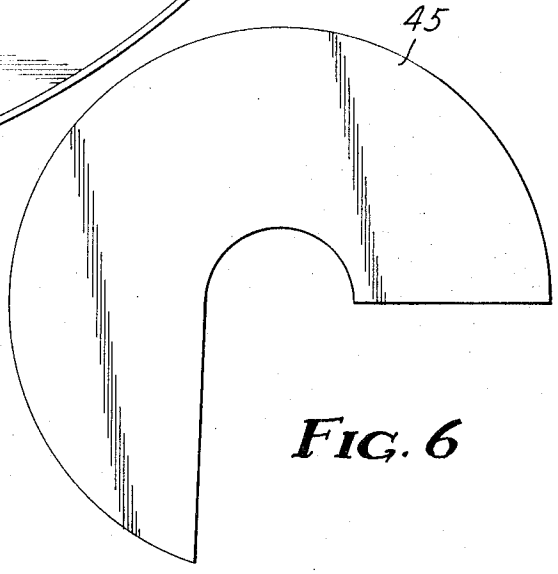



FIG. 6

# LONG YARDAGE TAPE CORE ASSEMBLY AND TAPE

## BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an improved tape core assembly for providing long yardage rolls of a tape material to a customer such as a manufacturer who utilizes significant quantities of tape in a relatively short time.

The present invention provides an assembly such that two or more rolls of wound pressure-sensitive adhesive tape may be joined to form a continuous length of tape so that a long yardage supply package affords tape continuously to a high speed tape applicator for packaging machines or other high speed production taping equipment. If it is necessary that the expensive equipment be slowed in its production due to frequent interruptions to provide a new supply of tape to the machine, such equipment is not being handled to its best advantage. The need for the supply of tapes in long yardages is continuing. Tapes are normally wound into radially wound rolls, i.e., wound about a single axis, in yardage lengths of 700 to 750 yards. Rolls with a diameter larger than about 15 inches are awkward to store and handle as well as to use. Tape rolls in these relatively short lengths can be rapidly used causing frequent interruptions of a manufacturing or packaging machine merely to replenish the tape supply.

2 . Description of the Prior Art

Long yardages of pressure-sensitive adhesive tape have previously been supplied in level wound rolls, namely tape wound in reversely spiral layers on axially elongated cylindrical cores such as shown in U.S. Pat. No. 2,746,696. Level wound rolls however have some disadvantages as concerns the roll of tape being more tightly wound in the center than on the edges and for some tapes such as a filament reinforced tape, the tape tends to unravel during unwinding of one layer over the reversely wound spiral therebeneath.

Other solutions to the problem presented with filament tapes were offered and a long yardage tape core which solved the problem of unravelling of the filaments is shown in U.S. Pat. No. 3,025,015. In this patented structure an eccentric axis on successive rolls of tape presents an unbalanced tape core during the unwinding operation. This presents several obvious problems. Additionally, this type of core requires an additional step in the tape production since rewinding of tape from a first core after slitting onto the core as disclosed in U.S. Pat. No. 3,025,015, makes such a core too costly for most applications.

The long yardage tape core assembly of the present invention is adapted to afford a 2,000 yard continuous tape package, which is assembled after the pre-slit tape is convolutely wound on rolls, hereinafter referred to as "radially wound" to describe a tape web spirally wound upon itself on a common radial plane, from an axis or radii emanating from a single axis. The tape rolls are prepared by removing the cores and inserting new cores and tape support members between rolls which members transfer the tape from the core of one roll to the outer peripheral convolution of a next adjacent roll of radially wound tape. This structure precludes the necessity of rewinding tape after it has been wound from the slitter and by having the tape radially wound it avoids the difficulties experienced with the level wound tape.



## SUMMARY OF THE INVENTION

The present invention is directed to a fabricated long yardage tape support assembly for use with filament tapes. The assembly of the present invention comprises a plurality of axially aligned tape cores having similar hub constructions and each having a tape supporting surface which may be placed within a prewound roll of tape, and tape support members which are secured to the tape cores and define a transition surface for a length of tape joining the innermost convolution of one radially wound roll of tape with the outermost convolution on a next adjacent roll of tape which adjacent roll is supported on a similar core. The tape support member has a surface generally tangential to the tape supporting surface on one core and the surface extends outwardly from one core a distance corresponding to the distance along said tangent to the outer peripheral convolution of the next adjacent roll of tape. Means are provided for locking the cores and tape support members together to provide a rigid assembly. The two basic members forming this assembly permit a continuous progression of tape cores to construct a tape package having at least 2,000 yards of tape in a continuous package. Such a package of ½ inch wide filament tape is compact at 11 to 15 inches in diameter and approximately 2¾ inches in width.

## BRIEF DESCRIPTION OF THE DRAWING

The accompanying drawing illustrates a long yardage tape package having a tape support assembly constructed according to the present invention and discloses the several parts of the assembly as will be more fully described hereinafter with reference to the drawing wherein:

FIG. **1** is an elevational view of the long yardage tape package;

FIG. **2** is a sectional view taken along the lines **2—2** of FIG. **1**;

FIG. **3** is an enlarged sectional view taken approximately along the lines **3—3** of FIG. **2**;

FIG. **4** is an end view of a core forming a part of the package;

FIG. **5** is an end view of a tape support member forming another part of the package; and

FIG. **6** is a reduced size end view of a filler member of the package.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

The long yardage tape support assembly of the present invention is utilized in forming a tape package generally designated **10**, comprises a plurality of axially aligned tape cores **11** and a number of tape support members **12** which are positioned between cores. In the package **10**, three rolls **13, 14, 15** of tape **16** are formed into one package. These tape rolls may typically comprise pressure-sensitive adhesive tape **15**, one-half inch in width and 720 yards in length. The tape may be a filament reinforced tape and as presented in the package of the present invention make up a continuous one-half inch by 2,160 yard package.

The package is constructed by removing the cores of the pre-slit radially wound rolls **13, 14** and **15** of tape,

by withdrawing one or two of the inside wraps of tape from the roll, and then placing a core **11** within the center of the roll. A tape support member **12** is then placed adjacent the roll **13** and is secured to the tape core. The tape support member has a transition surface **18** upon which the tape pulled from the inside of the roll **13** is placed to splice it with the tape on the outer convolution of the second roll **14.** The surface **18** forms a transition surface for the tape from the end of the first roll **13** around the surface **18** to the next outermost convolution of the next roll without any slack developing in the tape as it is unwound. The transition surface **18** has an axial width greater than the axial dimension of the tape or the tape supporting surface of a core **11.** In the illustrated embodiment with half-inch wide tape, the transition surface **18** on the tape support member **12** is five-eighths of an inch in axial dimension. The next roll of tape **14** is then placed with the core **11** thereof in axial alignment with the core of the roll **13** and against the tape support member to which it is locked. Another tape support member **12** is secured to the second core **11** and the third roll of tape with its core **11** is positioned in axial alignment to complete the package. The tape from the inside wraps of the first and second cores are spliced with the outside wraps on the second and third rolls of tape respectively, by an underlap splice, as illustrated in FIG. **2,** or other splicing process adaptable to the requirements of the customer/manufacturer.

The tape cores **11,** see FIG. **4,** comprise a cylindrical central hub **20** surrounded by a radially extending web **21.** The web **21** is provided with a plurality of circumferentially spaced key-hole type slots **22.** A cylindrical flange **24** surrounds the outer peripheral edge of the web **21** and the slots **22.** The inner cylindrical surface of the flange **24** adjacent the slots **22** is formed with ratchet teeth **25** which pitch away from the large end of the slot, i.e., the beveled edge of each tooth slopes from the cylindrical surface away from the large end of the slot and other edge has a generally radial position. Supported from and surrounding the outer cylindrical surface of the flange **24** is a tape supporting surface. The tape supporting surface is formed by a plurality of members **26** affording a discontinuous cylindrical surface with each discontinuity being adapted such that at least a portion thereof is radially movable to engage and suport the inner convolution of a wound roll of tape. The members **26** comprise a radially extending support **27** and a cantilever supported circumferentially extending arm **29** which has an increased radial dimension at its free end defining a cam engaging inner surface opposite the tape support surface thereof.

The slots **22** formed in the web **21** of the core **11** accept a locking member **30** from the tape support member **12.** Adjacent the enlarged portion of the slot **22** is a beveled surface **31** which will direct the head or short leg of the locking member **30** onto the surface of the web **21,** drawing the tape support member **12** and the hub **11** in juxtaposed position.

The tape support member **12,** as shown in FIGS. **3** and **5,** is formed with a circular flange **34** on the inner peripheral edge of which are positioned four locking members **30.** The diametrically opposed locking members extend in similar directions and in a direction opposite the other set of locking members. The locking members **30** are L-shaped as best shown in FIG. **3** and extend from the flange **34** in an axial direction. On the free end of the locking members **30** are heads **35** which extend through the slots **22** and radially projecting axially extending ribs **36** are formed on the outer radial surface to cooperate with the teeth **25** to hold the parts together. The heads **35** of the locking members **30** engage the side of the webs **21** axially opposite the tape support member **12** and the teeth **36** engage the teeth **25** on the inner cylindrical surface of the flange **24** after insertion of the members **30** through the slots **22** and relative rotation of the parts moving the heads **35** over the beveled surfaces **31.** Surrounding the cylindrical flange **34** is a web **39** which supports an outer peripheral flange **40.** The web **39** has a fan shape. The portion of the web surrounding the cylindrical flange **34** supports on each side a plurality of circumferentially spaced and axially extending parallel rods **41.** Each rod on each axial side of the web **39** is reinforced with a gusset plate **42.** The rods **41** are adapted to slide axially into the adjacent cores **11** beneath the arms **29** forming the discontinuities of the tape support surface of the cores. Upon relative rotation then of the tape support member **12** relative to the core **11** the rods **41** will urge the arms **29** radially outward into engagement with the inner convolution of the roll of tape.

The outer periphery of the flange **40** of the tape support member **12** defines the transition surface **18** as hereinbefore recited. This surface **18** extends tangential to the arcuate portion of flange **40** surrounding the flange **34** and is thus tangential to the tape supporting surface of the core **11** as defined by the outer cylindrical surfaces of each of the members **26.** The tangential surface then joins an arcuate surface having a center coaxial with the center of the flange **34** and of the adjacent cores **11** to position the arcuate surface adjacent the outer convolution of a roll of tape, thus letting a length of tape join to the inner convolution on one roll of tape and extend therefrom along the surface **18** and onto the outer convolution of the next adjacent roll of the tape.

In assembling a tape package **10** according to the present invention the inner cores of the pre-slit radially wound rolls are removed and the inside wrap or two of tape is pulled out to make a splice to the adjoining roll. A core **11** is inserted into the center of the wound roll. A tape support member **12** is then placed in position to insert the locking members **30** through the openings **22** in the web **21** of the core **11.** The tape support member is then rotated through a slight angle to allow the ribs **36** to engage the ratchet teeth **25** on the inner cylindrical surface of the flange **24.** The rods **41** simultaneously urge the arms **29** into firm supporting engagement with the tape roll **13.** A fill or packing member **45,** as shown in FIG. **6** and which may be formed of ⅝ inch corrugated paper, is then placed about the tape support member **12** to form a substantially complete supporting surface above the first roll of tape **13.** The next roll of tape **14,** with a length of tape withdrawn from the center of the roll **13** and a core **11** inserted into the roll **14,** is placed on the first support member **12.** The roll **14** and the core is then rotated and the second set of locking members **30** on the tape support member **12** secure the core to the first tape support member **12.** The outer tape convolution is then unwound and smoothly and evenly placed over the surface **18** to join the tape length from the first roll **13** of tape. A second tape support member **12** is then locked to the core **11** of the second roll **14** of tape. The inner wrap of tape is placed

along the tape transition surface **18** of the second tape support member. A packing member **45** is placed on the second roll **14** and the third roll **15** of tape **16** is placed upon the package. This roll and core are rotated to lock the third core **11** to the second tape support member **12.** The outer convolution is unwound and the end is placed over the end of tape from the second roll in another underlap splice on the transition surface **18** to join the second tape roll **14** and this third roll **15.** The three roll package is then completed. Packages of a greater number of rolls can be formed by continuing to add the support members and rolls of tape.

The customer receiving the package can place the cores **11** on a support shaft. The packing members will be removed and the tape can be unwound smoothly and continuously from the entire package by withdrawing an edge **46** on the outer convoluted surface of the roll **13.** The underlap splices permit the tape **16** from one roll to lift the end of the tape from the second roll and peel it off the transition surface **18.** Since the splices are disposed on the surface **18** the adhesive is not contaminated. The tape at the splice is usable in the tape applications and it is unnecessary, except in some specific applications, to cut the splice away. The entire length of tape is thus considered to be usable and no interruption in the tape feed needs to be made.

The cores **11** and support members **12** can be molded and a suitable material is medium impact polystyrene.

Having disclosed the present invention with reference to the preferred embodiment shown in the accompanying drawing, it is understood that structural modifications may be made without departing from the spirit of the invention as set forth in the appended claims.

What is claimed is:

**1.** A fabricated long yardage tape support assembly comprising:

a plurality of axially aligned tape cores having similar hub constructions and a substantially cylindrical tape supporting surface for supporting a roll of convolutely wound tape, and

tape support means disposed between and in fixed relationship with adjacent ones of said cores for forming a transition surface for a length of tape which surface is generally tangential to said tape supporting surface of one core and extends outwardly from said one core to allow a said length of tape to join the outer convolution of a roll of tape on a next adjacent tape core.

**2.** A tape support assembly according to claim **1** wherein said cores and tape support means are fixed together by locking means provided for locking said cores and tape support means together in a rigid assembly.

**3.** A tape support assembly according to claim **2** wherein said locking means affords adjustment of position of the individual tape support means relative to said cores for balancing an assembly.

**4.** A tape support assembly according to claim **1** wherein said transition surface has an axial width greater than the axial dimension of said tape supporting surface of said cores.

**5.** A fabricated long yardage tape package comprising:

a plurality of rolls of radially wound tape with an inner wound portion withdrawn,

a plurality of axially aligned tape cores having a substantially cylindrical tape supporting surface inserted in said rolls of tape for supporting the roll of tape, and

tape support means disposed between and in fixed relationship with adjacent ones of said cores for forming a transition surface for a length of tape joining the inner wound portion of one roll to the outer convolution of a next adjacent roll of tape, said surface being generally tangential to said tape supporting surface of one core and extending outwardly from said one core to the outer radial convolution of said next adjacent roll of tape to allow said length of tape to join the outer convolution of said next adjacent roll of tape on a next adjacent core to define a continuous length of tape in said rolls.

**6.** A tape package according to claim **5** wherein said cores and tape support means are individual members fixed together by locking means for locking said individual cores and tape support means together in a rigid assembly.

**7.** A tape package according to claim **6** wherein said transition surface has an axial width greater than the axial dimension of said tape and said surface is smooth and continuous to the outer periphery of said rolls of tape.

**8.** A tape package according to claim **5** wherein said transition surface has an axial width greater than the axial dimension of said tape supporting surface of said tape and said cores.

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