Nov. 15, 1966 N. A. KNIGHT ET AL 3,285,412

TUBE YARN SHIPPER

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Fig. 1.

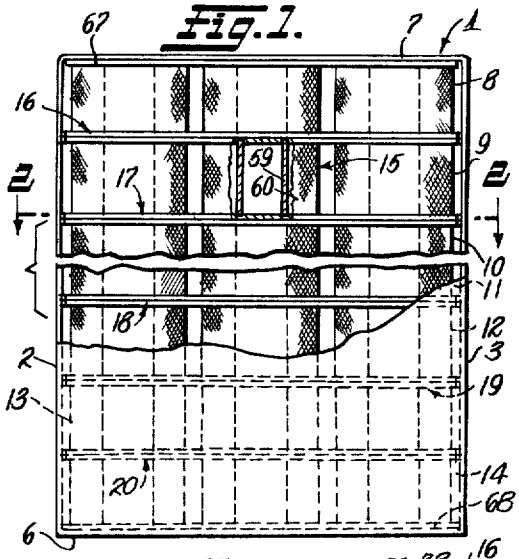


Fig. 2.

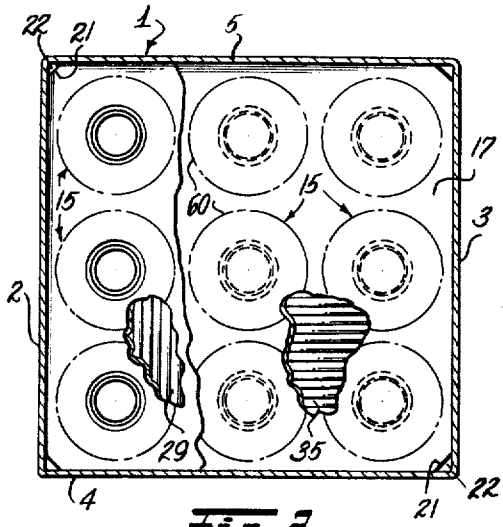


Fig. 4.

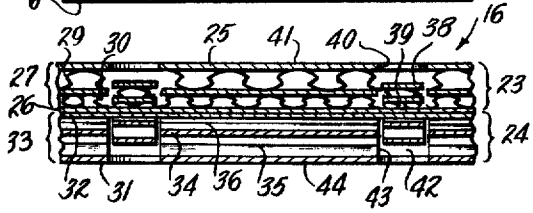


Fig. 6.

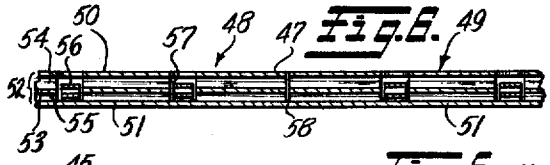
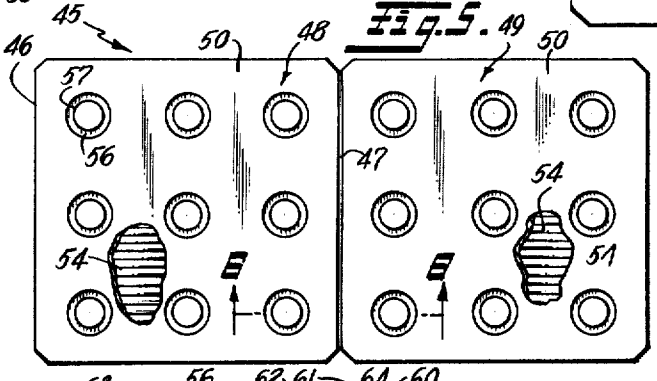


Fig. 5.



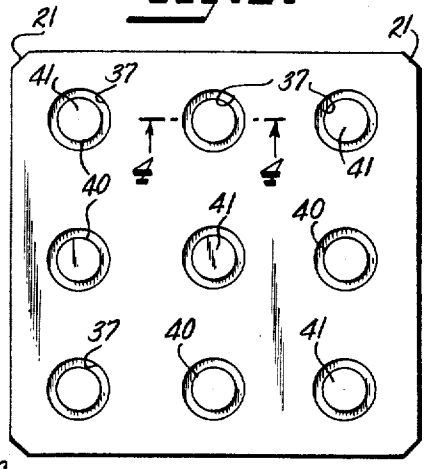


Fig. 3.

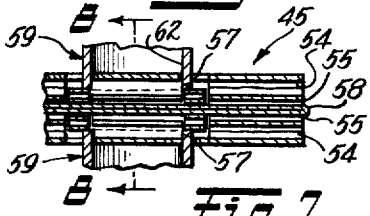
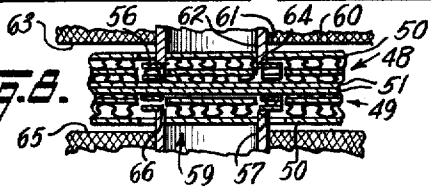


Fig. 7.

Fig. 8.



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TUBE YARN SHIPPER

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Fig. 9.

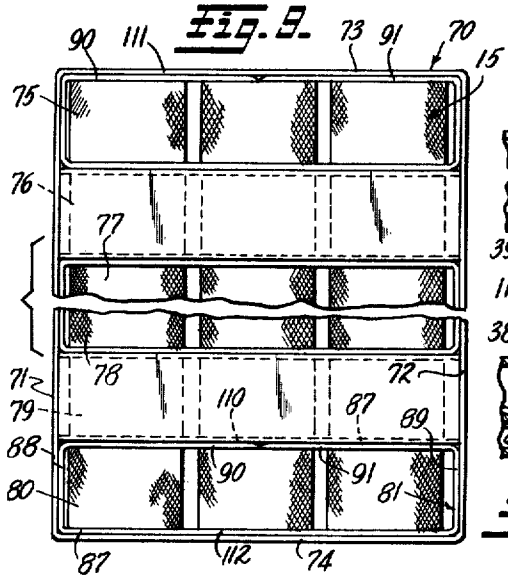


Fig. 13.

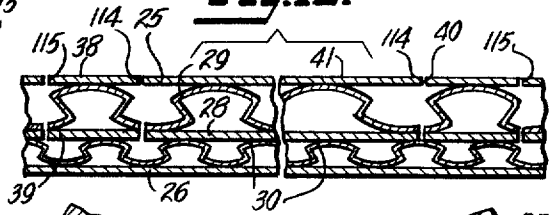
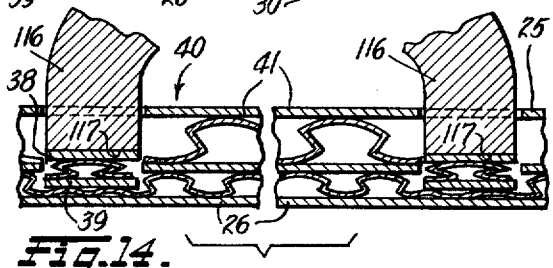


Fig. 14.



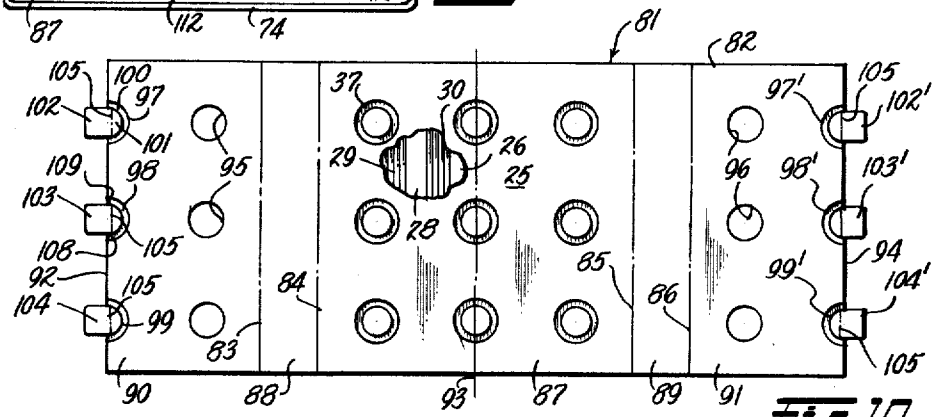


Fig. 10.

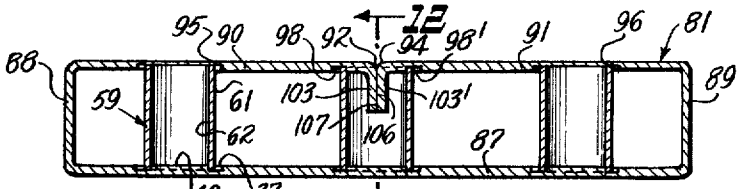


Fig. 11.

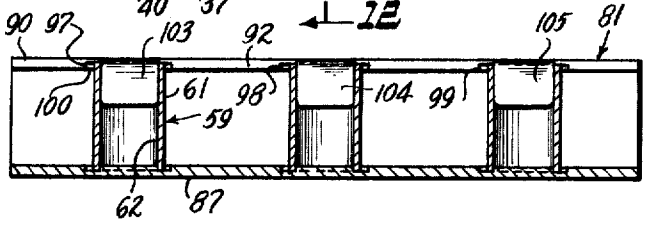


Fig. 12.

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United States Patent Office 3,285,412 Patented Nov. 15, 1966

3,285,412

TUBE YARN SHIPPER

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Filed Aug. 23, 1965, Ser. No. 481,595
7 Claims. (Cl. 206—65)

This invention relates generally to a container for packaging yarn wound on tubes, and more particularly to a container having improved pads which support and retain the yarn tubes during storing and shipping.

More particularly, the invention relates to improved pads for a yarn tube shipping container, the improved pads for retaining the yarn tubes in predetermined spaced relation in each tier, serving as dividers for the successive tiers of yarn tubes to prevent sifting of dust and dirt from one tier to the next, and also being of such construction that the shipping container exhibits remarkable transverse strength so that the container can be handled with a clamp-type lift truck without regard to the orientation of the container.

As is well known, most yarn is wound on bobbins, cones, and tubes, to facilitate handling and use. During the storing and shipping of such yarn tubes, they must be retained so as to prevent rubbing against each other or against the walls of the carton in which a plurality of the yarn tubes are packed. Because of the great number of yarn tubes which must be stored and shipped, it is of course important that the container for packing the yarn tubes not only adequately protects the yarn but is also inexpensive and of light weight to maintain low shipping and handling costs.

In addition to damage caused to the yarn by rubbing of one tube of yarn against another during shipment, it has been found that substantial damage occurs by the sifting of dirt and dust through the several tiers of the yarn containers. Such dust and dirt frequently causes the outer layer of yarn on each yarn tube to become soiled with consequent waste of yarn.

It is somewhat common in the industry to handle yarn cartons with a clamp type lift truck with lifting jaws that close on the opposite sides of the yarn carton to clamp the carton therebetween. With the prior yarn containers, it was necessary that the cartons be oriented in a particular direction so that the same sides of each container were always engaged by the jaws of the lift truck. This was necessitated by the arrangement of the pads within the container wherein the corrugations of each pad extended in the same direction to provide excellent transverse strength in a direction parallel with the corrugations but extremely poor transverse strength in a direction perpendicular to the corrugations.

Applicant has solved the problem of this dilemma which frequently required manual movement of containers to a position where the lift truck could be maneuvered to engage the container in the direction with the greater transverse strength. Such increased transverse strength in both directions is uniquely accomplished by the arrangement of the corrugations of the laminae of each pad so that there are an equal number of layers of corrugated material with the corrugations parallel to a first pair of opposite sides of the container and also the same number of corrugations parallel with the other pair of opposite sides. Such an arrangement permits clamping the lift truck jaws onto either of the opposite pairs of sides of the container without danger to transversely crushing the container. This is indeed significant since the need to orient the container with its sides facing in any particular direction is eliminated.

Damage to the yarn during shipping is uniquely prevented with applicant's container construction by providing

at least one unperforated layer of protective material in the pad between each tier of yarn tubes. The unperforated layer is uniquely obtained by providing concentric slits in the layers of the pad, and crushing down the material between the slits to provide a seat for the ends of the yarn tube. Since the slit extends only partially through each pad, the absence of sifting of dust and dirt from one tier onto the yarn of a lower tier is positively assured. In addition, the uncrushed central portion within the inner slit extends above the crushed annular portion to be received in the open ends of the tubes. With this arrangement, the tubes are positively retained in predetermined spaced relation in each tier and hence, damage due to rubbing of yarn tubes against each other and sifting of dust and dirt from one tier to another, except at the edges of each pad, is eliminated so that damage to the yarn is completely avoided.

Frequently, the user of the yarn has occasion to transport one complete tier of yarn to convenient locations within the factory where the yarn is used. By virtue of the wrapper arrangement of one embodiment of this invention, a complete tier of yarn can be easily removed from its container and moved to any convenient location while retaining the yarn tubes in spaced relation relative to the other tubes of the same tier while also preventing rubbing and dirt sifting during such movement. This same embodiment also has the advantage previously discussed wherein excellent transverse strength in both directions perpendicular to adjacent sides of the box is also provided, but in a slightly different manner.

Accordingly, an object of this invention is an improved yarn tube container with an improved pad arrangement to separate the tiers of yarn tubes and also to retain the tubes of each tier against movement relative to each other during storage and shipment.

A further object is a yarn tube container having pads uniquely formed to engage the inner surfaces of the openings in each tube to retain the tubes of each tier spaced from each other and from the walls of the container to prevent rubbing which may damage the yarn.

A further object is a yarn container having an improved pad arrangement in which the corrugations of the layers of the several pads extend in criss-cross fashion to provide good transverse strength of the container in both horizontal directions relative to the sides of the box.

A still further object is a yarn container having pads in the form of wrappers that extend around the yarn tubes of each tier to facilitate handling of a tier of yarn, and being so arranged that the transverse strength of the container in both horizontal directions relative to the sides of the container is extremely good.

A still further and most significant object is a yarn container of inexpensive construction and light weight which adequately protects the tubes of yarn packed therein from rubbing, scuffing and sifting of dirt and dust within the container.

In order that the manner in which the foregoing and other objects are attained in accordance with the invention can be understood in detail, particularly advantageous embodiments of the invention will be described with reference to the accompanying drawings, which form a part of this specification, and wherein:

FIG. 1 is a front elevational view of a container for yarn wound on tubes, with portions of the container wall removed for clarity;

FIG. 2 is a broken sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is a plan view of one embodiment of a yarn tube support pad in accordance with this invention;

FIG. 4 is an enlarged partial sectional view taken along line 4—4 of FIG. 3;

FIG. 5 is a reduced size plan view showing a second embodiment of a support pad for yarn tubes, prior to folding of the support pad;

FIG. 6 is an enlarged view in section taken along line 6—6 of FIG. 5;

FIG. 7 is a sectional view of the support pad of FIGS. 5 and 6 showing the pad folded upon itself;

FIG. 8 is a sectional view taken along line 8—8 of FIG. 7;

FIG. 9 is a front elevational view of a second container for yarn wound on tubes, in accordance with this invention;

FIG. 10 is a top plan view of an unfolded yarn tube wrapper used with the container of FIG. 9;

FIG. 11 is an enlarged view in front elevation of the yarn tube wrapper of FIG. 10, with the tube wrapper in folded position;

FIG. 12 is a sectional view taken along line 12—12 of FIG. 11;

FIG. 13 is an enlarged elevational view in section of a support pad showing the slitting of several layers of the pad material as the first step in the forming of the slit-score retaining annulus for a tube end;

FIG. 14 shows the crushing of the annulus downwardly to provide a sharp edged annular recess from the slitted sheet illustrated in FIG. 13.

Referring now to the drawings in detail and particularly to FIGS. 1 and 2, there is shown a first embodiment of a container for yarn tubes in accordance with this invention. As shown, container **1** includes a first pair of rectangular side walls **2** and **3**, and a second pair of rectangular side walls **4** and **5** connected to the respective end edges of side walls **2** and **3**, side walls **2–5** forming the side wall structure of the container. Fixed to the bottom edges of side walls **2–5** is a bottom end closure in the form of a square end wall **6**. At the upper end of panels **2–5** is a top end closure in the form of a square top wall **7**. The several walls **2–7** of container **1** are each formed from conventional carton material which may be corrugated paperboard.

Within the container are a plurality of tiers **8–14** (only several of which are shown in FIG. 1) of yarn tubes **15**, with yarn wound on the tubes. As shown in FIG. 2, each tier contains nine yarn tubes **15** and the yarn tubes of each tier are separated from the yarn tubes of adjacent tiers by a plurality of horizontal support pads **16–20**. As shown in FIG. 2, each support pad has a square outline and the side edges of each pad are in close fitting relation to the inner surfaces of side walls **2–5** of container **1**. Each corner of each of the support pads is cut off as at **21** to provide a triangular space at each corner to facilitate inserting the support pads in the container and to provide passages **22** for ventilation between the several tiers of the container.

A first embodiment of a support pad **16** is shown in FIGS. 2 and 4. As shown in FIG. 4, the support pad is comprised of a first or upper sheet **23** of multilayer paperboard and a second or lower sheet **24** also of multilayer paperboard. Upper sheet **23** includes a first surface layer **25**, a second surface layer **26**, and an inside corrugated layer **27** comprised of a center layer **28** sandwiched between corrugated layers **29** and **30**. Layers **25**, **26** and **28** are each of dense fibrous material such as kraft paper. Layers **29** and **30** are each of corrugated material of the type commonly used in corrugated paperboard. It is to be noted that the vertical height between layer **25** and layer **28** is greater than the vertical height between layer **26** and layer **28**, for a purpose which will subsequently be described in detail. The several layers **25–30** are adhesively secured to each other in the conventional manner.

Second sheet **24** is of similar construction to first sheet **23** and includes a first surface layer **31**, a second surface layer **32**, and an inner layer **33** sandwiched between layers **31** and **32**. Inner layer **33** is comprised

of a central layer **34** between corrugated layers **35** and **36**. It is to be noted with particularity that corrugated layers **29** and **30** of first sheet **23** each have their corrugations extending perpendicular to the direction of the corrugations of corrugated layers **35** and **36** of second sheet **24**. The exposed faces of second surface layers **26** and **32** of sheets **23** and **24**, respectively, are in engagement with each other and are adhesively secured together to provide the laminated support pad **16** of FIGS. 3 and 4.

As shown in FIG. 3, sheet **23** is provided with three rows of annular depressions **37** with three such depressions in each row and with the rows spaced the same distance as the depressions in each row. The depressions are formed, in a manner which will subsequently be described in more detail, by first circularly slitting both the first surface layer **25** and inner layer **27** of first sheet **23** to provide annuli **38** and **39** which are pressed into the material of the inner layer. During such pressing, a central cylindrical portion **40** within each annular depression remains undisturbed so that circular face **41** within the confines of each depression remains in the same elevation as the surface of sheet **25**.

Second sheet **24** is similarly provided with annular depressions **42** identical with and vertically aligned with depression **37** of first sheet **23**. The depressions in second sheet **24** are formed before the first and second sheets are adhesively joined and in a manner identical to the forming of depressions **37**, to provide on the second sheet a plurality of cylindrical portions **43** identical to cylindrical portions **40** and with circular faces **44** coplanar with the exposed surface of surface layer **31**.

FIGS. 5–8 show a second embodiment of a support pad for container **1**. As illustrated in FIGS. 5–7, support pad **45** is formed from a blank **46** of corrugated paperboard provided with a transverse slit **47** extending partially through the material of the blank to divide the blank into a first sheet **48** and a second sheet **49** of the same size as first sheet **48**. Each of sheets **48** and **49** has a first surface layer **50**, a second surface layer **51**, and an inner layer **52** sandwiched between surface layers **50** and **51**. Inner layer **52** is comprised of a central layer **53** sandwiched between corrugated layers **54** and **55**. Surface layers **50** and **51** and central layer **53** are each of dense fibrous material such as kraft paper. Sheets **48** and **49** are each provided with annular depressions **56** identical with annular depressions **37** to provide a cylindrical portion **57** within each of the annular depressions.

Slit **47** extends through all the layers of blank **46** except surface layer **51** and it is thus apparent that surface layer **51** of second sheet **49** is a continuation of surface layer **51** of first sheet **48** and sheets **48** and **49** are joined together at a hinge **58** provided by the material of sheet **51** adjacent slit **47**. The several annular depressions **56** of each sheet are so arranged that folding along hinge **58** provides a support pad **45** with the axes of annular depressions **56** and cylindrical portions **57** vertically aligned with each other and facing outwardly as shown in FIG. 7. With reference to FIGS. 7 and 8, it is apparent that the corrugations of corrugated layers **54** and **55** of sheets **48** and **49** are all parallel, so that, in this embodiment, the corrugations of second sheet **49** are parallel with the corrugations of first sheet **48**.

Yarn tube **15** includes a core **59** with yarn **60** wound thereon. As shown in FIGS. 1, 7 and 8, core **59** is a tube having a side wall of uniform diameter and thickness with an outer surface **61** on which yarn is wound and an inner surface **62**. The ends of core **59** are each perpendicular to the axis of its side wall. As shown in FIG. 8, yarn is wound on core **59** in the form of a cylinder **60** with a lower flat surface **63** of the yarn cylinder parallel with and spaced from the lower end **64** of a core **59** and with the flat upper surface **65** of the yarn cylinder similarly spaced from the upper end **66** of a core **59**. The dis-

tance that surfaces 63 and 65 are spaced from the respective ends 64 and 66 of core 59 is approximately equal to the thickness of sheets 48 or 49 to positively assure that surfaces 63 and 65 of yarn cylinder 60 are spaced from outer surface layers 50 of support pad 45 when yarn tubes 15 are positioned on the support pad. Such spacing is indeed essential to avoid the possibility of scuffing and chafing of the yarn cylinder against the surfaces of the support pad, which scuffing could easily cause a thread of the yarn to become weakened or broken.

Either pads 16 or pads 45 may be used between the tiers of yarn tubes 15 in container 1. In the following explanation, the relationship between yarn tubes 15 and pads 45 will be set forth in detail. However, it is to be understood that the relationships are the same for both pads 16 and 45 except where differences are specifically set forth.

With reference to tier 9 of FIG. 1, it is apparent that the surface of each yarn cylinder 60 is maintained in spaced apart relation relative to the adjacent yarn cylinders in each tier. This arrangement precludes the possibility of rubbing and scuffing of the yarn of the yarn tubes against each other which could damage the threads of the yarn. The annular depressions 56 of support pad 45 are so dimensioned that cylindrical portions 57 are in close fitting engagement with inner surface 62 of a core 59 and the ends of each tube seat in the aligned annular depressions 56 of adjacent support pads. Since at least layer 51 of each of sheets 48 and 49 is not cut during the formation of the annular depressions, each core 59 is prevented from axial movement and is securely held in predetermined position by cylindrical portions 57 which extend into the opposite ends of the cores. Thus, the proper spacing between yarn tubes of each tier is maintained and all exposed faces of yarn cylinder 60 of each yarn tube are protected by insuring against scuffing or rubbing of the yarn tubes against each other, and against the material of the container or support pads. With reference again to FIG. 8, it may be observed that the wall thickness of core 59 is substantially less than the width of annular depression 56 to provide sufficient clearance for easy positioning of a core in one of the annual depressions.

As previously explained, either support pad 16 or support pad 45 can be used with container 1 at the positions shown for support pads 16–20 of FIG. 1. When a support pad 16 is used, the orientation of the support pad is not critical since corrugated layers 29 and 30 extend in a horizontal direction perpendicular to the direction in which corrugated layers 35 and 36 extend. Since a corrugated sheet is extremely strong in a direction parallel with its corrugations, it is apparent that excellent transverse strength in a direction perpendicular to side walls 4 and 5 as well as perpendicular to side walls 2 and 3 of container 1 is obtained. Since the peripheral edges of each pad lie closely adjacent the inner surface of walls 2–5 of the container, the side walls are deflected only a sufficient amount to engage the side edges of the pads when a fork lift truck with clamp type jaws engages either parallel pair of sides of the container. It is also to be appreciated that each pad is somewhat analogous to a column loaded at its opposite ends, when a container is gripped by the jaws of the lift truck. It is also to be noted, that the ends of cores 59 provide uniform spacing between the pads of each tier and that each pad is supported intermediate its side edges at nine spaced apart locations because of the nine yarn tubes in each tier. Since each pad is analogous to a column, and since a column braced against bending intermediate its ends is extremely strong and more susceptible to crushing than bending, it is apparent that applicant's arrangement provides an extremely strong shipping container for yarn. It is also to be noted that because each pad has at least one sheet which is not cut completely through or otherwise perforated, there is absolutely no chance for a sheet to slip vertically relative to the end of a core 59. In addition to preventing the adverse effects of rubbing of yarn cylinders 60 against a slipped pad, the transverse strength of the container would also be affected by such slipping, but is impossible with the pad and container of the present invention.

When a plurality of pads 45 are used at the locations indicated for pads 16–20 of FIG. 1, the pads are arranged so that the corrugations of adjacent pads extend in alternate directions. For example, a pad 45 at the position of the pad designated 20 of FIG. 1, would have hinge 58 adjacent side wall 3 of the container. The next pad 45 placed at the position of pad 19 would be turned 90° so that hinge 58 would be adjacent side wall 4 of the container. The next pad at the position of pad 18 of FIG. 1 would again have the hinge 58 adjacent and parallel with side wall 3 of the container and this arrangement is continued for the entire height of the container.

To conserve materials, the pads at the top and bottom of container 1 are half pads designated 67 and 68. The structure of half pads 67 and 68 is best visualized by assuming that the portion of surface layer 51 of pad 45 is cut completely through at hinge 58. The two resulting structures are half pads as used at the top and bottom of container 1.

A third pad arrangement is shown in FIGS. 9–12. FIG. 9 shows a container 70 with a pair of parallel side walls 71 and 72 and end walls 73 and 74 connected to the opposite ends of the side walls. Although not shown in plan, it is to be understood that container 70 is identical to container 1, container 70 being square as viewed in plan and having side walls (not shown) connecting the corresponding side edges of side walls 71 and 72. Within container 70 are a plurality of tiers 75–80 of yarn tubes 15, the yarn tubes being identical to the yarn tubes 15 described with reference to FIG. 1. There are nine yarn tubes in each tier and each yarn tube is provided with a wrapper 81 which separates yarn tubes 15 of one tier from the next adjacent tier.

Wrappper 81 is formed from a sheet of corrugated paperboard having a laminate structure identical to the laminate structure of first sheet 23 of pad 16 (FIG. 4). With reference to FIG. 10, it may be seen that sheet 82 includes a first surface layer 25, a second surface layer 26, and corrugated layers 29 and 30 with a center layer 28 sandwiched therebetween. Corrugated layer 29 is adhesively secured to surface layer 25 and corrugated layer 30 is adhesively secured to surface layer 26 with corrugated layers 29 and 30 adhesively secured to the opposite sides of center layer 28. Corrugated layers 29 and 30 each have their corrugations extending perpendicular to the long dimension of sheet 82. Parallel transverse score lines 83–86 divide sheet 82 into a centrally located body sheet 87, a pair of side sheets 88 and 89 of equal width, and a pair of end sheets 90 and 91 which are also of equal width. Body sheet 87 is provided with nine annular depressions 37 identical with the depressions 37 of pad 16 and similarly located.

The width of sheet 90 as measured from end edge 92 to score line 83 is exactly equal to one-half the width of body sheet 87 as measured from score line 84 to centerline 93 of the body sheet. Similarly, the width of end sheet 91 is measured from end edge 94 to score line 86 is the same as half the width of body sheet 87 as measured from center line 93 to either of score lines 84 or 85. Formed in sheet 90 are three circular openings 95 which are cut completely through all the layers of the sheet. Three identical circular openings 96 are formed in end sheet 91. Formed adjacent edge 92 of sheet 90 are semi-circular annular depressions 97–99 which are identical to exactly one-half of an annular depression 37. The diameters of depressions 97–99 are each coincident with edge 92 of sheet 90. Formed adjacent edge 94 of end sheet 91 are three

semi-circular annular depressions 97'–99'. Each of the depressions 97–99 and 97'–99' have a semi-circular annulus 100 identical to one-half of annulus 38 of pad 16 and a semi-circular face 101 identical to one-half of face 41 of pad 16.

Extending perpendicularly from edge 92 of end sheet 90 are integrally formed rectangular tabs 102–104, each of which has a width equal to the diameter of semi-circular face 101, each of the tabs extending as a continuation of the semi-circular faces 101 of semi-circular annular depressions 97–99. Extending perpendicular to edge 94 of sheet 91 are identical tabs 102'–104'. Formed in each of tabs 102–104 are score lines 105 parallel with and spaced inwardly of the line of edge 92 a distance sufficient to permit faces 106 of the tabs to lie in a plane passing through edge 92 and perpendicular to end sheet 90, when the flaps are folded at right angles to the sheet as shown in FIG. 11. Score lines 105 are similarly provided in tabs 102'–104'. To permit such folding of the tabs, the short arcuate edge of face 101 extending from score lines 105 to the end edges 92 and 94 of end sheets 90 and 91, respectively, are cut completely through the material of these end sheets as indicated at 108 and 109.

Sheet 82 is folded along score lines 83–86 and 105 to erect the wrapper 81 illustrated in FIG. 11. When so folded, end sheets 90 and 91 are parallel and spaced from body sheet 87. Side sheets 88 and 89 are parallel and perpendicular to sheets 87 and sheets 90–91. Wrapper 81 accommodates nine yarn tubes which, for simplicity of illustration, are shown as cores 59 and are identical to the cores previously described. Thus, it will be noted that each of openings 95 in end sheet 90 is vertically aligned with the annular depressions 37 in the left hand row of body sheet 87. Similarly, each of the openings 96 of end sheet 91 are vertically aligned with annular depressions 37 of the right hand row of body sheet 87. At the center of the erected wrapper, faces 106 and 107 of tabs 102–104 and 102'–104', respectively, abut each other and semi-circular depressions 97–99 and 97'–99' precisely meet to form annular depressions vertically aligned with and facing annular depressions at the center row of body sheet 87. It will be observed with reference to FIG. 11 that openings 95 and 96 are each slightly greater than the outer diameter of core 59 so that outer surface 61 of each core is closely adjacent and preferably engages the inner surface of these openings. However, the cylindrical portion 40 of each annular depression 37 of body sheet 87 is in close fitting engagement with inner surface 62 of each of cores 59. Hence, with regard to the left hand set and right hand set of cores 59 of FIG. 11, the outer surface of each yarn tube at openings 95 and 96 is supported, rather than the inner surface at cylindrical projections 40 to prevent lateral movement of the yarn tubes. The tubes at the center of the wrapper, as shown in FIG. 11 are prevented from lateral movement by engagement of their inner surfaces by cylindrical portion 40 adjacent its lower end and by tabs 102–104 and 102'–104' as well as by the cylindrical portions formed by the mating of semi-circular recesses 97–99 and 97'–99'.

Cores 59 are easily placed in a wrapper merely by aligning the lower ends of the cores with cylindrical projections 40 of annular recesses 37 of bottom sheet 87. Then, the side and end sheets are folded up and inwardly and flaps 102–104 and 102'–104' are inserted in the open ends of the center row of cores 59. Due to the frictional engagement between the side edges of the flaps and the inner surfaces of core 59, the wrapper maintains itself in a closed position without additional securing.

As can be observed with reference to FIG. 11, wrapper 81 when erected, defines a generally tubular open ended wrapper of rectangular cross-sectional configuration. As shown at FIG. 9, a wrapped group of yarn tubes 15 forms each of tiers 75–80 of the packed container 70. Bottom tier 80 includes a group of yarn tubes 15 in a wrapper 81 with sides 88 and 89 of the wrapper parallel with side wall 71 and 72 of carton 70 and closely adjacent the inner surfaces of these side walls. The next tier 79 is similarly comprised of a group of yarn tubes enclosed in a wrapper 81 with side sheets 88 and 89 extending perpendicular to side walls 71 and 72 of carton 70. The next tier 78 is identical to tier 80 and side sheets 88 and 89 and again are parallel with side walls 71 and 72 of container 70. This arrangement is continued from bottom to top of the carton with each adjacent tier having its wrapper turned 90° with respect to the wrapper of an immediately preceding tier. This carton arrangement wherein the wrappers of adjacent tiers are disposed at 90° to each other provides for excellent transverse strength of carton 70 in a direction perpendicular to side walls 71 and 72 and also provides for excellent transverse strength in a direction perpendicular to side walls of the carton which extend between side walls 71 and 72. In this regard, it will be observed that corrugations 29 and 30 of sheet 82 from which wrapper 81 is formed extend transversely of the sheet and hence are parallel with side sheets 88 and 89. It will thus be observed with reference to FIG. 9 that between each tier of yarn tubes, the corrugations of end sheets 90 and 91 extend in a direction perpendicular to the direction in which the corrugations of body sheet 87 of the next adjacent wrapper extend.

With reference to FIG. 9, it will also be observed that body sheet 87 of the wrapper of tier 79 cooperates with end sheets 90 and 91 of the wrapper of tier 80 to provide a support pad 110 between tiers 79 and 80. Support pad 110 thus formed by the top sheet of one wrapper and the bottom sheet of the next adjacent wrapper has all the advantages of support pads 16 and 45, previously described. Although there are openings 95 and 96 in each of end sheets 90 and 91, the bottom surface of body sheet 87 of each wrapper is not perforated and hence, closes the upper ends of openings 95 and 96 when packed in carton 70 as shown. In addition, end sheets 90 and 91 of the wrapper of tier 75 provide a top sheet 111 for the top tier of the container. Also, bottom sheet 87 of the wrapper of tier 80 provides a bottom sheet 112 for the container. Thus, it is apparent that with wrappers 81 arranged as shown in FIG. 9, the wrappers provide all the advantages of pads 16 and 45, previously described, and in addition, have the advantage that an entire tier of yarn tubes 15 may be removed from the container and may be readily transported to the location where they are used while within the wrapper. Hence, wrapper 82 facilitates handling of a group of yarn tubes 15 at their location of intended use.

FIGS. 13 and 14 show one manner of forming the annular depressions for support pads 16, 45 and 110. For convenience of explanation, the forming of the top annular depressions will be described for first sheet 23 of support pad 16. As shown at FIG. 13, the first step is to provide a pair of concentric circular slits 114 and 115 which extend only into layers 25, 29 and 28 of the material of the support pad. Slits 114 and 115 do not extend into layers 30 or 26 of the pad, thus leaving these layers completely uncut. The slits 114 and 115 thus form an annulus 38 surrounding a cylindrical portion 40 having face 41. Such pressing by tool 116 crushes the material of corrugated layers 29 and 30 so that annulus 38 is only slightly above the plane of center layer 28 and annulus 39 is pressed to a position between the planes of center layer 28 and surface layer 26. However, the cylindrical portion within slit 114 remains undisturbed so that face 41 is still co-planar with surface layer 25. As previously described, the cylindrical portion 40 projects into the open end of a core 59 to prevent lateral displacement of the core when packed in the container.

Although several preferred embodiments of a container arrangement and support pads for packing yarn have been shown and described, with the container of a particular type and the support pads oriented in a particular direc-

tion, it is to be understood that different arrangements and orientations of the support pads and container are within the purview of this invention as defined in the appended claims.

What is claimed is:

1. In a container for yarn wound on tubes, the combination comprising

a container comprised of

a first pair of upright parallel side walls,

a second pair of upright parallel side walls connected to said first pair of side walls to provide a generally rectangular side wall structure, and

first and second end walls adjacent the opposite ends of said side wall structure;

a plurality of tiers of yarn tubes within said container;

a plurality of horizontal support pads in said container in close fitting relation to said side walls and forming separation for a plurality of tiers of yarn wound on tubes, each of said support pads comprised of

a first sheet of multi-layer paperboard, and

a second sheet of multi-layer paperboard,

each of said sheets comprising

a first surface layer at one side of the sheet,

a second surface layer at the other side of the sheet,

an inside corrugated layer sandwiched between said first and second layers, and

an annular depression in each sheet formed by deforming said first surface layer into the material of said corrugated layer to define a cylindrical member within each depression

said inside corrugated layer of each sheet comprising

a first corrugated layer,

a second corrugated layer, and

an uncorrugated sheet sandwiched therebetween;

one of said sheets of each support pad being inverted relative to the other so said cylindrical members face outwardly in opposite directions;

said cylindrical members being close fitting in the ends of said yarn tubes, and said annular depressions being of a width greater than the wall thickness of said tubes to receive said tube ends therein;

at least one of said sheets of each support pad being unperforated to prevent sifting of dust and dirt from one tier onto the yarn of another tier;

said support pads being so arranged and oriented that a support pad for each tier of yarn tubes has the corrugations of a corrugated layer extending transverse to the corrugations of a corrugated layer of the support pads immediately above and below, whereby the compressive strength of said container is approximately equal in a transverse direction perpendicular to said first pair of side walls and in a transverse direction perpendicular to said second pair of side walls.

2. A container for yarn tubes in accordance with claim 1 in which

said corrugated layers of said first and second sheets of a selected support pad have corrugations which extend in the same horizontal direction, and

the support pads for tiers immediately adjacent said selected support pad have corrugations which extend horizontally but transverse to the direction of the corrugations of said selected support pad.

3. A container for yarn tubes in accordance with claim 2 in which

said second surface layer of said first sheet of each support pad is a continuation of the second surface layer of said second sheet; and

said first and second sheets are hingedly connected together along one edge by only said second surface layer.

4. A container for yarn tubes in accordance with claim 1 in which

said first sheet is a portion of a wrapper for the yarn tubes of one tier;

said second sheet is a portion of a wrapper for the yarn tubes of an adjacent tier; and

said first and second sheets being joined to each other by integral sides extending between said sheets from opposite side edges thereof.

5. In a container for yarn wound on tubes the combination comprising

a container comprised of

a first pair of upright parallel side walls,

a second pair of upright parallel side walls connected to said first pair of side walls to provide a generally rectangular side wall structure, and

first and second end walls adjacent the opposite ends of said side wall structure;

a plurality of horizontal support pads in said container in close fitting relation to said side walls and forming separation for a plurality of tiers of yarn wound on tubes, each of said support pads comprised of

a first sheet of multi-layer paperboard, and

a second sheet of multi-layer paperboard,

each of said sheets comprising

a first surface layer at one side of the sheet,

a second surface layer at the other side of the sheet,

an inside corrugated layer sandwiched between said first and second layers, and

an annular depression in each sheet formed by deforming said first surface layer into the material of said corrugated layer to define a cylindrical member within each depression

said inside corrugated layer of each sheet comprising

a first corrugated layer,

a second corrugated layer, and

an uncorrugated sheet sandwiched therebetween;

one of said sheets of each support pad being inverted relative to the other so said cylindrical members face outwardly in opposite directions;

said cylindrical members being adapted to fit the ends of said yarn tubes, and said annular depressions being of a width greater than the wall thickness of said tubes to receive said tube ends therein;

at least one of said sheets of each support pad being unperforated to prevent sifting of dust and dirt from one tier onto the yarn of another tier;

said support pads being so arranged and oriented that a support pad for each tier of yarn tubes has the corrugations of a corrugated layer extending transverse to the corrugations of a corrugated layer of the support pads immediately above and below, whereby the compressive strength of said container is approximately equal in a transverse direction perpendicular to said first pair of side walls and in a transverse direction perpendicular to said second pair of side walls.

6. In a container for yarn wound on tubes the combination comprising

a container comprised of

a first pair of upright parallel side walls,

a second pair of upright parallel side walls connected to said first pair of side walls to provide a generally rectangular side wall structure, and

first and second end walls adjacent the opposite ends of said side wall structure;

a plurality of yarn tube wrappers each formed from a single sheet of multi-layer paperboard and each comprising

a body sheet

a first side sheet hingedly connected to one edge of said body sheet;

a second side sheet hingedly connected to an opposite edge of said body sheet

said side sheets extending perpendicularly from said body sheet

first and second end sheets connected respectively to said side sheets and extending parallel to said body sheet in space relation therewith,

a plurality of aligned annular depressions in that surface of said body sheet which faces said end sheets

said first and second end sheets having free edges parallel with said body sheet and abutting each other,

a plurality of semicircular depressions extending from the free edges of each of said end sheets, said semicircular depressions on each end sheet being aligned with each other to form complete annular depressions adjacent the abutting free edges of said sheets,

a plurality of tabs, one of said tabs extending from the free edge of each of said end sheets at each of said semicircular depressions and hinged to be bent downwardly to be encircled by the annular depression formed by aligned ones of said semicircular depressions,

said tabs and annular depressions formed by aligned ones of said semicircular depressions being in vertical alignment with said annular depressions on said body sheet, said aligned annular depressions each being adapted to receive a yarn tube therebetween with said tabs extending into one end of the yarn tube;

said single sheet of multilayer paperboard from which said wrapper is formed comprising

a first surface layer,

a second surface layer, and

an inside corrugated layer;

said yarn tube wrappers being disposed in superposed relation within said container to support a plurality of tiers of yarn tubes; said wrappers being so arranged and oriented that the corrugations of each adjacent superposed wrapper extend transverse to each other

whereby the compressive strength of said container is approximately equal in a transverse direction perpendicular to said first pair of side walls and in a transverse direction perpendicular to said second pair of side walls.

7. A container for yarn wound on tubes in accordance with claim 6 in which

said inside corrugated layer of each of said sheets from which each of said wrappers is formed comprises

a first corrugated layer,

a second corrugated layer, and

an uncorrugated sheet sandwiched therebetween;

said first corrugated layer being substantially thicker than said second corrugated layer; and

said annular depressions and said semicircular depressions being formed in said first corrugated layer.

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