Feb. 15, 1966 A. M. ANTLIFF 3,235,203

COLLAPSIBLE REEL

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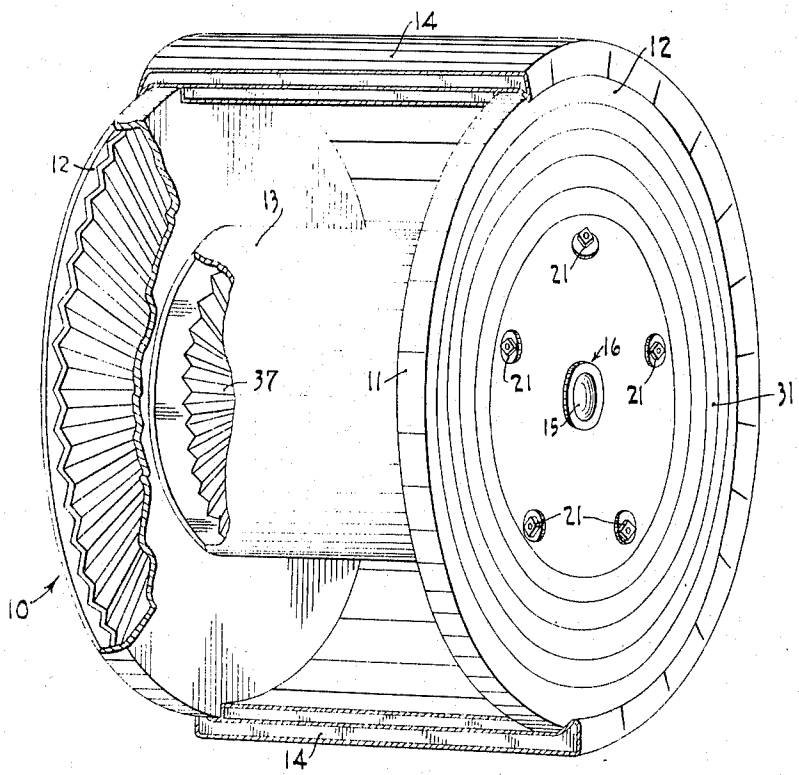
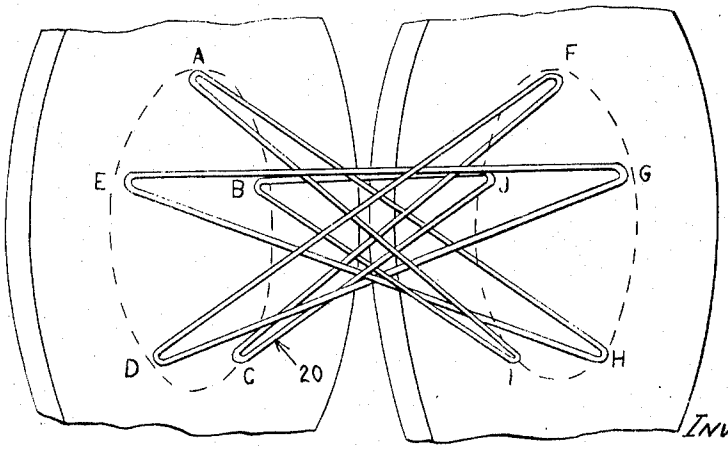


FIG. 1.

FIG. 2.



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3 Sheets-Sheet 2

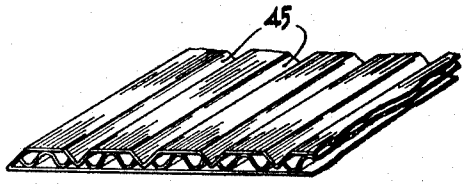


FIG. 8.

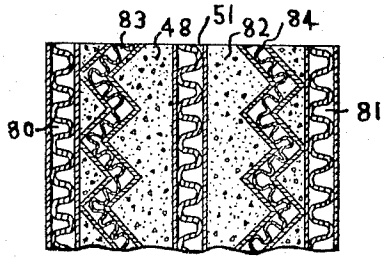


FIG. 9.

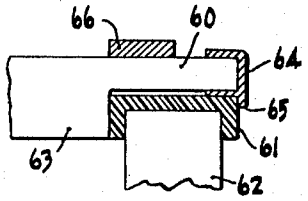


FIG. 11.

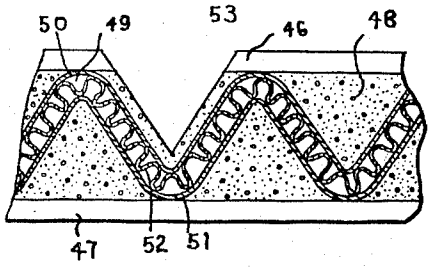


FIG. 10.

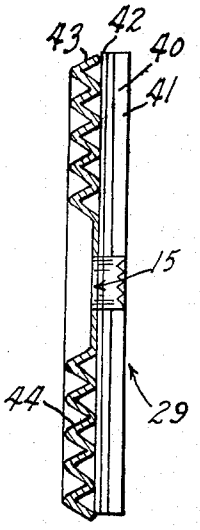


FIG. 6.

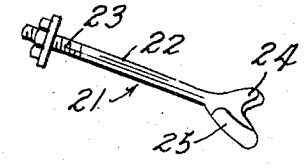


FIG. 3.

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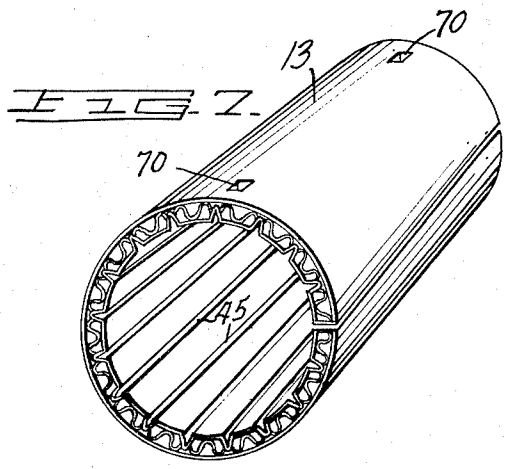


FIG. 7.

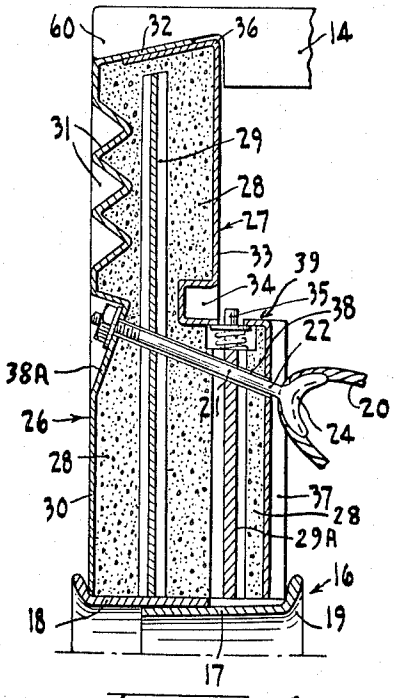


FIG. 4.

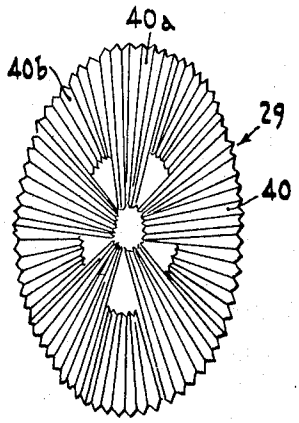


FIG. 5.

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COLLAPSIBLE REEL

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Filed Feb. 6, 1963, Ser. No. 256,675
13 Claims. (Cl. 242—115)

The invention relates to collapsible reels for use in handling wire goods, such as cables or the like. The handling of these goods includes, storing, transporting and dispensing of such goods or the like.

Numerous attempts have been made to provide an economical collapsible reel which may be readily assembled and disassembled. For the small lightweight wires, disposable type reels have been evolved, however, for the medium and heavier cables, the reels have been considered to be too expensive to be disposable.

The present inventon is concerned with reels for medium and heavy cables. In transporting these cables, the usual type of reel consists of heavy wooden discs secured together in spaced parallel relationship by an annular drum which consists of a plurality of planks placed edge-to-edge. The entire assemblage is usually secured together by a plurality of circumferentially spaced bolts (tie-rods) arranged axially parallel to the drum.

Wooden reels, when exposed to the elements for long periods, may soak up water to almost double their weight. When such water-soaked empty reels are returned from distant locations, substantial cost is encountered in shipping weight. In addition, the wooden reels are not normally collapsible. The extreme bulk presents difficulties in shipping, handling, and storage of the empty reels. Thus a reel of lightweight construction, made of substantially water-impervious materials, that is readily collapsible for return shipment, would represent a considerable saving in shipping and storage costs.

In addition there is ample room for improvement in the strength of the present reels. When a water-logged reel is dried out for re-use, the wood inside may be partially rotted and weakened. Accordingly, the supporting strength of the reel is considerably deteriorated. Also the axially-aligned tie-rods serve only to unite the two flanges with the drum, and provide no cross-bracing support. Finally, the 2-ply and 3-ply arrangement of planks used for the flanges, does not take into account the circular nature of said flanges, giving neither a complete radial strength to support the cable-drum, nor complete annular strength to re-inforce the flange against a lateral blow.

Accordingly, it is the main object of this invention to overcome the above objections by providing a reel that is capable of being readily collapsed for return shipment when the cable has been removed therefrom.

A further object is to provide a reel fabricated from relatively moisture resistant materials.

A still further object is to provide a reel of the required strength and yet relatively light in weight..

Accordingly, the invention in its broadest aspect consists of a reel comprising a pair of mutually opposed axially spaced substantially parallel flanges having a drum supporting means on each of the adjacent mutually opposed faces, an annular cable-supporting drum disposed between said flanges and defining the minimum spacing therebetween, at least three anchor means on each of said opposed faces disposed radially about the central axis of said flanges, and a continuous flexible tensile threadable member, continuously selectively and sequentially threaded through diagonally opposed anchoring means on alternate flanges, and adapted to be slidable through said means, whereby one flange is selectively rotatable with respect to the other flange thereby to vary the axial distance between said flanges, rotation in one direction increasing

the axial distance between said flanges to release the drum and rotation in the opposite direction decreasing the axial distance thereby to clamp the drum between said flanges by means of forces acting along said tensile member.

The invention is illustrated by way of the example in the accompanying drawings, wherein:

FIG. 1 is a partial sectional oblique view of an unloaded reel constructed in accordance with the present invention;

FIG. 2 is an ablique view illustrating the endless flexible tensile member interconnecting the spaced flanges;

FIG. 3 is a view of an eye bolt used to slidably connect the tensile member to the flanges;

FIG. 4 is a detail partial cross-sectional view of a flange constructed in a preferred form;

FIG. 5 is an oblique view of a radially corrugated reinforcement member adapted to be embedded in the flange between the faces thereof;

FIG. 6 is a cross-sectional view of a modfied reinforcement member;

FIG. 7 is an oblique view of the annular drum;

FIG. 8 is a partial view of the drum of FIG. 7 shown in a rolled out or flat position;

FIG. 9 is a partial cross-sectional view of a modified flange;

FIG. 10 is an enlarged partial sectional view illustrating the composite board from which the drum is formed; and

FIG. 11 is a detailed partial sectional view illustrating means whereby the lagging may be readily adapted to lock the flanges.

Referring now in detail to the drawings, shown in FIG. 1 is a reel **10** consisting of a pair of spaced, substantially parallel flanges **11** and **12** respectively abutting opposite ends of an annular, in cross-section, drum **13**. As will be seen hereinafter, the flanges are held in such abutting relationship by a continuous length of a flexible tensile member such as a cable, a rope or the like, located interiorly of the drum and threaded through suitable eyelets secured to the flanges. A lagging **14** is used to enclose the assembly if so desired.

Each flange is provided with an axial aperture **15** adapted to receive a shaft and thereby support the reel during an "on" or "off" winding. Bearings **16**, of nylon or other suitable material, consisting of a pair of telescopic sections **17** and **18** (FIG. 4) may be fitted into the apertures. The section **17** includes a conical entry **19** thereby to facilitate entry of the supporting shaft.

A cable, rope, chain, wire or the like flexible tensile member **20** (FIG. 2) interconnects the flanges and is slidably anchored to each flange by a plurality of eye bolts **21**. These bolts shown in detail in FIG. 3, consist of a shank **22** having external threads **23** at one end and a yoke or Y-shaped member **24** at the opposite end. A transverse aperture **25**, through the shank adjacent the yoke **24** provides means whereby the cable may be threaded through the bolt. The yoke or Y-shaped portion of the bolt is suitably contoured to thereby reduce friction and prevent fraying of the cable.

The flanges, drum and lagging are composite members consisting of preshaped plastic, metal, paperboard or the like, and rigid foamed plastic. These members each consist of a facing member bonded to opposite sides of the rigid foam plastic and corrugated reinforcing member is embedded in the plastic. These composite members may include several embodiments. FIG. 4 illustrates, in detail, a flange member consisting of an outer facing **26**, an inner facing **27** and a rigid foam plastic **28** interposed therebetween. The foam plastic may be any well known material, for example, polyurethane, and embedded therein is a corrugated reinforcing member **29**. The facing sheets **26**, **27** and the corrugated reinforcing member **29** may be plastic, paperboard, metal or the like, plastic

being preferable in that it may readily be molded to the particular desired configuration.

The facing member **26** consists of a disc portion **30** having an annular corrugated portion consisting of a plurality of concentric annular grooves **31**, adjacent an outwardly directed peripheral flange **32**. The facing member **27** consists of a disc **33** having an annular groove **34** adjacent a drum supporting flange **39** and a peripheral oppositely directed flange **36** adapted to fit into nesting relationship with the flange **32**. The disc member **27** includes a plurality of radial corrugations **37** (see also FIG. 1) extending from the central aperture of the flange to the drum supporting shoulder. The projecting portion defined by the flange **39** forms a hub adapted to support the drum of the reel. The hub may also include a corrugated reinforcing member **29A** embedded therein.

An aperture **38** extends through each flange and the flange outer face **26** is indented as at **38A** in order that the anchor bolts **21** may terminate flush with the outer surface thereof.

The reinforcement **29** embedded in the flange is shown in detail in FIG. 5 and consists of a plastic, paperboard or metal member having radial corrugations **40**. Several groups of corrugations **40A** extend to the central aperture in the disc whereas alternately spaced groups **40B** terminate at the larger radius from the centre of the disc. This permits relatively deep corrugations yet corrugations spaced apart widely enough for the foam plastic to fit into. FIG. 6 illustrates an alternative reinforcing member for the flanges. Shown therein is a member **41** having radial corrugations **40** and fastened to one face thereof is a plain disc-like member **42**. Secured to the opposite face of member **42** is a member **43** having a plurality of concentric annular corrugations **44**.

The drum **13**, illustrated further in FIGS. 7 and 8, is a single substantially rectangular member as viewed in the flat position having a plurality of parallel grooves **45** directed inwardly from one surface thereof and the member thereby may be manually or otherwise bent from the flat position shown in FIG. 8 to the cylindrical shape illustrated in FIG. 7. The drum is circular in cross-section when in the assembled reel. Alternatively, if desired, the drum may consist of a plurality of arcuate segments not joined together, however the disadvantage of such construction is quite obvious.

The composite member forming the drum as illustrated in FIGS. 7, 8 and 10 again, as in the case of the flanges, consists of a pair of spaced facing materials having rigid foamed plastic interposed therebetween. Corrugated reinforcing members are embedded in the foam. FIG. 10 is a partial enlarged detail sectional view of the drum illustrating also a somewhat modified form from that shown in FIG. 8. The drum shown in FIG. 10 consists of spaced plastic facing sheets **46** and **47**, having foamed settable plastic material **48** interposed therebetween. The material **48** is preferably rigid foamed polyurethane, however, any lightweight, strong filler material may be used.

Embedded in the plastic material **48** is a corrugated reinforcing member **49**. The member **49** is corrugated and consists of facing members **50** and **51** interconnected by a corrugated member **52**. The corrugations in member **49** are parallel to one another and to longitudinal notches **53** cut in one surface thereof.

The members **46**, **47**, **50**, **51** may be fibrous material, plastic impregnated fibrous material, plastic, reinforced glass fiber or the like. The member **49** may be plastic, paperboard, metal or the like.

In the embodiment shown in FIG. 8, one of the outer sheets is so shaped as to provide the spaced parallel grooves **45**. This may be attained by use of a suitably shaped forming mandrel. In the embodiment shown in FIG. 10, the drum is formed into a tube and subsequently slit at spaced parallel intervals in one surface thereof.

The flanges may alternatively be formed from the composite board, illustrated in FIG. 9 which consists of a

pair of spaced outer members **80** and **81** having rigid foam plastic **82** interposed therebetween. Corrugated reinforcing members are embedded in the foam plastic and as illustrated, these reinforcing members consist of a pair of spaced members **83** and **84** each having a plurality of radial corrugations. A plurality of apertures may be provided in the reinforcing members and the interior surface of the outer facing members. Such apertures would facilitate bonding of the foamed plastic or settable material to the reinforcing facing members.

The lagging **14** (FIG. 1) is constructed similarly to that of the drum, using heavy transverse corrugated material embedded within to give the necessary traverse strength and is also provided with transverse parallel grooves to facilitate bending the lagging to conform to circular shape of the reel.

From FIG. 4 it will be particularly noted that the peripheral edge of the flanges are tapered and the lagging is recessed adjacent the marginal edge to fit snugly onto the flange. This construction provides a lip **60** at the marginal edge of the lagging to restrain the reel flange from outward movement due to pressure of wire, rope or other material wound on the drum.

Alternatively, the peripheral edge of each flange may be protected by a channel-shaped extruded plastic member **61** as illustrated in FIG. 11. This strip is illustrated as fitting around the edge of a flange **62** of the reel and wherein a lagging **63** encloses the assembly. The edges of the lagging includes an extruded strip **64** substantially U-shaped in cross-section secured thereto and adapted to fit over the edge of the lagging. Such strip includes a projecting flange portion **65** adapted to abut against an edge of the extruded member **61** and thereby retain the flange from lateral outward movement. The lagging is secured in position by a metal band **66** tightened thereabout or other suitable means.

As previously noted the flanges are secured together by a cable **20** threaded through the eye bolts. These bolts are equi-radially positioned as well as equi-circumferentially spaced preferably an odd number of such bolts being used in each flange.

The cable **20** is threaded as shown in FIG. 2. Shown therein are five anchor bolts A, B, C, D and E in one flange and similar bolts F, G, H, I and J in the opposite flange. The cable preferably is endless and the complete threading follows the sequence A, H, E, G, D, F, C, J, B, I, A. It should be noted that by using this design and an odd number of bolts in each flange, the axis of the drum is not interfered with, so that a supporting axle can be inserted for off-winding the cable. Alternatively the rope, although threaded the same as described, may have opposite ends thereof secured to one eye bolt, e.g. bolt A. Also the eye bolts may alternatively be rings, hooks or the like adapted to hold the cable and permit the latter to slide freely through the hooks. Obvious friction reducing means such as rollers, etc. may be provided if desired. Alternatively the cables may be fixed on one flange, i.e. A, B, C, D and E and pass slidably through eye bolts on the other flange, i.e., F, G, H, I and J.

To assemble the reel, the drum is taken from its flat position and is shaped into a cylinder to bear snugly against the supporting ledge **39**. The drum is retained in this position by the spring catch **35** while one flange **11** is rotated with respect to the other. Such rotation draws the pair of flanges closer together; the drum ends, thereby fitting into the respective grooves **34** (FIG. 4) of the end flanges. The drum is thus retained in its annular shape.

The drum has an aperture **70** (FIG. 7) adjacent each end. Referring to FIG. 4, it will be noted a spring based pin **35** projects radially outward from the hub **39**. The drum is initially positioned such that upon a predetermined amount of rotation of the flanges, the pins fit into the re-

spective apertures 70 to thereby lock together the assembled reel.

To collapse the reel, the flanges are rotated oppositely to that described above subsequent to release of at least one pin 35. The drum is thereby released and may readily be removed and rolled out flat. The flanges are then placed face to face, adjacent one another, the flexible cable being in a folded state therebetween and the flattened drum, may be piled thereupon to provide a relatively compact package for shipping.

Although at first glance, by reason of its construction innovations, this reel may appear somewhat complex, it is actually very simple. It consists of three main features: (1) The construction of the flanges, (2) the collapsible drum, and (3) the method of cross-bracing.

The multi-ply flange construction provides both radial strength through a corrugated inner member, and transverse strength by reason of annular corrugations on the outer face which are always at right-angles to the radial corrugation within. Shaped plastic sheeting and foamed polyurethane are the principal materials used.

The collapsible drum is a cylindrical member with a corrugated inner member to provide longitudinal supporting strength. Longitudinal grooves in the inner face allow the drum to be opened flat when it is released from engagement in the two flanges.

The cross-bracing is considered the heart of the invention as it permits the flanges to separate to a wider traverse to receive the drum members, then as one flange is rotated with respect to the other, the cross-bracing closes the traverse, embedding the drum tightly within the receiving groove in the face of each flange, to form one rigid structure. When the members are thus locked together, the cross-bracing has assumed diagonal bracing within the drum, to provide the greatest possible support. For return shipment, when the drum has been released, the flexible nature of the cross-bracing permits the two flanges to come together. In this position they can be clamped together with the flattened drum members, to form a single compact unit.

Lagging.—An additional, but subsidiary feature is the unique design of the lagging, which can be folded flat in the same manner as the drum. When the lagging is secured in place, it provides an interlocking joint with the outer periphery of the two flanges, holding them as a single rigid unit, while at the same time providing circumferential protection for the cable within.

In a modified form the collapsible reel may be further rigidified and converted to a non-collapsible reel by filling the hub with a settable plastic material, e.g. thermosetting resin or the like. In such construction, the annular drum may be reduced in strength by merely utilizing a single thickness material, e.g. sheet plastic, sheet metal, paperboard or the like.

I claim:

1. A collapsible reel comprising:

(a) a pair of mutually opposed axially spaced substantially parallel flanges having a drum supporting means on each of the adjacent mutually opposed faces and an aperture extending through said flanges for inserting a rod therethrough along the axis of the reel,

(b) an annular cable-supporting drum disposed between said flanges and defining the minimum spacing therebetween,

(c) an odd number of anchor means of three or more on each of said opposed faces disposed radially about the central axis of said flanges, and,

(d) a continuous flexible tensile threadable member continuously, selectively and sequentially threaded through substantially diagonally opposed anchoring means on alternate flanges and readily slidable therethrough and offset from the axis of said reel, said flexible member extending from the anchor on one flange at a position above a rod inserted through the apertures in the flanges to a pair of adjacent anchors on the other flange disposed below and one on each side of said rod, said flanges being selectively rotatable with respect to one another to vary the axial distance therebetween, rotation in one direction increasing the axial distance between said flanges to release the drum and rotation in the opposite direction decreasing the axial distance to clamp the drum between said flanges by means of forces acting along said tensile member, the latter providing diagonal bracing for said reel.

2. A reel as defined in claim 1 wherein said drum supporting means consists of an annular recess in the respective mutually opposed faces of the flanges, said recesses being adapted to receive respective opposite ends of the drum and a hub intergrally formed on each of said flanges and projecting inwardly into said drum, said hub including reinforcing means embedded therein.

3. A reel as defined in claim 2 wherein said hub terminates in a plurality of radially directed ribs defining a corrugated face.

4. A reel as defined in claim 1 wherein each of said flanges consists of a pair of facing members having rigid foam plastic disposed therebetween.

5. A reel as defined in claim 4 wherein the outer face of the flange consists of a series of annular grooves or corrugations while the inner face is substantially smooth down to the drum supporting means.

6. A reel as defined in claim 4 and including radially reinforcing means embedded in said rigid foamed plastic.

7. A reel as defined in claim 1 wherein said anchor means on the flanges consists of eye bolts having the stem thereof extending through the flange associated therewith and including an aperture at the other end adjacent a yoke, the latter providing a smoothly curved surface protecting the flexible member from abrasion during said sliding movement.

8. A collapsible reel as defined in claim 1 wherein said drum consists of a pair of facing members having rigid foamed plastic disposed therebetween, said member having a plurality of longitudinal grooves and thereby being adapted to be readily collapsible from a cylindrical shape into a flat surface.

9. A collapsible reel as defined in claim 8 wherein said drum consists of a transversely corrugated inner reinforcing member embedded in the said rigid foamed plastic.

10. A reel adapted for transporting wire cable comprising a pair of axially spaced, substantially parallel flanges having drum supporting means on the mutually opposed adjacent faces, said means comprising an annular groove in the respective flanges adjacent a ledge projecting outwardly from the flanges, said parallel flanges each consisting of a pair of first preshaped spaced members having rigid foamed polyurethane disposed therebetween and a reinforcing member embedded in said foamed polyurethane, an annular cable supporting drum disposed between said flanges and defining the minimum axial distance therebetween, said drum comprising a pair of second preshaped spaced members having rigid foam plastic disposed therebetween, at least three eye bolt anchor means having the eye thereof projecting toward the opposing flange from each of said opposed faces and disposed radially about the center of said flanges and disposed within the drum and a continuous flexible cable continuously, selectively and sequentially threaded through diagonally opposed eye bolts on alternate flanges and adapted to slide through the eye of said bolts, said flexible cable extending from the eye of one bolt on one flange wherein such bolt is at a position above the central axis of the flanges to a pair of bolts on the other flange wherein the latter bolts are adjacent one another and disposed below and one on each side of the axis of the flanges, each of said flanges having peripheral frusto-conical tapered edges; and a lagging having a pair of spaced parallel grooves

adapted to receive the edges of the flanges and thereby prevent axial displacement of the flanges with respect to the drum.

11. A collapsible reel as described in claim **10** having lagging consisting of an outer and an inner member in spaced relationship having rigid foam plastic disposed therebetween and a corrugated reinforcing material embedded therein; said lagging having a plurality of parallel, spaced grooves on its inner face whereby it may be readily rolled into large cylinder from flat position for assembly of the reel or vice versa, for stacking the drum and flanges upon collapse of the reel.

12. A reel as defined in claim **10** wherein said first and second preshaped members are plastic.

13. A reel for winding relatively heavy cables thereon to protect the latter during transportation and being collapsible for return and reuse, said reel comprising a pair of mutually opposed, axially spaced, substantially parallel flanges each comprising a composite structure of facing sheets with a substantially rigid foam plastic disposed therebetween and reinforcement members embedded in said plastic, said flanges each having an aperture at the axis thereof to receive a rod and thereby provide a support for the reel during winding and unwinding of the cable, said flanges having a hub projecting toward one another from adjacent faces to provide support means for a drum, an annular groove in each of said flanges adjacent said hub, a cable supporting drum disposed between said flanges in abutting relation therewith defining the minimum distance therebetween, said drum comprising a composite sheet including outer protective members with a rigid foam interposed therebetween and reinforcement embedded in such foam, said composite sheet having a plurality of grooves in one face thereof providing means whereby the sheet may be rolled from a flat position to an annular form, said drum resting upon the respective hubs and projecting into the annular recesses associated therewith in a reel assembled position, said drum having an aperture in each end thereof overlying the hub of the respective flanges and a pin in each of said hubs resiliently biased outwardly therefrom and projecting into said apertures to lock the reel in an assembled position, each of said flanges having an odd number of anchor means of five or more secured thereto and including an eye terminating within the annular drum, said anchor means being disposed equiradially about the axis of the reel and including an eye bolt with the shank projecting through the flanges and abutting against the outer walls thereof, each of said flanges having an aperture at the axis thereof and a two-part sleeve providing a bearing member for each of said apertures, said sleeve having a flange abutting opposed faces of the respective flanges of the reel and telescopically overlapping therebetween, a flexible member threaded continuously through the anchor means on the flanges and extending from the anchor on one flange at a position above a rod inserted through the apertures to a pair of adjacent anchors on the other flange disposed below and one on each side of the aperture of such flange, said flanges thereby being selectively rotatable with respect to one another to vary the axial distance therebetween, rotation in one direction increasing the axial distance between the flanges to release the drum and rotation in the opposite direction decreasing the axial distance to clamp the drum therebetween, said flexible member providing diagonal bracing for said reel in an assembled position.

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