Dec. 8, 1964 L. G. BERQUIST 3,160,275

COIL PACKAGE

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Fig. 1.

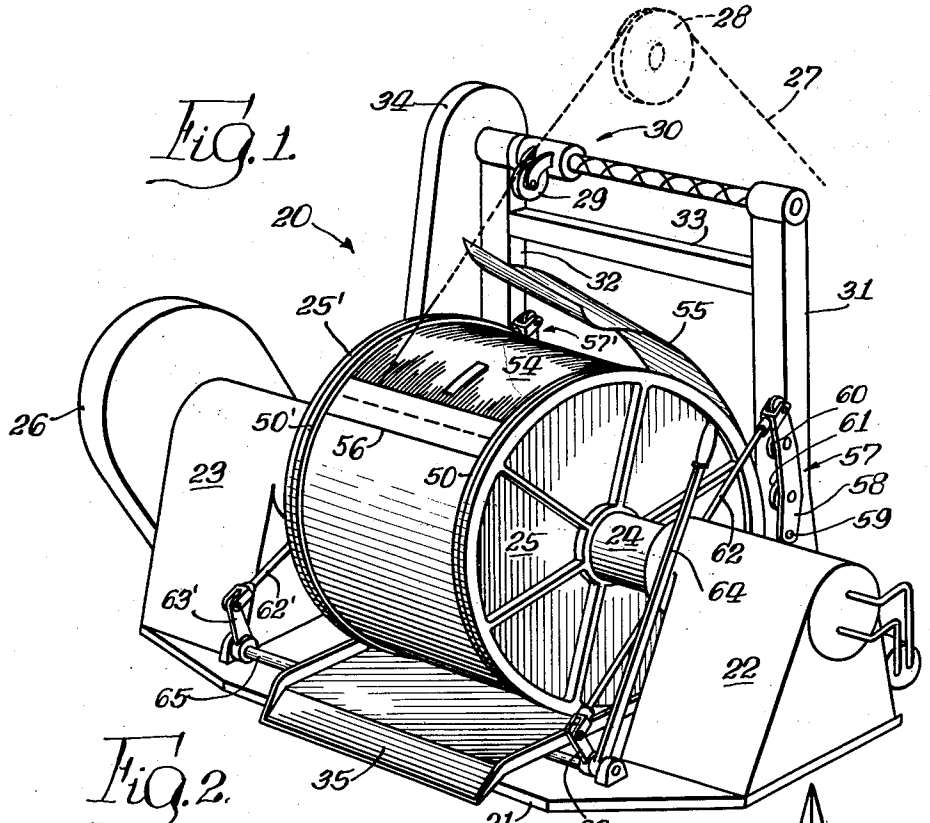

Fig. 2.

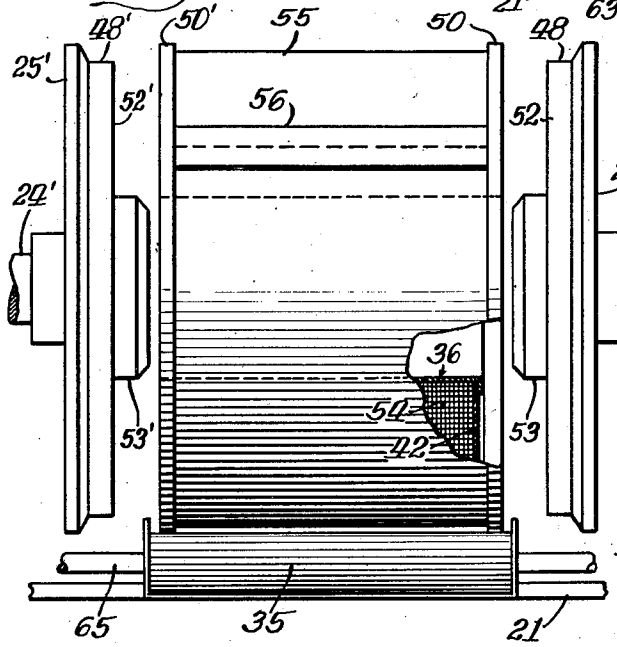

Fig. 3.

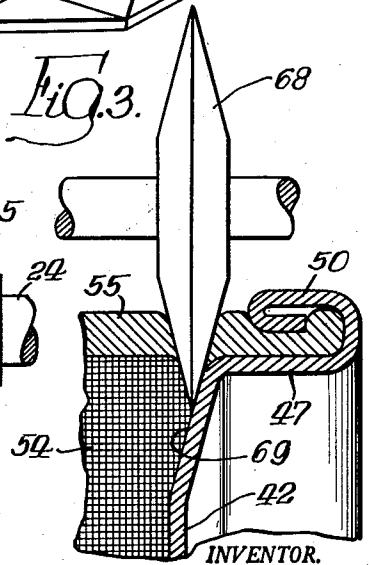

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Fig. 4.

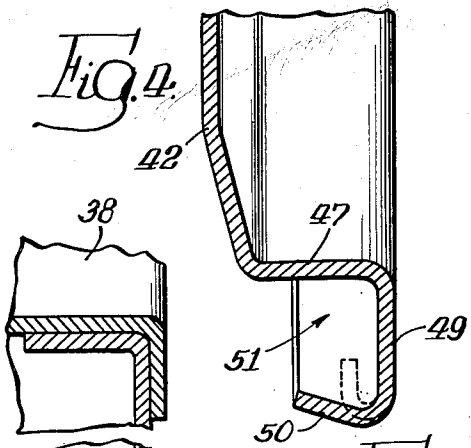


Fig. 5.

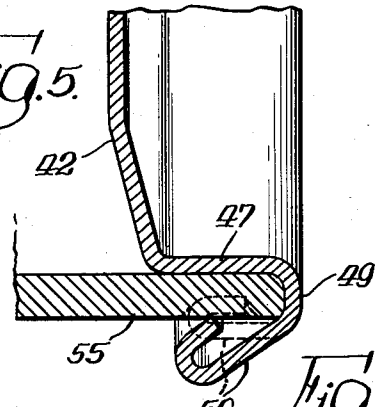


Fig. 6.

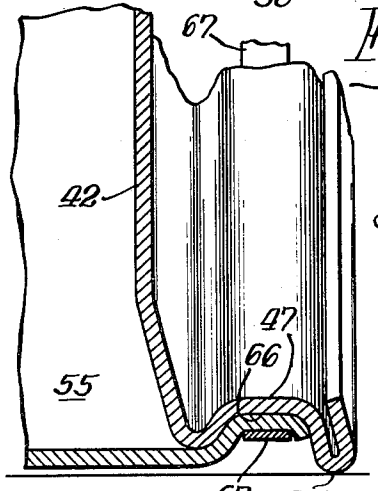
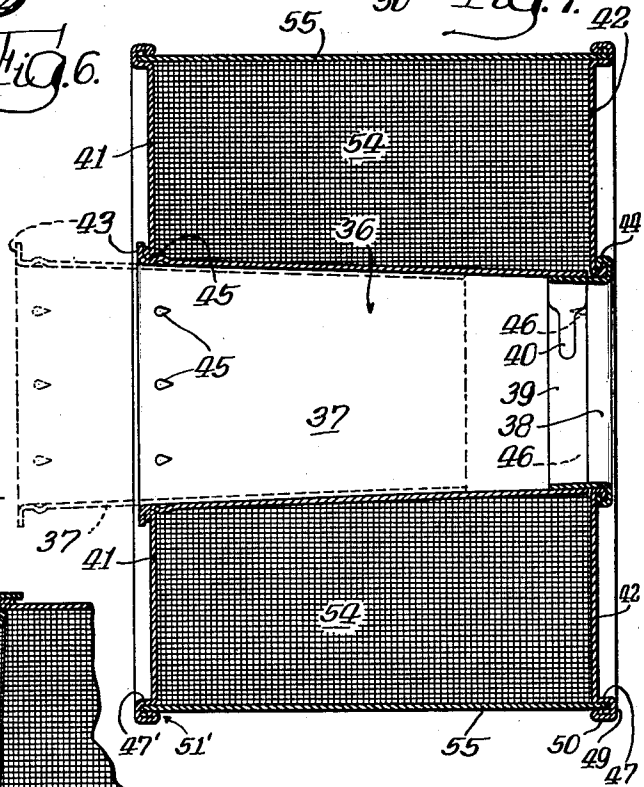


Fig. 7.



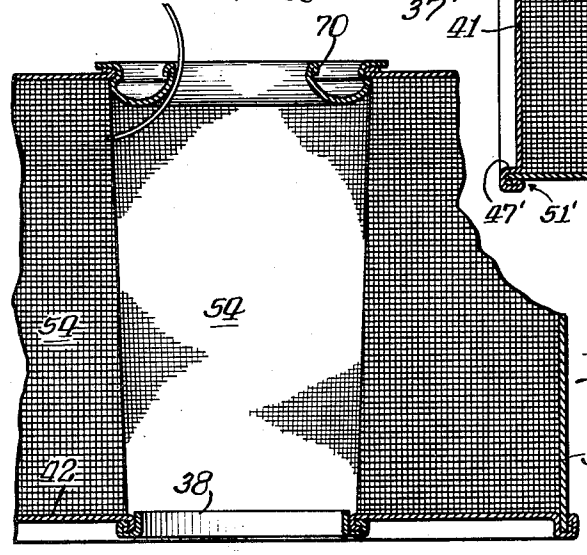


Fig. 8.

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Fig. 9.

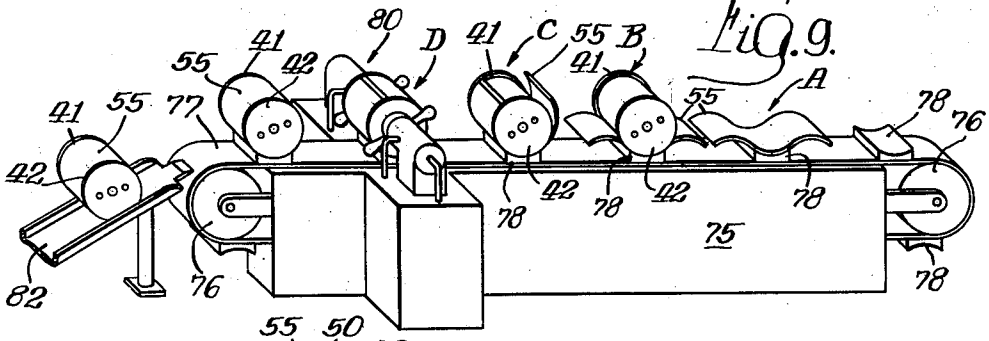


Fig. 10.

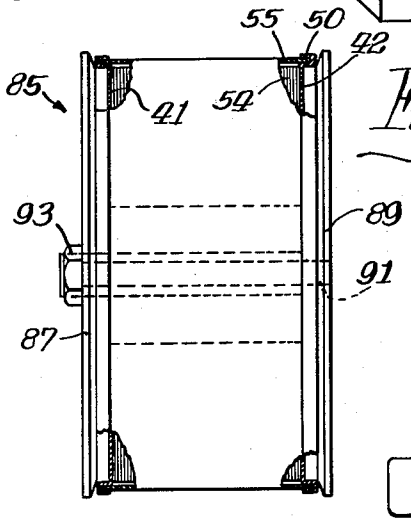
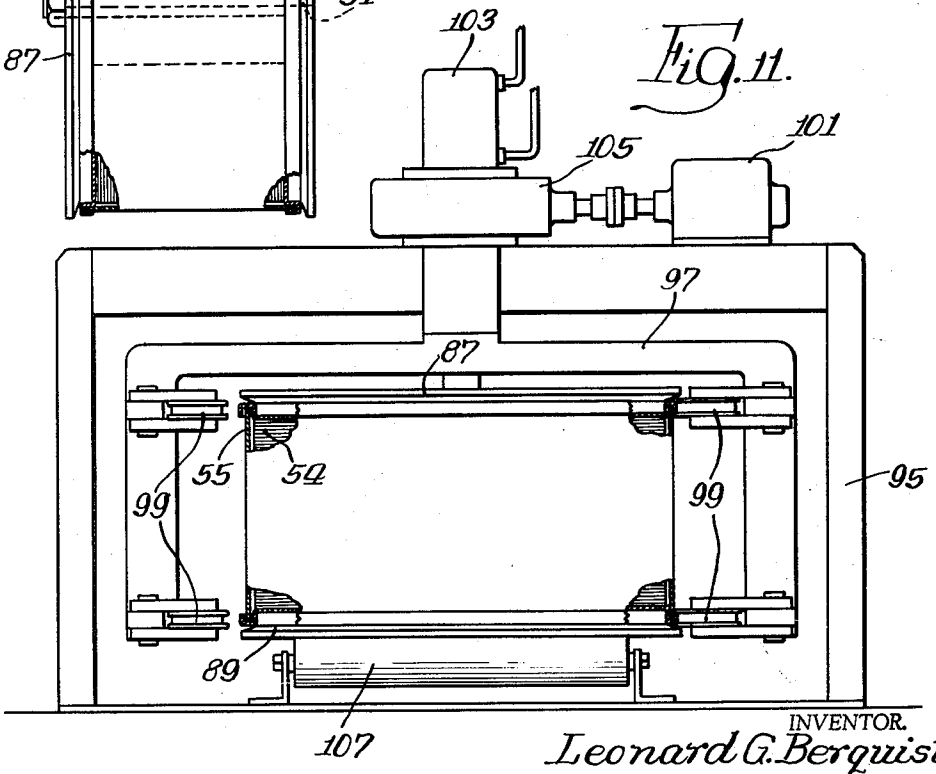


Fig. 11.



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COIL PACKAGE

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5 Claims. (Cl. 206—59)

This invention relates to a package of coiled wire or the like.

More specifically, the invention relates to an annular coil package having outer and inner peripheral covers both ends of which are locked to corresponding annular package sides to form a sealed enclosure.

The principal problems inherent in the shipping of coiled wire or the like, from its place of manufacture to a customer, are several fold. It is obviously desirable to protect the coiled product from damage caused by atmospheric corrosion, handling and other adverse influences and to minimize handling and shipping expenses.

Heretofore coiled wire has, in accordance with one known practice, been wound on heavy iron or steel reels which are not only difficult to handle because of their excessive weight, but necessitate appreciable shipping costs. Due to the expense of the reels themselves, they must be returned to the manufacturer after the wire thereon has been expended, so as to be used over and over again, and the shipping and handling costs consequent to returning them is also considerable.

Further, the reel sides are frequently damaged due to rough handling in shipment, and straightening operations are required in order to re-use the reel which additionally adds to the cost of handling wire in the manner related.

Furthermore, the reels heretofore employed for shipping coiled wire do not in themselves constitute a protective sealed package, so that if it is desired to protect the wire against corrosion the reels must be packaged in sealed containers.

An alternative practice of handling wire coils for shipment entails the banding of a completed coil of wire while on the coil forming machine and, after removal of the banded coil, wrapping or enclosing it in a plastic bag or the like. Coils of this type require special handling equipment designed to engage the center opening or core of the coil. This type of coil package has disadvantages in that there are no structural components such as afforded by a reel to protect the coil from physical damage in the shipment and handling of the coil.

An important object of this invention is to provide a novel coiled wire package or the like avoiding the aforementioned and other disadvantages of presently known construction.

In order to achieve the aforementioned object I propose to provide a coiled wire package comprising a spool or reel having integral hub and reel sides fabricated of relatively light gauge and inexpensive sheet material with the wire of the coil being wrapped in successive layers about the hub and between the reel sides, and on which the outer peripheral cover is secured to the outer peripheral edges of the reel sides to provide an integrated package in the form of an annulus with the several components assembled as described providing a structurally strong package.

Another object of my invention is to provide a package as described which is relatively inexpensive so as to permit its disposal by a customer after its contents have been expended.

A further object of the invention is to provide a coil package which is unusually light in weight so as to facilitate handling and reduce shipping costs.

Still another object of the invention is to provide a coiled wire package which not only permits unwinding of the wire from its outer periphery as from a reel, but also permits withdrawal of the wire from the interior of the coil.

Another object of the present invention is to provide a compact, structurally sound package of coiled wire which can be assembled on a winding machine with a minimum of time and expense.

These and other objects and advantages of the invention will be apparent from the following description thereof.

Now in order to acquaint those skilled in the art with the manner of utilizing and practicing my invention, I shall describe in conjunction with the accompanying drawings certain preferred embodiments of my invention.

In the drawings:

FIGURE 1 is a perspective view illustrating a partially constructed wire package of my invention mounted on a winding machine;

FIGURE 2 is a front elevational view, partly broken away, showing one form of completed wire package of my invention, and further illustrating a pair of drive flanges and an elevator platform which form a part of the winding machine of FIGURE 1;

FIGURE 3 is an enlarged fragmentary view, partly in section, illustrating the manner in which an outer wrapper of the wire package of FIGURES 1 and 2 may be removed by means of a cutting tool;

FIGURE 4 is an enlarged fragmentary view, in section, showing the outer periphery of a side plate which has been preformed for use in constructing the wire package shown in FIGURES 1 and 2;

FIGURE 5 is a view similar to FIGURE 4 illustrating the manner in which the side plate of the wire package of FIGURES 1 and 2 may be locked to the side edges of an outer package wrapper;

FIGURE 6 is an enlarged fragmentary sectional view illustrating an alternative method of locking the side plates of another form of wire package of my invention to the edges of its outer wrapper;

FIGURE 7 is a longitudinal sectional view of a form of wire package of my invention in which the wire may be removed from either the inner or outer peripheries of the coil;

FIGURE 8 is a fragmentary sectional view showing the package of FIGURE 7 with its core removed to permit withdrawal of wire from within the coil, and further illustrating a snap-in guide member to facilitate such withdrawal.

FIGURE 9 is a perspective view of apparatus for applying an outer wrapper around a coil of wire wound on a spool assembly, for compressing the sides of the spool, and for securing the wrapper to the spool sides, said apparatus having utility in conjunction with an alternative method of winding of a coil of wire and application of an outer wrap are carried out in separate apparatus;

FIGURE 10 is an elevational view showing a spool assembly having a coil of wire wound thereon and an outer wrapper in position to be secured to the sides of the spool, said spool assembly being shown mounted on a rigid support reel for transfer to apparatus for securing the wrapper in place in accordance with another embodiment of the invention; and

FIGURE 11 is an elevational view of apparatus for securing the outer wrap to the sides of a spool assembly of the type illustrated in FIGURE 10.

Before describing the coil package of my invention in detail it is believed desirable to refer generally to the structure and manner of operation of a coil winding machine modified as noted below to provide a coil package in accordance with the invention.

Referring to FIGURE 1 of the drawings, I have shown a coil winding machine indicated generally at 20, including a base plate 21 on which are mounted a pair of axle housing 22 and 23. The housing 22 accommodates an axle 24 on which is mounted a circular driving flange 25, a similar axle 24' and flange 25' being associated with the housing 23. The axles 24 and 24' are adapted to be moved axially relative to each other in order to bring their corresponding drive flanges into operative supporting position with respect to a spool or reel assembly positioned therebetween, and they are adapted to be rotated in order to effect the winding of wire or the like on the spool or reel. Conventional drive mechanism (not shown) for the winding machine is located within the housing 26.

A strand of wire 27 is shown passing over a guide pulley 28 and thence over a pulley 29 of a level winder mechanism indicated generally at 30. The mechanism 30 is of a type well known in the art, the pulley 29 being adapted to be moved laterally during winding of a coil of wire in order to assure proper positioning of the wire on a spool. In the embodiment shown the level winder mechanism 30 is mounted by a pair of stationary upright supports 31 and 32 which are connected by a cross-bar 33. A housing 34 accommodates drive mechanism (not shown) for operation of the level winder.

According to my invention an integrated spool or reel assembly, several suitable forms of which will be described hereinafter, is positioned between the drive flanges 25 and 25', and the flanges are moved axially towards one another to support the spool or reel for rotation and brace or reinforce the sides thereof. A strand of wire is then affixed to the hub of the spool, and the flanges are then rotated to effect rotation of the spool in order to wind a coil of wire around the hub of the spool. An elevator platform 35 may be provided to facilitate removal of a package of coiled wire from the machine.

The first form of spool assembly conceived by me in accordance with my invention is shown in FIGURES 7 and 8 to which reference may now be had. As there shown, the spool assembly includes a core or hub member indicated generally at 36, which forms an element of a sealed package of coiled wire ultimately to be produced. The core or hub member serves as a central support on which a coil of wire is wound and also as a protective cover or seal for the inner periphery of the coil. In the embodiment being described, the core or hub 36 is fabricated of sheet metal in two sections, such as shown at 37 and 38, which may be joined at their overlapped ends by soldering or other suitable means.

The longer core section 37 is fabricated in the form of a truncated cone to facilitate its removal from a wire package. The shorter core section 38, which is telescoped into the smaller end of the member 37 to which it is soldered, is provided with a shear band ring 39 having a tongue tab 40 thereon. It will be seen that the two core sections may be separated if desired by engaging the tab 40 with a turning key and shearing off the band 39, after which the longer core section 37 may be removed, as indicated by the dashed lines in FIGURE 7.

A pair of annular spool sides 41 and 42, preferably of light gauge sheet metal, are then fixed on opposite ends of the core or hub in spaced parallel relation to one another. The side plate 41 is joined at its inner periphery to the outer end of the core member 37, and

its inner diameter is therefore dimensioned accordingly, whereas the side plate 42 is provided with a smaller inner diameter corresponding to the outer end of the core member 38 to which it is joined at its inner periphery.

The side plates 41 and 42 may be secured in any conventional known manner to opposite ends of the core and as shown the inner periphery of the member 41 is bent back on itself, and the outer rim 43 of the core section 37 is bent radially outwardly so as to overlap the inner periphery of member 41 to form a sealed joint. The side plate 42 may be secured to the outer end of core member 38 in like manner but as shown embodies an alternative arrangement, in which the inner periphery of side plate 42 is bent back radially outwardly to form a circumferential recess and the outer rim of the core section 38 is first bent radially outwardly and then inwardly again at 44 so as to be seated in the circumferential recess.

A plurality of detents 45 are provided around the outer circumference of the core 37 immediately inwardly of the inner rim of the plate 41 so as to proivde a seat therefor. Similar detens 46 may be provided on the core section 38 to seat the side plate 42.

It is obvious that various other equivalent means may be used for joining the inner rims of the side plates to the corresponding outer ends of the core, it being understood that the essential purpose to be served is to provide an initial integrated arrangement of the side plates and core member.

With regard to the outer peripheral edges of the side plates 41 and 42, these edges are preformed prior to assembly, and in accordance with one embodiment of my invention, as shown in FIGURE 4, are provided with recesses for entry of the drive flanges 25 and 25' of the winding machine, and with recesses for an outer coil wrapping for the package to be described hereinbelow. Referring, for example, to the plate 42, the outer peripheral edge thereof is first bent axially outwardly to form a circular rim 47, as best seen in FIGURES 4 and 7, which as will be clear from FIGURE 2, is adapted to accommodate a supporting mandrel 48 on the drive flange 25 of the winding machine. The outer peripheral edge is then bent radially outwardly at 49 and then axially inwardly again at 50 so as to form the aforementioned circular recess, indicated at 51, for an outer coil wrapper. The side plate 41 is preformed in a similar manner to provide a rim 47' and recess 51'.

The supporting mandrels 48 and 48' are similarly dimensioned and are of a diameter which enables them to fit snugly within the circular rims 47 and 47', respectively.

The described spool assembly may be conveniently mounted on the winding machine 20 by positioning the side plates 41 and 42 between the drive flanges 25 and 25', as shown in FIGURE 2, after which the axles 24 and 24' are moved axially inwardly toward each other until the flanges 25 and 25' are in operative position to support the spool for rotation as seen in FIGURE 1.

It will be noted that the drive flange 25 comprises, in addition to the cylindrical mandrel 48, a flat annular face 52 and a smaller cylindrical mandrel or centering hub 53. Similar elements on the flanges 25' are designated with corresponding primed numerals.

It will now be understood that in its operative supporting position the drive flange 25 is disposed so that its flat annular face 52 engages substantially the entire area of the outside surface of side plate 42 so as to brace or reinforce the latter against outward axial displacement, the mandrel 48 is positioned within the rim 47 so as to provide support for the spool assembly as well as brace the rim against radially inwardly displacement, and the mandrel 53 is disposed within the core 36 to locate the spool and provide additional support for the spool in the winding of wire thereon. The drive flange 25' is constructed the same as drive flange 25 and positioned in

the manner described with respect to the opposing side plate 41.

When the embodiment of FIGURES 1 and 2 showing a cylindrical core or hub member is employed, the smaller mandrels 53 and 53' are similarly dimensioned and are of a diameter which enables them to fit snugly within the respective ends of the core 36. However, when the truncated conical hub of FIGURES 7 and 8 is utilized, the outer ends of the core sections 37 and 38 will be of different diameters, and the mandrels 53 and 53' must then, of course, be dimensioned accordingly so that each is accommodated snugly within a corresponding end of the core.

When the spool assembly has been mounted on the winding machine in the foregoing manner, the strand of wire 27 is attached thereto and the machine is set in operation so as to rotate the drive flanges and wind a coil of wire 54 on the core 36 between the two side plates 41 and 42. The coil is normally wound to a diameter approximately equal to the outer diameter of the side plates.

After the completion of the coil winding operation, the package is completed by applying an outer protective wrapper 55 which may be fabricated of fibre board, sheet metal, or various other flexible materials. The wrapper 55 is positioned around the outer periphery of the coil, within the side plate recesses 51 and 51', and the ends thereof are spliced in any suitable manner, as for example as shown at 56 in FIGURE 2. Thereafter, the sides of the wrapper are secured to the outer peripheral edges of the side plates 41 and 42, respectively, so as to lock the edges in place and at the same time seal the wrapper and side plates.

A two stage roller forming device suitable for effecting the afore-mentioned operation is indicated generally at 57 in FIGURE 1. The device 57 comprises a lever 58 which is pivotally mounted at 59 and carries a pair of forming rollers 60 and 61 for producing a continuous known lock seam joint. The term "lock seam joint" is used herein in its conventional sense in the canning art to mean that two members are formed so as to grip or be clamped by one another without the use of additional fastening means.

An actuating rod 62 has one end connected to the lever 58 and its other end connected to a crank 63, the latter being integral with a manually operable lever 64 for bringing the forming rollers into engagement with the edge of the wrapper 55 and the outer peripheral edge of the side plate 42 to form, upon rotation of the drive flanges, a continuous lock seam joint between the two. The dotted lines in FIGURES 4 and 5 illustrate the effect of the first and second stage rollers respectively. During the roller forming of the lock seam the latter is rigidly supported by the mandrel 48.

A similar roller forming device may be provided for simultaneously joining the plate 41 to the opposite edge of the wrapper, and a bar 65 is shown for operatively connecting the actuating rod 62 thereto.

Referring to FIGURE 5, it will be noted that the cylindrical flange 50 is bent back on itself and imbedded in the outer surface of the adjacent edge of the wrapper 55. This type of lock seam joint is desirable because it can be produced quickly and inexpensively and not only effectively seals the wrapper and the outer peripheral edges of the side plates 41 and 42, but it also locks the wrapper to the edges of the side plates to prevent outward axial displacement of the latter due to the pressure exerted thereon by the sides of the coil 54.

Various other equivalent types of joints may be employed and one alternative embodiment of package of my invention is shown in FIGURE 6 from which it will be seen that the rim 47 is substantially U-shaped to form a cylindrical recessed rim 66 and the sides of the wrapper are offset so as to be accommodated therein, the joint being effected by means of a tie strap 67 which is wrapped tightly around the cylindrical edge of the wrapper and secured at its ends by welding or by a suitable clamp. FIGURE 6 illustrates the formation of a peripheral edge 66' which extends radially outwardly of the wrapper 55. The completed package may thus be positioned horizontally and rolled on the edge 66' without damage to the coiled wire.

In the coiling of wire on the spool, the coiled wire 54 exerts considerable outward axial force on the spool sides 41 and 42, and the annular surfaces 52 and 52' on the drive flanges serve to brace the spool sides against outward displacement until the sides are locked at their outer peripheries to the wrapper 55, after which the flanges may be withdrawn and the completely sealed wire package removed from the winding machine.

The coiled wire is restrained in the completed package and after removal of the package from the winding machine will tend to exert axial forces on the spool sides tending to displace the sides away from each other. Such forces will place the core or hub of the spool and the outer wrapper under axial tension with the result that an exceptionally strong package may be formed by the use of light gauge or weight material for the core and wrapper.

In the form of package of FIGURES 7 and 8, the wire 54 may be withdrawn from the package by removing the wrapper 55 and unwinding it from the spool or by removing the core section 37 and withdrawing the wire from the interior of the coil.

The outer wrapper may be removed by cutting the same with any suitable cutting tool, as for example, by means of rotary cutter 68 which, as shown in FIGURE 3, may be positioned adjacent the outer peripheral portion of the spool side 42 which for this purpose may be provided with a clearance bevel 69.

In order to withdraw wire from the interior of the wire package of FIGURES 7 and 8, a turning key (not shown) is applied to the tongue tab 40 and the band 39 is sheared off thus disconnecting the two core sections 37 and 38. The longer core section 37, being formed as a truncated cone, can then readily be removed so as to expose the interior of the wire coil. The package may then be placed on its side as shown in FIGURE 8 and a snap-in guide member 70 inserted in the plate 41, after which the wire may be readily withdrawn from the interior of the coil.

The above-described coil package has been found to be surprisingly effective in protecting coiled wire from atmospheric corrosion as well as accomplishing the various other stated objects of this invention. However, it may be desirable in certain instances, as an added precaution against corrosion, to provide valve means (not shown) whereby the package may be charged with an inert atmosphere such as helium.

Various modifications of the method described hereinabove may be employed for making a coil package in accordance with the invention. For example, in some instances it may be desirable to wind a coil of wire on a spool in one machine, and to apply and secure the outer wrapper 55 in a separate machine specifically suited for this purpose. In accordance with the latter proposal, a spool having a core 36 and side plates 41 and 42 may be supported on a winding machine and a coil of wire 54 wound thereon as described hereinabove, after which the spool may be transported to a separate machine adapted to recompress the sides of the spool, and apply and secure an outer wrapper 55.

FIGURE 9 illustrates, somewhat schematically, apparatus adapted to apply and secure and outer wrapper to a spool which has previously had a coil of wire 54 wound thereon in a separate machine. Such apparatus may comprise a base 75, pulleys 76, and a conveyor belt 77 passing over said pulleys and having a plurality of saddles 78 thereon. Means for recompressing the sides of a spool is indicated generally at 80, and adjacent thereto a discharge conveyor 82 is shown for transporting completed wire packages to a shipping room or the like.

In operation, the pulleys 76 are rotated so as to move the upper run of the conveyor belt 77 toward the discharge conveyor 82. When a saddle 78 reaches station A an outer wrapper 55 is positioned thereon, and at the next station B a spool having a coil of wire 54 previously wound thereon is positioned on the saddle so as to overlie the wrapper 55. As the spool and wrapper move on toward station C, the coil 54 may be enclosed by applying the wrapper 55 therearound and around the outer peripheries of the spool sides 41 and 42, after which the spool will be moved on to station D where means 89 will recompress the spool sides and secure the side edges of the wrapper to the outer peripheries of the side plates, in accordance with one of the methods described earlier herein.

In carrying out the above modified method, it will be understood that the sides of the spool are braced during the winding of a coil of wire on the spool, such bracing is then discontinued while the spool is transported to a separate machine for applying the wrapper 55 and the latter machine is adapted to recompress the sides of the spool to their original dimension, after which the wrapper 55 is secured in place. The feasibility of this method depends upon the winding techniques employed and the material being coiled, and in certain cases it may not be practical to recompress the spool sides. However, with many types of materials and winding techniques, I have found this method particularly useful.

In still another method of making the coil package of this invention, a spool may be supported by a rigid reel and a coil of wire wound thereon, after which the rigid reel and spool may be transported to a separate machine adapted to apply and secure a wrapper 55. In this instance, it is not necessary to recompress the spool sides at the second machine, since the rigid reel will maintain these sides in position both during winding of a coil and during application of a wrapper, the completed wire package being removed from the reel after the construction of the package is completed. A rigid support reel is indicated generally at 85 in FIGURE 10, and comprises reel sides 87 and 89 which are held compressed against the spool sides 41 and 42 by means of a bolt 91 and nut 93.

When employing a support reel such as the reel 85 to transport a spool having a coil wound thereon to a separate machine for applying and securing an outer wrapper 55, the latter machine may be of the type shown in FIGURE 11. Such apparatus comprises a frame 95, a yoke 97 having a plurality of rollers 99 thereon for forming a continuous lock seam joint, and drive means comprising a motor 101, an air cylinder 103, and a drive 105 for rotating a spool mounted on the machine. During rotation the rollers 99 are caused to engage the outer peripheral edges of the spool sides to form a lock seam joint in the manner described earlier herein. If desired the yoke or seaming roller frame 97 may be rotated rather than the spool. A conveyor roll is shown at 107.

While in the foregoing description and in the appended claims I refer to wire as the product being packaged, it will be understood that my invention has application with respect to cables, rope, string and other products capable of being wound cylindrically.

It will be understood that various modifications and re-arrangements may be made in the embodiments selected for disclosing my invention without departing from the spirit and scope of my invention.

I claim:

1. A package comprising a spool composed of a core of rigid sheet material, and a pair of side plates of rigid sheet material one each being joined fast at the opposite ends of said core, a coil of wire mounted under axial compression on said spool by winding the wire of said coil on said core with the ends of said coil engaging the inside surfaces of said side plates biasing said side plates in a direction axially away from the ends of said coil, a

wrapper extending transversely between said side plates outwardly of said coil of wire, and the side edges of said wrapper being joined fast to said side plates, said core and said wrapper being maintained under axial tension by the axial compressive force of said coil on said side plates.

2. A package comprising a spool composed of a core, and a pair of annular side plates one each being joined fast at its inner periphery at opposite ends of said core, a coil of wire mounted under axial compression on said spool by winding the wire of said coil on said core with the ends of said coil engaging the inside surfaces of said side plates biasing said side plates in a direction axially away from the ends of said coil, a cylindrical wrapper extending coaxially of the axis of said core and between said pair of side plates radially outwardly of said coil, the side edges of said wrapper being joined fast to said side plates, said core and said wrapper being maintained under axial tension by the axial compressive force of said coil on said side plates, and said side plates being composed of sheet material of insufficient mechanical strength without being joined fast to said core ends and said wrapper to resist deformation by the axial compressive force of said coil of wire.

3. A package comprising a spool composed of a core, and a pair of side plates one each being joined fast at its inner periphery at opposite ends of said core means, a coil of wire mounted on said spool under axial compression by winding the wire of said coil on said core with the ends of said coil engaging the inside surfaces of said side plates biasing said side plates in a direction axially away from the ends of said coil, a cylindrical wrapper extending coaxially of the axis of said core and between said pair of side plates radially outwardly of said coil, the side edges of said wrapper being joined fast to said side plates, said core and said wrapper being maintained under axial tension by the axial compressive force of said coil on said side plates, said side plates being composed of sheet material of insufficient mechanical strength without being joined fast to said core ends and said wrapper to resist deformation by the axial compressive force of said coil of wire, and means for removing at least a portion of said core means to provide for withdrawing of wire of said coil from the interior of said core means.

4. A package comprising a spool composed of a hollow tubular rigid sheet material core having radially outwardly extending annular flanges at its opposite ends, and a pair of annular rigid sheet material side plates, one each being joined fast at its inner periphery inwardly of the annular flanges at the opposite ends of said core and with the outer surface portions of said side plates opposite the inner surface portions of said annular flanges of said core in engagement with each other, a coil of wire mounted on said core under axial compression by winding the wire of said coil on said core with the ends of said coil engaging the inside surfaces of said side plates biasing said side plates in a direction axially away from the ends of said coil, a cylindrical wrapper extending co-axially of the axis of said core and between said pair of side plates radially outwardly of said coil, and the side edges of said wrapper being joined fast to said side plates, said core and said wrapper being maintained under axial tension by the axial compressive force of said coil on said side plates.

5. A package of coiled wire or the like comprising a spool composed of a generally tubular core of rigid sheet material and a pair of annular side plates of rigid sheet material mounted in spaced parallel relationship on said core, said plates having cylindrical rims formed at their outer peripheries and being joined at their inner peripheries to a correspondingly dimensioned end of said core, respectively, a coil of wire mounted on said core under axial compression by winding the wire of said coil on said core with the ends of said coil engaging the inside surfaces of said annular side plates biasing said side plates in a direction axially away from the ends of said coil, a wrapper around the outer peripheries of said plates so as to

overlap each of said rims, and a tie strap around each of the cylindrical overlapping portions of said wrapper so as to join the side edges of said wrapper fast to said rims, said core and said wrapper being maintained under axial tension by the compressive force of said coil on said side plates.

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3,000,493	Hirst	Sept. 19, 1961
3,002,610	Granger	Oct. 3, 1961
3,014,577	Bruestle	Dec. 26, 1961