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(54) **Filamentary material coil and package and method of winding material into such a coil and package.**

(57) A wire coil (13) is spirally wound in layers in a package container (10) having a plurality of straight sides contacting the periphery of the coil. Upon completion of the winding of the coil, the layers of the coil are secured together by tie members (15) in a multiplicity of positions around the coil. The wire (12) fed to the container (10) has a cast larger than the outside diameter of the coil formed therefrom.

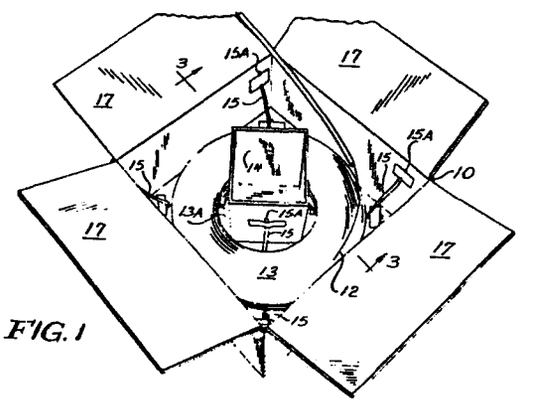

FIG. 1

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Filamentary material coil and package and method of winding material into such a coil and package

The present invention relates to a cylindrical coil of filamentary material (e.g. wire) wound in layers, each layer of material in the coil forming a spiral and a shipping package containing the cylindrical coil of material. The invention also embraces a method of winding wire into a coil.

In the past, it has been known to coil wire or rods into specially adapted cylindrical containers or reels for shipment of the filamentary material to the end user. For example, U.S.P.-A 3,014,577 and 3,822,045 disclose, respectively, coils of spirally wound wires and rods in layers positioned in specially designed cylindrical shipping containers. However, such known coils and shipping containers have the disadvantage that during the spiral winding of the wire into the cylindrical container, a very complicated winding control system has to be used in order to fill the container without leaving voids in each layer of wire. Such a void in a layer of wire permits wire from an upper layer to drop down into the lower adjacent layer, thereby resulting in and causing snags or snarls of the wire during removal from the cylindrical container.

Additionally, such prior art cylindrical coils and containers permit displacement of wire from its correct layered position during shipment of coils of the wire which can again result in snags upon removal of wire from the container. To overcome this problem, the prior art has suggested the use of rings for pressing against the top of the coil during shipment in an attempt to prevent this displacement. However, the use of rings does not eliminate the movement of the coiled wire from an upper layer to a lower layer when there is a void in the lower layer of the wire.

A further disadvantage of and problem with the prior art coils and shipping containers is the formation of loops in the wire as the wire is being removed from the container. This formation of loops during removal also causes snags in the wire.

Additionally, the prior art cylindrical containers utilize a large diameter core about which the coiled wire is wound, which core necessitates the shipping container being reinforced and bulky in size to accommodate the coiled wire. Accordingly, such prior art packages are unnecessarily bulky and utilize shipping containers which are non-disposable and must be returned for subsequent refilling by the end user.

The present invention seeks to provide an improved cylindrical coil of filamentary material wound in layers, with each layer of material forming a layered spiral and a multi-sided shipping package for the cylindrical coil of material.

The present invention also seeks to provide a cylindrical coil of filamentary material utilizing a small diameter core and a shipping package for the coil.

According to one aspect of the invention there is provided a coil of filamentary material comprising alternate layers, one layer wound in an increasing spiral from the inside of said coil to the outside of said coil and the next adjacent layer wound in a decreasing spiral from the outside of said coil to the inside of said coil, and a container therefor, which is characterised in that said coil is secured together in a multiplicity of positions around said coil and said package container has a plurality of substantially straight sides each contacting part of the periphery of the said coil.

According to a further aspect of the invention there is provided a method of winding wire into a coil which comprises feeding the wire to a package container in a series of superposed spiral layers which is characterised in that the container has four or more straight sides and the wire is led into the container so that the outer turn of each layer contacts each straight side of the container.

The present invention permits the use of a simple winding control which spirally winds filamentary material into a shipping container having a multiplicity of sides which permit the filamentary material to slightly bulge, in varying amounts, into the apices formed between adjacent sides of the shipping container. A multi-sided central winding insert can be positioned in the centre or core of the coil and can be used during winding to permit the filamentary material to slightly bulge on the inside of the coil to provide a small diameter core for the coiled material. Before removing such a central insert for shipping the coil, the coil can be secured by tying or strapping the coil in the shipping package in a multiplicity of positions. Securing of the coil in the package is readily permitted by the utilization of a multi-sided shipping container and a central winding insert.

Importantly, by forming the cylindrical coil of filamentary material in layers with each layer wound as a spiral and by requiring that the filamentary material possesses a cast of a diameter larger than the diameter of the periphery of the coil, the formation of loops in the filamentary material upon removal from the coil is eliminated.

A coil and package in accordance with the present invention occupies substantially less space for shipment and storage than does a prior art package of comparable

quantity and results in a coil and package which is in a more dense condition than prior art coils and packages. Moreover, the present invention permits the use of a smaller diameter central core in the coil which substantially eliminates tangles, snags or the formation of loops upon removal of the filamentary material from the coil. Additionally, the package for the coil can be disposable thus eliminating the attendant costs and handling charges necessary for returning expensive cylindrical containers for subsequent reusage.

The invention will now be further described by way of example, with reference to the accompanying drawing, in which:

Figure 1 is a perspective view of a partially wound wire coil and package of a first embodiment in accordance with the present invention;

Figure 2 is a top view of a second embodiment in accordance with the invention showing a secured wire coil after winding but before removal of a central winding insert in a shipping package container; and

Figure 3 is a cross-sectional view taken along lines 3-3 of Figure 1.

Referring now to the drawing, wherein like numerals have been used throughout to designate the same or similar parts, in Figures 1 and 3, a package or container 10 which is square in plan is shown receiving a wire 12 as it is spirally wound into layers to form a wire coil 13. A square central insert member 14 is shown positioned in the centre or core 13A of the coil 13. A plurality of tie members 15 are positioned within the box with the ends 15A thereof releasably attached (e.g. taped) to the inside of the container 10 or the sides of the central insert 14.

Figure 2 illustrates a second embodiment of coil and package according to the invention. In this case the container 10 is a regular octagon in plan with a central insert 14 for the coil 13 in the form of a cross-frame member. It should be pointed out that the scope of the present invention includes other multisided packages or containers, such as, containers having five, six or seven sides. A fully wound wire coil 13 is shown in Figure 2 and the turns thereof can be seen to be secured together by a plurality of tie members 15. Scuff pads 16 are shown in Figure 2 positioned between the tie members 15 and the wire coil 13 to prevent damage or marking of the wire 12 during shipment and storage, but these are not essential.

In Figure 3, the container or package 10 is shown with its upper flap members 17 flared out at about a 45 degree angle and positioned on a flange member 19 of a driven member 20. A feed tube 18 positions wire 12 between the sides of the container 10 and the corners of the central insert 14. The driven member 20 includes a shaft 21 and a gear member 22. A motor 23 drives a gear 24 in mesh with the gear member 22.

Preferably, the wire 12 is processed through the feed tube 18 at a constant rate so that the drive motor 23 includes a programmed speed control mechanism (not shown) which slows down the flange member 19 and the container 10 as the turn radii increase, thereby permitting the layer of turns of the wire 12 to spiral outwardly. This slowing down of the speed of rotation of the container 10 is permitted to proceed slightly more than when the wire 12 first contacts the container 10. By controlling the speed in this way, the wire 12 is made to bulge slightly outwardly into the apices formed between the sides of the package or container 10. Additionally, the drive motor 23 may be made to speed up slightly when

the wire 12 contacts the corners of the central insert 14 thereby pulling the wire in slightly toward the corners of the central insert 14. On the next layer of the coil, the rotational rate of the flange member 19 will increase as the turns approach the central insert 14 so that the next spiral layer is correctly formed. In conventional cylindrical containers and inserts in accordance with the prior art in this field of technology, this leeway in permitting variations in speed at the periphery and inner arc of each leyer of wire of the coil thereof is not permitted or the wire will either climb up or leave a void in the layer of wire because of the difficulty in accurately programming the speed control of the package with respect to the depositing of the wire therein.

After the coil of wire has been fully wound, the layers of the coil 13 are secured together in a multiplicity of positions utilizing the tie members 15, to ensure that the individual turns of wire 12 in the coil do not shift between layers thereof during transport and shipping of the wire coil 13 and the package 10. After securing the coil 13, the central insert 14 is removed and may be reused on subsequent coil windings.

The wire coil and its individual layered turns of wire 12 once placed in the package or container 10, do not move from their intended layered position in the container until the wire is removed therefrom by being unwound in a reverse manner to that in which the wire was formed into the coil. Generally, the wire is removed from the coil while the container or package 10 is stationary and, if desired, a different type of central insert is used during the removal of the wire.

Importantly, it has been found that when the cast of the wire 12 is larger than the periphery of the coil 13, snags or snarls caused by loops in the wire are eliminated and avoided during unwinding. The word "cast"

is meant to mean the free-form curvature adopted by a piece of wire when it is placed on a flat surface. When the wire 12 is withdrawn from a stationary container 10, a twist is imparted into the wire for each loop removed. By having the cast of the wire larger than the periphery of the coil, the formation of loops during withdrawal is avoided.

From the foregoing, it will be seen that the present invention affords a useful wire coil and shipping package. By the use of the coil and package, a 500 mm wide package or container 100 mm thick can hold and protect during shipment up to 68 kg of coiled fine wire, having an inner core 250 mm in diameter. Thus, a wire coil and package in accordance with the present invention permits the packaging, shipment and storage of an equivalent amount of wire in approximately one-fourth the space required by the conventional cylindrical-shaped containers in accordance with the prior art. The economy in shipping and storage costs are significant in the present invention because the wire winding is in a much more dense condition utilizing a smaller core for the wire coil. It is believed that the reason for the economy in storage and the dense condition result from the substantially layered, planar spiral lay of the wires within the coil package. Additionally, the package container in accordance with the present invention is disposable thereby eliminating the need for deposit payments and the usage of spools and the like which must be returned by the end user to the wire manufacturer, as required by the containers according to the prior art teachings.

It will be understood that the specific embodiments described above are capable of variation and modification, and that the invention is defined by the following claims.

CLAIMS

1. A coil (13) of filamentary material (12) comprising alternate layers, one layer wound in an increasing spiral from the inside of said coil to the outside of said coil and the next adjacent layer wound in a decreasing spiral from the outside of said coil to the inside of said coil, and a package container (10) therefor, characterised in that said coil (13) is secured together in a multiplicity of positions around said coil and said package container (10) has a plurality of substantially straight sides each contacting part of the periphery of the said coil (13).

2. The coil of filamentary material claimed in claim 1, characterised in that said filamentary material (12) has a cast of a diameter larger than the diameter of said periphery of said coil (13).

3. The coil of filamentary material claimed in claim 1 or claim 2, characterised in that said package container (10) is square in plan.

4. The coil of filamentary material claimed in claim 1 or claim 2, characterised in that the package container (10) is a regular octagon in plan.

5. The coil of filamentary material claimed in claim 1 or claim 2, characterised in that the package container has from four to eight straight sides.

6. The coil of filamentary material claimed in any preceding claim, characterised in that the turns of the coil (13) are secured together by a multiplicity of fastening tie members (15).

7. The coil of filamentary material in accordance with any preceding claim characterised in that a central

winding insert member (14) is positioned within said package container (10) for defining the centre (13A) of the coil (13) during winding of said filamentary material (12) into alternate layers spiralling towards and away from said centre (13A).

8. A method of winding wire (12) into a coil (13) which comprises feeding the wire (12) to a package container (10) in a series of superposed spiral layers characterised in that the container (10) has four or more straight sides and the wire (12) is led into the container (10) so that the outer turn of each layer contacts each straight side of the container (10).

9. A method as claimed in claim 8, characterised in that the wire (12) has a cast of a diameter larger than the diameter of the outer turn of any layer in the coil (13).

10. A coil (13) of filamentary material (12) comprising alternate layers, one layer wound in an increasing spiral from the inside of said coil (13) to the outside of said coil (13) and the next adjacent layer wound in a decreasing spiral from the outside of said coil (13) to the inside of said coil (13), characterised in that said filamentary material (12) has a cast of a diameter larger than the diameter of said periphery of said coil (13) of filamentary material (12).

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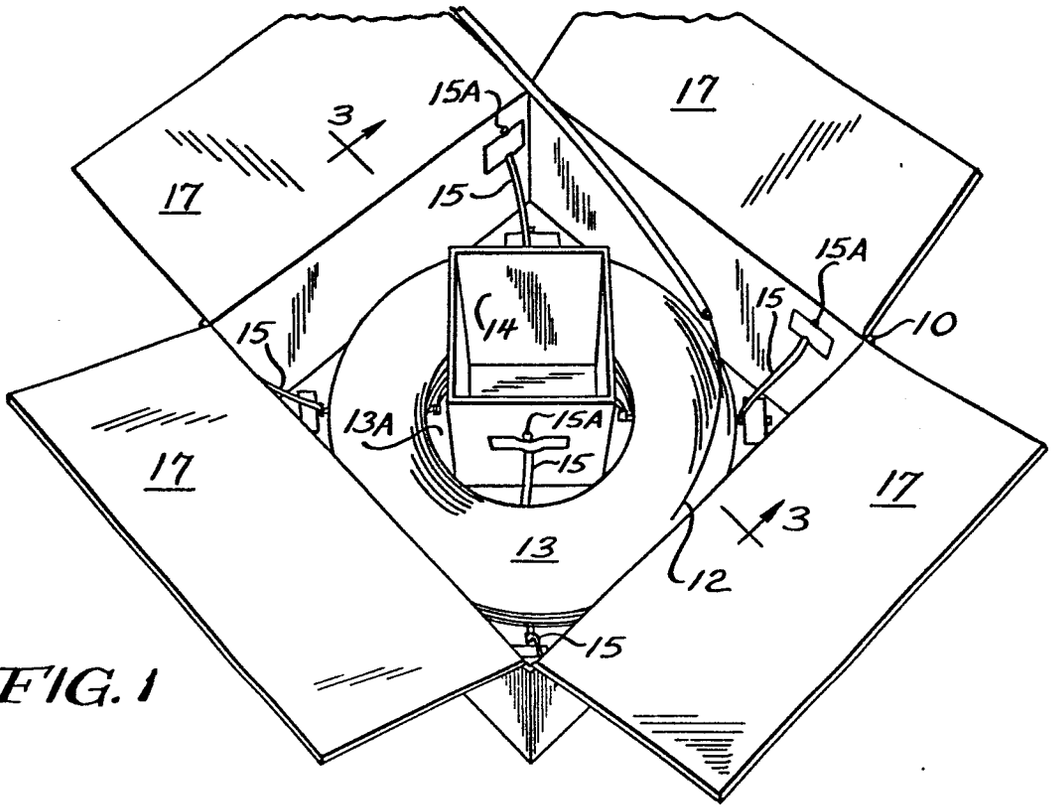

FIG. 1

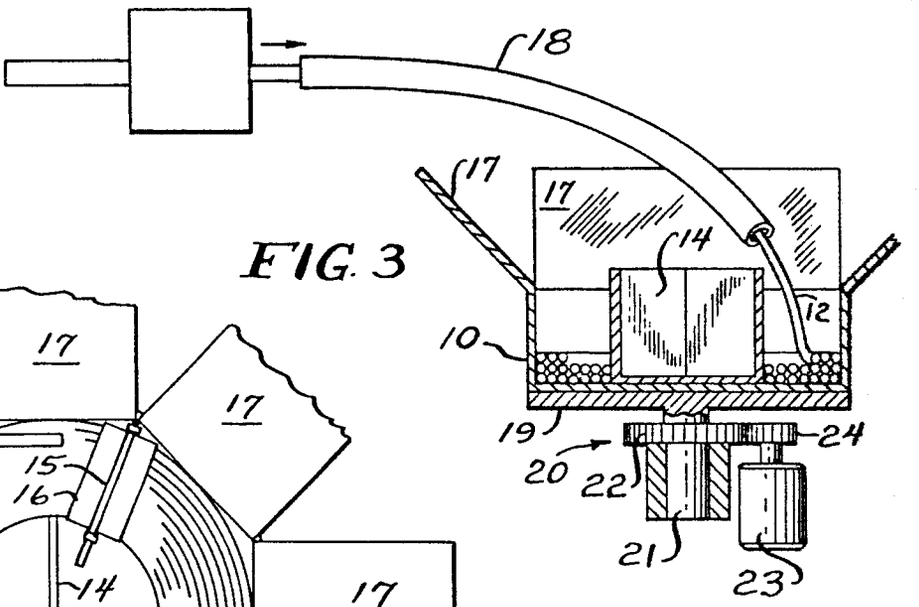

FIG. 3

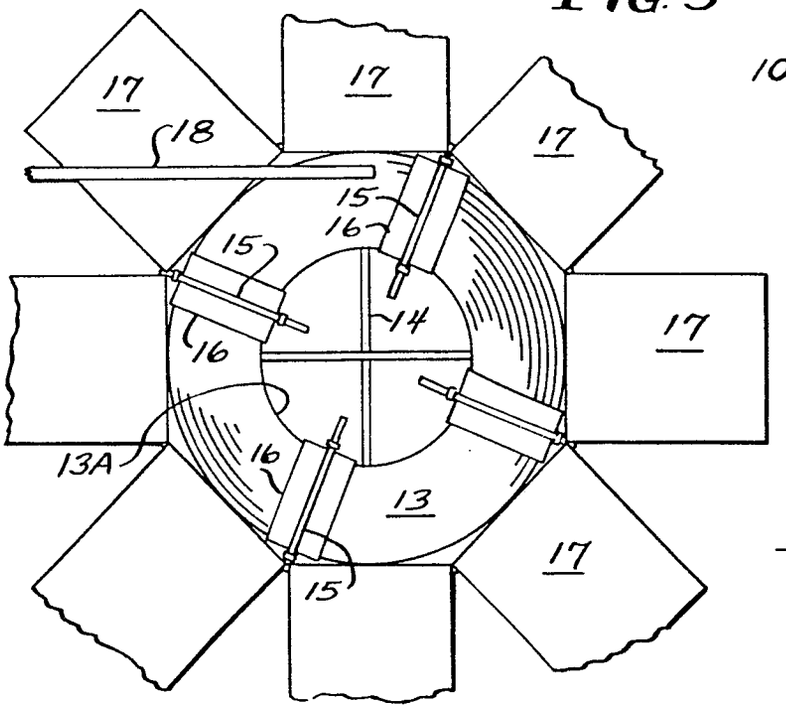

FIG. 2