

May 15, 1951

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2,552,594

COIL PACKAGE

Filed June 5, 1946

2 Sheets-Sheet 1

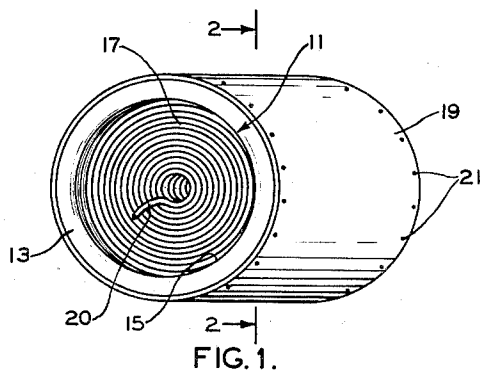


FIG. 1.

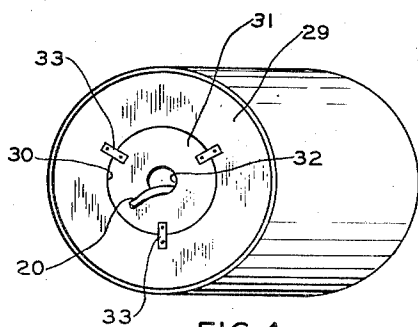


FIG. 4.

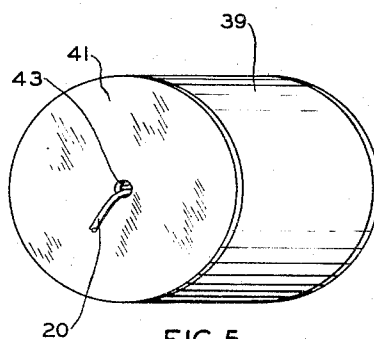


FIG. 5.

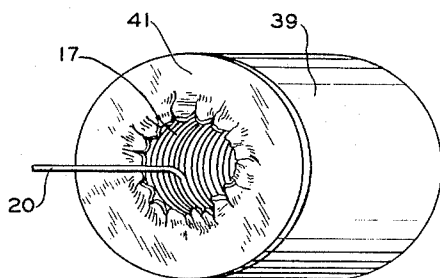


FIG. 6.

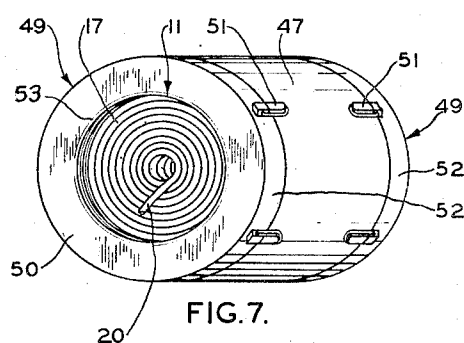


FIG. 7.

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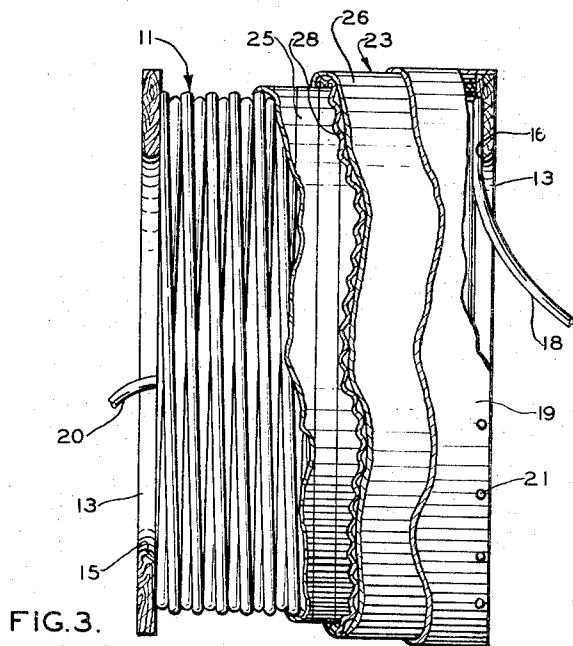
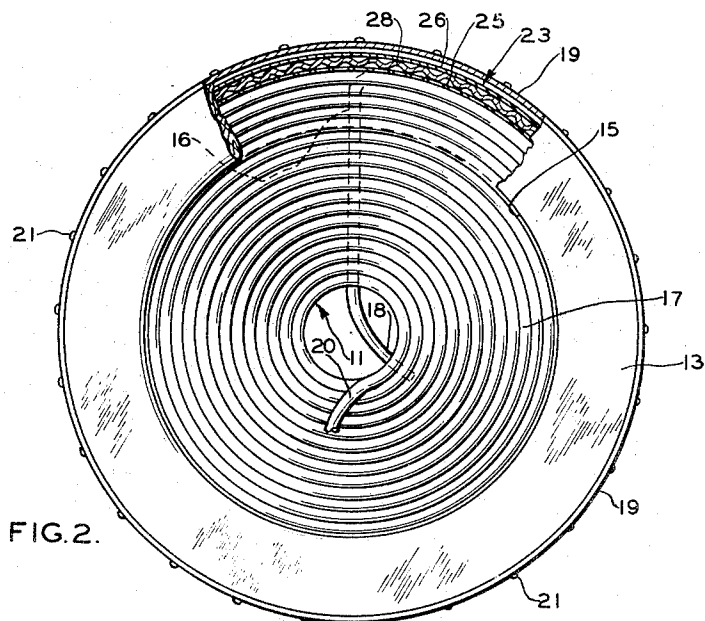
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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COIL PACKAGE

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4 Claims. (Cl. 206—52)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

The present invention relates to improvements in coil packaging, and more particularly to packages for coils of wire and the like, such as coils as described in my copending applications, Serial Numbers 674,411, 674,412 and 674,413, now Patent No. 2,490,837 issued December 13, 1949 and methods and means for accomplishing such packaging.

Although in the present application the invention will be described and illustrated in connection with the packaging of coils of insulated electrical wire, it will be understood that the invention is applicable to the packaging of many other elongated or filar materials, such as rope, twine, flexible tubular conduit for electrical wires, multiple conductor cables, uninsulated wire, flexible stranded wire rope, etc., and hence should not be deemed to be limited in its application to coils of insulated electrical wire. In the absence of a more suitable generic term, the word "wire" will be used herein to indicate such materials.

Further, the present invention will be disclosed and illustrated in connection with coils which are pulled out from the inside, that is the innermost turns are unwound first. However, the present invention should not be deemed limited thereto as it will be obvious to those skilled in the art that the invention set forth has a far broader application.

As used in the present application, the word "coils" will be used in its broadest sense, and will be deemed to include any and all types of windings of elongated materials (such as rope, wire, etc.), wherein the said material is wound about an axis, irrespective of the geometrical shape (as spherical, cylindrical, etc.) and irrespective of the type of winding (as level layer wound, honeycomb, etc.) and irrespective of the pitch at which the turns are wound.

The conventional manner of paying out or laying telephone wire or the like is to unwind it from a spool or reel which is rotated about its axis during the laying process. This method has a number of drawbacks, among which are the fact that it requires a certain amount of heavy equipment, namely, the reels and equipment to rotatably sustain the reels during unwinding, thereby greatly reducing or impairing operational scope; that friction between moving parts and the inertia of the reels and the wire thereon must be overcome as the wire is unwound so that laying

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at high speeds is not practicable; that it usually is noisy in operation; that continuous telephone or telegraph communication through the wire during the paying out operation is not possible; and that certain special military tactical installation requirements are not possible at all with such equipment.

Efforts to overcome the said objectionable characteristics have resulted in attempts to wind satisfactory coils of wire having hollow centers, so that the wire could be drawn out from the center without rotating said coils about their axes. This was an improvement in some respects but, prior to the invention covered in the present application and in my copending applications aforementioned, it was found that, in the use of such coils, certain other objectionable characteristics appeared. For example, during laying, particularly at high speeds (such as when laid from a motor vehicle or airplane), the wire would be lacerated and abraded and would be subjected to torsional stresses and sharp bends so as to weaken or even fracture the wire. Also the wire would come out in bunches, particularly at the end of a coil, thus resulting in snarls, knots, deformations of lay-twist, etc. As a result of the foregoing the wire might be so damaged as to be unusable for communication purposes and also the effective length thereof might be greatly shortened.

The improvements of "pretwisting," "turn-to-turn restraint" and "turn-to-package restraint," as covered in my copending applications mentioned above, eliminated most of these objectionable characteristics, but a suitable package for the improved coils was still required. Proper packaging is necessary or helpful to facilitate storage and transportation of coils, and, in the case of some coils to assist in preventing their unintentional unwinding, and to suitably sustain them while they are being payed out so as not to interfere with the paying out operation, and to prevent damage to the wire or the like, and, in the case of tandem laying, to prevent the telescoping of successive coils.

The objects of the present invention are as follows: to provide suitable packaging for coils of elongated material, such as wire, rope, etc., which protects them against accidental unwinding during their transportation and ordinary handling, but which, nevertheless, allows them to be payed out, to the bitter end, at both high and low speeds without strain or damage to the elongated material and which enables the outermost layer thereof to be sustained so as to prevent the

collapse thereof; to provide packages which expedite the laying of the coils thereof in tandem; to provide packages for coils which are light in weight and small in volume; to provide packages for coils which are inexpensive and easy to fabricate; to provide packages for coils in which the openings through which they are payed out are automatically self-adjusting, or manually adjustable, so as to produce opening sizes suitable to the speed and manner at which the coils may be payed out; and to provide a package for coils of wire, and the like, which are so versatile as to be suited to laying by plane, motor vehicle, boat, pack animal, a man on foot, etc.

These and other objects and advantages of my present invention, will be better understood as the detailed description thereof progresses.

In the accompanying specification there are described, and in the annexed drawings illustrated, what are at present considered preferred embodiments of my invention. It is however to be understood that the said invention is not to be limited to said embodiments inasmuch as changes may be made without the exercise of invention and within the true spirit and scope of the appended claims.

In the drawings, Figure 1 is a perspective view of one form of package embodying the present invention;

Figure 2 is an enlarged left end view of the package of Figure 1, partly broken away and sectioned along the line 2-2 thereof;

Figure 3 is a right side elevation of the package of Figure 2, partly broken away and partly sectioned to show the inside construction thereof;

Figure 4 is a perspective view of a modified form of package, wherein the pay out opening may be adjusted to the speed and conditions under which the coil is to be payed out;

Figure 5 is a perspective view, shown before being payed out, of another modified form of package embodying the present invention, wherein the pay-out opening is self-adjusting;

Figure 6 is a perspective view, during pay-out, of the package of Figure 5, illustrating how the opening is automatically self-adjusted; and

Figure 7 is a perspective view of a reusable form of package which may be used alone or in combination with packages of the type shown in Figures 5 and 6.

Referring now to the drawings and particularly to Figures 1, 2 and 3 thereof, a package embodying the present invention is there shown in connection with a coil 11 of electrical communication wire. The package itself includes two end members 13, each of which is a flat ring of plywood or the like which has a relatively small dimension in a radial direction so that the pay-out aperture 15 therethrough is of as large a size as possible. One of said end members 13 is provided with one radially disposed slot 16 cut into its inner surface to accommodate the outermost end 18 of the wire 17 of the coil 11.

The peripheral edge of the aperture 15 through said end member 13 should preferably be rounded and smooth so as to offer as little frictional resistance as possible, to the wire 17 of the coil 11 when it is being payed out, innermost end 20 first. If the inside diameter of said aperture 15 is sufficiently large and the wire 17 is payed out substantially perpendicularly to said end member 13, the wire and end member should never actually come in contact with each other so that no damage to the wire should occur. Also, if the coil is to be payed out only at low

speeds, then damaging friction will not occur and the aperture 15 need not be so large.

The two end members 13 are joined together by a tubular wall 19 of sheet metal or the like, which may be secured to the end members 13 in any suitable way as by a plurality of tacks 21. Said tubular wall 19 should preferably be sufficiently stiff against longitudinal compression so as to prevent longitudinal telescoping of a plurality of the packages in the event that they are payed out in tandem (such as described more specifically in my copending application, Serial Number 674,413).

Inside the tubular wall 19 is a cylindrical liner 23 of a material which may be suitably cemented to the outer layer of turns of the coil 11. Said liner 23 should be stiff enough so that it will not collapse inwardly during the laying operation, but nevertheless should have some flexibility so that it may conform to minor irregularities in the contour of the outer layer of the coil 11 so that it can be bonded to the said outer layer. I prefer half-corrugated cardboard for the liner 23, the corrugations running parallel to the axis of the coil 11. However, other suitable substances may be substituted for the half-corrugated cardboard. The said liner 23 should make a snug fit about the outermost layer of the coil 11 and should be secured thereto by a suitable adhesive means. I wind Scotch tape 25, with its adhesive surface facing inwardly, tightly around the outer cylindrical surface of the coil 11, then cover the outer, or back, surface of the Scotch tape with any suitable adhesive and then wrap the liner 23 tightly about said Scotch tape. By "half-corrugated cardboard" I mean that type which is made up of one flat sheet 26 and one corrugated sheet 28 secured to one surface thereof. Thus it may be flexed about an axis parallel to the corrugations, but not about an axis perpendicular thereto. I paste the said half-corrugated cardboard with its corrugated sheet 28 facing inwardly to said Scotch tape 25.

The modified package shown in Figure 4 is similar to the package already described (Figures 1-3) except that each end member comprises an outer end ring 29, pierced by a relatively large pay-out aperture 30, similar to the end member 13 already described above, and an inner end ring 31, pierced by a relatively small pay-out aperture 32, which inner ring 31 nests in the aperture 30 of said outer end ring 29.

Said rings 29, 31 may be held together by any suitable means, as by the metal straps 33 which are set into the rings 29, 31 so as to be flush with the outer surfaces thereof and are fastened to both of said rings. The inner peripheries of both the apertures 30, 32 should preferably be rounded and smooth. Both of the end rings 29, 31 at one end of the package should be provided with a radially disposed slot (not shown), as the slot 16 described above (see Figure 3).

The modified form of package shown in Figures 5 and 6 is similar to the cylindrical packages as used for breakfast cereals and the like, in that the tubular cover 39 is preferably made of cardboard and the circular end caps 41 are made of a suitable, easily torn or friable material, such as cardboard or preferably paper of the blotting paper type. Said end caps 41 may be secured in any suitable way to the tubular cover 39.

Each end cap 41 is provided with a small central opening 43 through which the wire 17

may be payed out. A liner 23, as already described above, should preferably be installed within the tubular cover 39 of the modified form of package shown in Figures 5 and 6.

The forms of package already described (Figures 1-6) are of the type which may be used once and then discarded. However, for certain uses, it is advisable to have a permanent, reusable type, container (Figure 7) which may be used over and over again, the coils 11 being supplied with any light packaging means (such as the package of Figures 5 and 6) and then installed in said permanent container, so as to be suitable for tandem or any other type of laying.

The reusable container or package illustrated in Figure 7 comprises a tubular cover 47, of metal or the like, and a pair of end plates 49 of metal or the like. Each end plate 49 comprises a flat ring 50, the outer periphery of which is bent over to form a tubular flange 52 of a size to fit snugly over one end of the tubular cover 47. The end plates 49 are secured to the tubular cover 47 by means of several catches 51 of any conventional type. The inner edge of the pay-out aperture 53 of each end plate 49 should preferably be rounded and smooth to prevent damage to the wire 17 of a coil 11.

In the use of the first form of the present invention (Figures 1-3) the innermost end 20 of the wire 17 leading from the innermost layer of the coil 11 is pulled out through the aperture 15 in one of the end members 13 and said wire 17 is then payed out, preferably in a direction aligned with the axis of the package and the coil 11. The said aperture should preferably be as large as possible, the radical thickness of said end member 13 being merely sufficient to give said end member sufficient structural strength to hold the tubular wall 19 in place and protect the coil 11 against blows to which it may be subjected in ordinary handling and to also prevent telescoping of the packages in the event that several of the coils 11 are laid in tandem (as described in my copending application, Serial Number 674,413).

If the aperture 15 in the end member 13 is large, the wire 17 should feed out without touching it. However, toward the latter part of the unwinding operation, as the outermost layers of the coil 11 are being unwound, the larger the aperture 15 the less the possibility of the wire 17 hitting or rubbing against the edge of said aperture while being payed out. Said edge is preferably rounded and smooth so as to prevent any damage to the wire 17, even should contact therewith be made.

Ideally, the aperture 15 through which the coil 11 is fed out should be as large as possible. However, as a practical matter, it has been found that, during the paying out operation, the wire 17 will feed out fairly close to the axis of the coil 11 and hence no damage will be done if the size of the aperture 15 is reduced to some extent.

In reducing the aperture, a greater measure of protection is given to the coil 11 during transportation and handling preparatory to actually laying the wire. If too much of the coil 11 is exposed through a larger aperture 15 in the end member 13, there is a greater likelihood that something may strike against the coil and disarrange the turns thereof so as to lead to snarls during laying. Thus it is found preferable to strike a balance between a very large aperture 15 to avoid contact between the wire 17 and the

edge thereof and a smaller aperture to protect the coil 11 prior to laying.

The slot 16 on the inside of one of the end members 13 accommodates the outermost end 18 of the coil 11. Said end 18 is then available for communication, through the wire 17, during the laying operation, and for splicing two coils 11 together for tandem laying (as described in my copending application, Serial Number 674,413).

It has been found that a coil 11 intended for slow speed laying, as for instance by a man on foot, or even by a slowly moving motor vehicle, can be payed out safely through a relatively small aperture 15 in the end member 13, there being no danger of damage to the wire 17 while being payed out, because of the low speed. However, if high speed operation is required, as where the wire 17 is to be payed out from an airplane, for instance at speeds of 150 miles an hour, a larger aperture 15 is advisable.

A modified form of coil package having an adjustable aperture is shown in Figure 4. In the use of said package when the coil 11 is being laid at slow speed, the package is used as shown, the inner ring 31 being retained in place. However, when said coil 11 is used in high speed laying (as for instance in tandem laying from an airplane as shown in my Patent 2,490,837), the inner ring 31 may be removed by removing the metal straps 33, thereby enlarging the opening to a size more satisfactory for high speed laying.

The modified form of package shown in Figures 5 and 6 is adapted to form the size of pay-out aperture which is best suited to the particular conditions and speed of paying out the wire 17. Here the package is made with a relatively small pay-out aperture 43 which preferably should be of approximately the same diameter as the diameter of the central cavity of the coil 11. Then the end caps 41 completely cover the ends of the coil 11 and protect the turns thereof from being dislodged from their respective positions during transportation or handling. However, during the laying of a coil 11 from such a package, should the wire 17 strike against the edge of the pay-out aperture 43, it will tear the material of the end cap 41 so as to enlarge said aperture. Thus the said aperture 43 will be enlarged to the extent requisite for satisfactory paying out of the wire 17 (as shown in Figure 6). No damage is done to the wire 17 in striking against the blotting paper or other similar material of the end caps 41.

The package shown in Figure 7 is of a type to suit certain special conditions where reduced weight and bulk of equipment is of paramount importance. Then a coil 11 should preferably be packaged in as light a package as possible. For instance, it may be packaged only by wrapping it in Scotch tape 25 and a half-corrugated cardboard liner 23 (as described above and illustrated in Figures 2 and 3), or it may be packaged in the package of Figures 5 and 6, or some similar lightweight paper package.

The coil 11 with or without the lightweight package (dependent upon the particular type used) may then be inserted into the container of Figure 7 for paying out. Said container suitably protects it against blows which it might receive as a result of rough handling but still allows the wire 17 to be payed out as in the other packages already described. The pay-out apertures in the end plates 49 may be of a fixed size, if the speed and conditions of laying are determinable in advance, or it may be made up of several con-

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centric rings similar to the modified form shown in Figure 4. The container of Figure 7 has sufficient longitudinal strength to allow laying in tandem and to prevent the telescoping of successive packages. Said container may be opened up and used over and over again to pay out additional coils 11. Thus a plurality of coils 11, packaged for least weight and bulk, may be payed out by the use of one of the containers of Figure 7.

It should be understood that, as explained hereinabove, an ideal package will have as large a pay-out aperture as possible. However, this is only practical if the turns of the coil, particularly at the ends thereof, are suitably prevented from spilling out or unwinding prematurely and if the ends of the coil will not be subjected to blows which may displace turns of wire so as to cause the coil, subsequently, to pay out with snarls, knots, etc. The turns may be prevented from spilling out or becoming easily disarranged by means of a suitable "turn-to-turn restraint" (as is disclosed at length in my copending application, Serial Number 674,411). If in a particular coil, "turn-to-turn restraint" is not used, or is used for very slight restraint, or there is any likelihood for any other reason that, during transportation or handling in preparation for laying, etc., the wire may spill out or the turns may be upset, it is advisable, where a large pay-out aperture is provided in the package, to also provide additional protection, such as a sheet of tearable or friable material (as the end member 41, of blotting paper or the like, of Figures 5 and 6) which will provide sufficient protection for the coil, but will nevertheless not interfere with the paying out thereof.

While there have been described what are at present considered preferred embodiments of my invention, it will be obvious to those skilled in the art that many changes and modifications may be made therein without departing from the invention, and it is aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. In combination, a coil of wire provided with a hollow center from which it may be uncoiled, a tubular wall encircling said coil, a circular end member attached to each end of said tubular wall, at least one of said end members comprising two

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concentric rings, each of said rings having a central pay-out opening for said wire, the inner ring being removable to permit the pay-out opening of the outer ring to be used for uncoiling said wire.

2. In a package for a coil of wire, a tubular wall surrounding said coil, two circular end members secured to the ends of said wall, at least one of said end members being provided with a pay-out aperture, a tubular liner within said wall and encircling said coil and making a snug fit about the outermost layer of turns thereof, an adhesive means releasably securing the turns of said outer layer to the inner surface of said liner, said liner being at least sufficiently stiff to prevent inward collapse thereof during the paying out of the outermost layer of turns of said coil.

3. In a package for a coil of wire, a layer of Scotch tape encircling the coil with its adhesive surface in intimate contact therewith, a liner of corrugated cardboard snugly encircling the Scotch tape, an adhesive means between the outer surface of the Scotch tape and the inner surface of the liner, a substantially cylindrical container surrounding said coil and liner, said container including a pair of spaced coaxially disposed end members and a tubular wall joining said end members and encircling the liner, at least one of said end members being pierced by a pay-out aperture.

4. In a package as defined in claim 3, wherein at least one of said end members is provided with a substantially radially disposed slot receivable to the outermost end of the wire of the coil.

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