

April 6, 1965

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3,176,932

SPOOL FOR WIRE

Filed June 26, 1963

2 Sheets-Sheet 1

Fig. 1

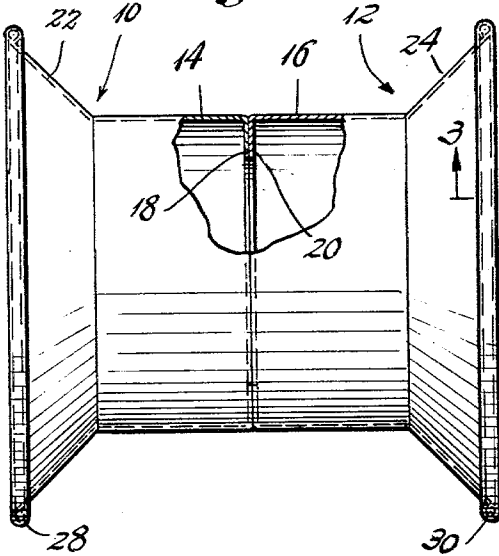


Fig. 2

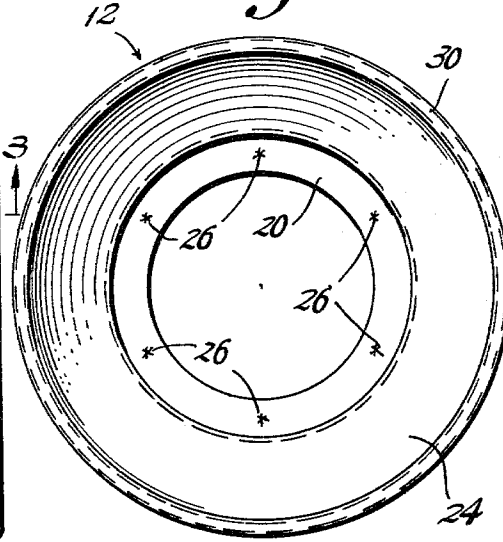


Fig. 3

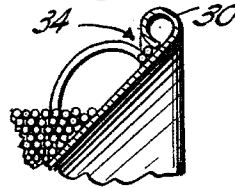


Fig. 5

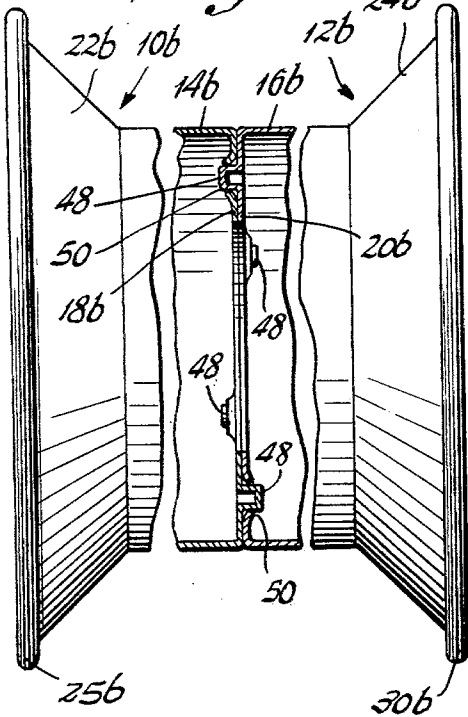
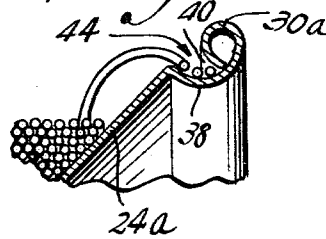


Fig. 4



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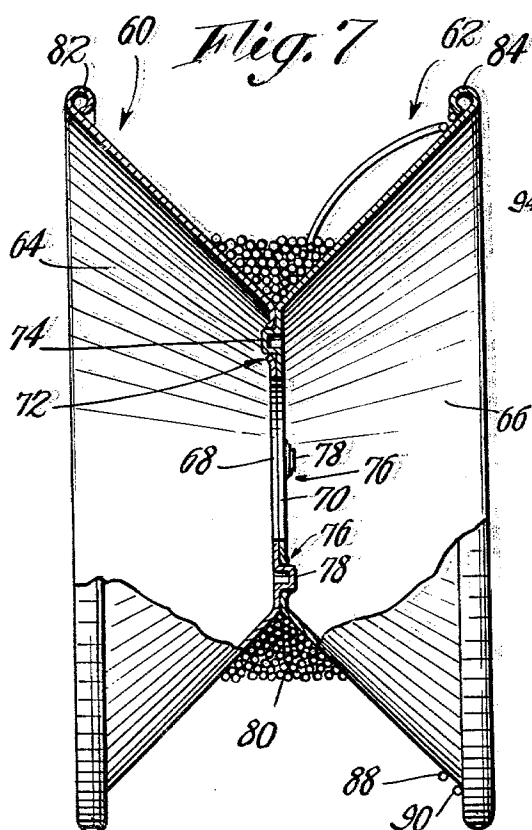
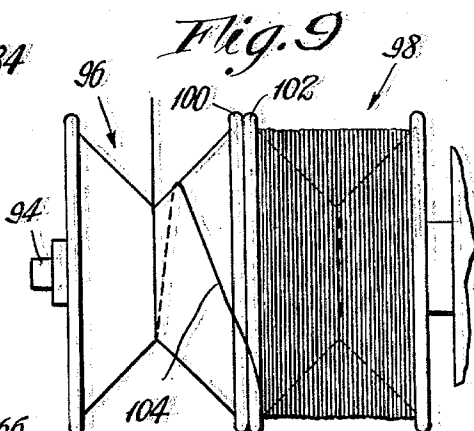
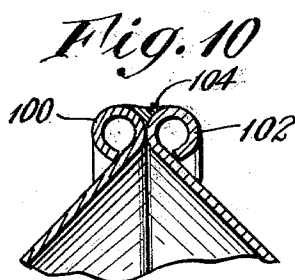
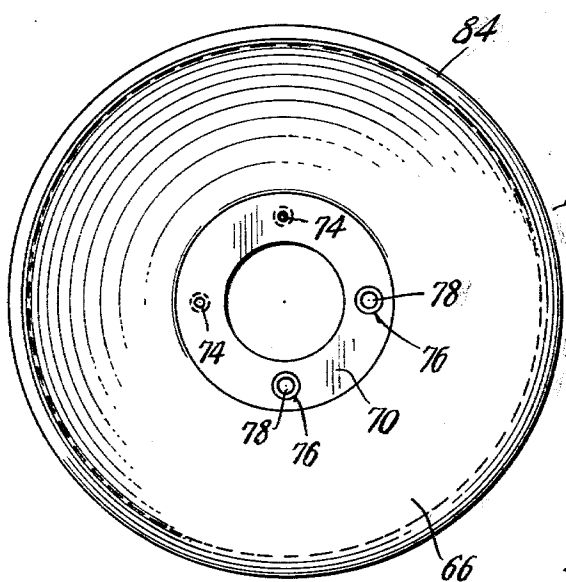
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3,176,932

SPOOL FOR WIRE

Filed June 26, 1963

2 Sheets-Sheet 2



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3,176,932

SPOOL FOR WIRE

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Filed June 26, 1963, Ser. No. 292,193
7 Claims. (Cl. 242—118.8)

The present application is a continuation-in-part of my copending application Serial No. 174,137 filed February 19, 1962, entitled "Spool for Wire," and now abandoned.

This invention relates to spools for wire of relatively small diameter (including fine wire), and more particularly to spools for this purpose which are formed of sheet metal.

Spools intended to accommodate the smaller or finer wire sizes and which are formed of sheet metal are already well known. The present invention relates to improvements in such spools, by which they require less room in shipping and storage, by which they may be fabricated more economically, and by which they are capable of being more useful.

One object of the invention, therefore, is to provide a novel and improved sheet metal spool of the type adapted to hold an appreciably large amount of relatively small-diameter or fine wire and intended to constitute a storage or carrier as well as a dispensing means for the wire, which spool prior to being put into use may be supplied in knocked-down condition so as to require but little space, considering its packaging capacity.

Another object of the invention is to provide an improved sheet metal spool as above set forth, which may be easily and quickly assembled and placed in readiness for use.

A still further object of the invention is to provide a novel sheet metal spool in accordance with the foregoing, which is sturdy and durable both prior and subsequent to its assembly, thereby to enable it after such assembly to hold large amounts of wire and to dispense the same without risk of malfunctioning or failure.

An additional object of the invention is to provide an improved knocked-down spool as outlined above, wherein only simple and readily available equipment is required to effect assembly of the components.

Yet another object of the invention is to provide a novel wire holding spool of the type arranged to pay off the wire from one end when the spool is stood on its other end, wherein slack or loose coils will be supported without snagging or binding during the initial threading and starting of the wire through the take-off equipment.

A feature of the invention resides in the provision of an improved slack-coil supporting spool as characterized, which is extremely simple in construction and economical to fabricate.

Another object of the invention is to provide an improved spool of sheet material which has the above advantages and which is of relatively small axial dimension whereby a number of such spools may be readily secured together in axial alignment to provide multiples of a standard quantity of wire.

A still further object of the invention is to provide an improved multiple spool organization as above set forth, wherein a continuous winding or filling process is possible without involving breakage of the wire at the points where the individual quantities are joined.

Another feature of the invention resides in the provision of improved spool components in the form of identical halves which may be nested with each other to the maximum possible degree, thereby to provide for an appreciable economy of space.

Yet another feature of the invention resides in the provision of an improved spool construction capable of utilizing light gage sheet material such a sheet metal, with-

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out sacrificing strength or durability, thereby to effect a saving in material costs.

Other features and advantages will hereinafter appear.

In the drawings accompanying this specification, similar characters of reference are used to designate like components throughout the several views, in which:

FIG. 1 is a side elevational view of an improved sheet-metal wire-holding spool as provided by the invention.

FIG. 2 is an end elevational view of the spool shown in FIG. 1.

FIG. 3 is a fragmentary sectional view through a peripheral portion of one end flange of the spool of FIGS. 1 and 2, the said section being taken on the line 3—3 of FIG. 1. FIG. 3 also shows wire being carried by the spool.

FIG. 4 is a fragmentary sectional view similar to that of FIG. 3, but illustrating a modification of the invention.

FIG. 5 is a fragmentary view partly in axial section and partly in side elevation, illustrating another embodiment of the invention wherein the two spool halves are assembled to each other in opposed relationship merely by forcing these axially together.

FIG. 6 is a fragmentary side elevation view of a spool similar to that of FIGS. 1-3 but of a larger capacity, this view showing a portion of one end flange only.

FIG. 7 is a view partly in side elevation and partly in axial section, of another embodiment of the invention wherein the spool is devoid of cylindrical or substantially cylindrical portions.

FIG. 8 is an end elevational view of the spool of FIG. 7.

FIG. 9 is a side elevational view of two spools similar to that of FIGS 7 and 8, joined end-to-end and in the process of being filled with wire by a continuous winding procedure. The assembled spools are shown as mounted on a rotating mandrel.

FIG. 10 is a fragmentary sectional view of the joined peripheral portions of the assembled spools illustrated in FIG. 9.

Referring first to FIGS. 1-3, the improved sheet metal spool for carrying relatively fine wire (sizes from #16 and up) is shown as comprising two identical halves 10 and 12, having shell-like structures provided with cylindrical body portions 14 and 16 respectively. The shells 10 and 12 further have radially inturned flanges 18 and 20 which are disposed in a plane normal to the axis of the shells, and also have out-turned conical flanges 22 and 24 respectively, which constitute the opposite ends of the spool. As used herein, the term "radially inward" means generally in the direction of the axis or center of revolution of the pieces. The conical flanges 22 and 24 define what may be considered as conical surfaces of revolution, and have an angularity of substantially 45° with respect to the axis of the spool, said flanges extending outward and away from the cylindrical body portions 14 and 16 as clearly shown in FIG. 1. As seen in this figure, the shells 10 and 12 are axially aligned with each other, and the radially inturned flanges 18 and 20 thereof are engaged and secured together rigidly so that the two shells constitute a single rigid assembly in the form of a spool with flared ends.

In the embodiment of the invention illustrated in FIGS. 1-3, the radially inturned flanges 18 and 20 are secured together by a spot welding procedure, FIG. 2 showing a total of six spot welds 26 equi-spaced circumferentially along the flanges. The assembly of the two shells 10 and 12 thus involves only a simple welding operation, wherein the six spot welds may be made utilizing a welding fixture and ordinary spot weld equipment. The six welds may be effected one at a time, or else in groups, or else all at once, depending on the particular fixture and equipment.

As thus provided by the invention, the spool is constituted of two identical halves 10 and 12, and prior to the assembly by welding as above explained, the two halves

may be partially nested one in the other, by insertion of the radially inwardly flanged end portion of the cylindrical body 14 in the outwardly flared or conical flange 24 of the shell 12. By such organization, a large number of shells may be packed in nested relation, so as to occupy a relatively small space.

From an inspection of FIGS 1 and 2 it will be seen that a large opening exists at the joined flanges 18 and 20, thereby to accommodate a suitable mandrel on which the spool may be placed at the time that wire is wound and stored on it.

In accordance with the present invention, in conjunction with the 45° conical flanges 22 and 24, curled peripheries providing annular beads 28 and 30 are formed on the conical flanges, said beads jutting out from the convex surfaces of the flanges. Another way of considering the structure and disposition of the beads 28 and 30 is that they are wholly disposed at the axially inner or mutually facing convex sides (considering the spool structure) of the two conical surfaces of revolution defined by the flanges 22, 24. Such convex sides are termed herein "axially inner" because of their presence with relation to the entire spool, whereas if a conical surface were considered alone the convex side would be thought of as the "outer" side. The terms "axially inward" and "radially inward" as explained herein are used in the following description and in the claims, to simplify the terminology. Referring to FIG. 3 it will be seen that the peripheral portions of the conical flanges are curled both axially inward and radially inward, considering the spool as a whole, and the beads 28, 30 are hollow and of substantially circular cross-section. The axially and radially inward curling of the peripheral portions of the conical flanges and the forming of the hollow beads 28, 30 may be readily carried out by a metal spinning procedure, such as is well understood in the metal working art. The beads 28, 30 are formed so as to be not only hollow and of relatively large diameter but also completely closed as seen in FIG. 3, thereby to preclude the catching or binding of wire at this point. Instead, by the provision of the rounded beads 28, 30 there is prevented any tangling or binding of loose wire coils, as will now be explained. When wire is to be removed from the fully wound spool, the latter is placed on one end so that the wire may be readily payed out from the other end by the use of suitable take-off equipment.

In setting up such equipment and placing the spool with wire thereon, the slack in the wire as it is threaded and started through the equipment will result in one or several coils, as indicated at 34 in FIG. 3, becoming loose and dropping down. By the provision of the bead 30 such loose coils are prevented from leaving the spool, but instead have an effective resting and nesting place and are arranged in such a manner that they may be readily payed out without danger of binding, snagging and the like. Regardless of which end of the wound spool is placed downward, there will be such a supporting or nesting bead to accommodate one or several loose coils of the slack wire at the time that the equipment is being readied for removal of the wire from the spool.

Moreover, if during the take-off operation the wire should again become slack for some reason, or else broken, the annular curls or beads provided on the flanges 22, 24 will serve the nesting purpose explained above, facilitating the operation necessary to effect resumption of the wire take-off.

Considering FIGS. 1 and 3 it will be noted that the concave or axially outer surfaces of the conical flanges are devoid of any projections or protruding bead portions, thereby enabling the spools to be readily accommodated on a single size and type of supporting mandrel, regardless of spool or flange size, it being only necessary to maintain constant the diameter and length of the cylindrical portions 14 and 16 of the spool. Accordingly, by altering only the sizes of the conical flanges 22, 24 larger spools suitable for holding and storing much larger amounts of wire may be had, such larger spools being still readily

mounted on the same mandrel which accommodates the smaller sizes.

A larger conical flange of such a spool of greater capacity is illustrated in FIG. 6, it being understood that the cylindrical body or hub portion thereof has the same diametric size as the spool of FIGS. 1-3. With such uniform diametric size of the body or hub portion, the spool capacity increases more than in direct proportion to the maximum flange diameter, because of the angularity of the flange as compared with perfectly flat flanges which lie in planes normal to the axis of the spool. In other words, doubling the maximum or peripheral diameter of the conical flanges more than doubles the capacity or amount of wire the spool can hold.

In some circumstances it will be found desirable to accommodate or nest a large number of such loose coils of wire. Accordingly, in accordance with a modification of the invention illustrated in FIG. 4, the peripheral portions of the conical flanges may be especially formed to accommodate such coils. As seen in this figure, the conical flange 24a at its peripheral portion is not only provided with the axially and radially inwardly curled annular bead 30a of cylindrical cross section, but is also formed to have an arcuate-section portion 38 adjoining the bead 32 and constituting therewith the entire nesting curl formation of the flange. The arcuate-section portion 38 thus forms an annular groove 40 which is disposed in and is accessible from the convex surface of the flange 24a, such groove adjoining the bead 30a and providing a relatively large-capacity temporary storage space for the loose coils of wire, as those indicated at 44. The curl formation shown in FIG. 4, constituting the curl 30a and groove 40, is also readily formed by a metal spinning operation, utilizing suitable forms, as will be readily understood.

Another embodiment of the invention is illustrated in FIG. 5, wherein the two shells making up the wire spool as provided by the invention have means enabling them to be easily and quickly, permanently assembled by the simplest possible equipment involving merely a pressing operation, as distinguished from the spot welding assembly involved with the embodiment of FIGS. 1-3. As shown in FIG. 5, the sheet metal spool comprises drawn shells 10b and 12b, such shells having cylindrical body portions 14b and 16b and conical end flanges 22c and 24c. Annular beads 28b and 30b similar to those already described, are provided on the conical end flanges 22b and 24b.

By this invention, the cylindrical body portions 14b and 16b have novel fastening means on the radially inturned flanges 18b and 20b respectively, which are engageable with each other when the shells 10b and 12b are axially aligned for the purpose of assembly to form a spool. The radially inturned flanges 18b and 20b may, by such novel means, be secured rigidly together by a simple press operation, such means comprising integral projections 48 and cooperable openings 50. The openings 50 are so arranged that they snugly receive and securely hold the projections 48. Some of the projections 48 may be provided on one of the inturned flanges 18b and other projections 48 may be provided on the other inturned flange 20b as illustrated, the same being true for the projection-accommodating openings 50. By such organization, the two shells 10b and 12b may be made identical to each other, and may be formed by exactly the same fabricating process. Preferably, as illustrated, the edges of the openings 50 in either flange are drifted in a direction away from the adjoining portions of the juxtaposed flange, thereby to present sharp retainer corners which are adapted to bite into and to retain against removal the said projections. Further, the openings 50 as thus drifted may be made slightly smaller in size than the outer diameters of the projections 48. In the assembly of the two shells, these are brought together to match the projections 48 with the cooperable openings 50, and the flanges 18b and 20b are thereafter forcibly pressed together. This will force the projections 48 into and through the openings 50, slightly

spreading the latter. The sharp edges at the drifted parts of the flanges, will bite into the projections 48 and securely retain the shells 10b and 12b against separation. Thus, a strong and sturdy attachment of the two shells to each other is effected. It will be understood that, if desired, all of the projections 48 may be provided on one flange, and all of the openings 50 provided on the other flange. While a total of six such projections 48 and openings 50 have been shown, either a greater or lesser number may be utilized, according to the requirements of use.

It will now be seen from the foregoing that I have provided an improved sheet metal spool for wire, constituted of two identical sheet metal shells which may be applied to the consumer in knocked-down condition whereby they require an appreciably smaller space when being shipped or stored. Since the shells are preferably identical any two of the same size may be selected and quickly and easily assembled, either by the spot welding or press techniques above described. The curled peripheries or beads on the conical end flanges provide a convenient and simple means for temporarily holding loose coils of wire at such time that the wire has slack in it. Moreover, the peripheral beads provide a desirable rounded and reinforced edge which facilitates handling of the spool rolling of the same along a supporting surface, etc.

Yet another embodiment of the invention is illustrated in FIGS. 7 and 8. The spool shown therein may be fabricated still more economically than the spools of the preceding figures. Also, it may be constituted of thinner gage metal as well as requiring a smaller-sized blank and simpler forming tools. Thus, an appreciable saving of material is had.

Further, the spool of FIGS. 7 and 8 lends itself to use in assemblages involving multiple numbers of spools each of which has a lesser capacity than the spools first described. In consequence, smaller standard quantities may be supplied to the ultimate consumer because of the smaller individual spool size, while at the same time larger quantities of wire in a continuous length are possible by utilizing the multiple spool assemblage and by arranging the connecting wires to be continuous and unbroken.

The spool of FIGS. 7 and 8 additionally has superior nesting qualities, since a larger number of shells or halves may be nested in a given space, as compared with the construction of the previous figures.

Accordingly, as illustrated, the spool of this embodiment comprises a pair of identical halves 60, 62 of shell-like structure, comprising mainly axially out-turned conical flanges 64 and 66 respectively. The conical flanges 64, 66 define what may be considered as conical surfaces of revolution, and have an angularity of substantially 45° with respect to the axis of the spool, said flanges extending outward and axially away from each other as clearly seen in FIG. 7.

The flanges 64, 66 are axially aligned with each other, and are secured in coaxial relationship at their small-diameter ends. Such securement may be effected in various ways. As illustrated in FIGS. 7 and 8, the conical flanges 64, 66 have radially inwardly extending attachment flanges 68, 70 respectively which function in a manner similar to the flanges 18, 20 of the previously described embodiment. The flanges 68, 70 may be advantageously spot welded to each other by simple equipment, at the time that the spool halves are to be assembled to produce completed spools. Or, as illustrated in FIGS. 7 and 8, the flanges 68, 70 may have cooperable openings and projections 72, 74 and 76, 78 formed in such a manner that the assembly may be effected by a press-fitting operation, as already described in connection with the spool construction of FIG. 5. By the above organization, the space provided for the wire 80 is in the form of a large V-groove.

By the invention, axially and radially inwardly protruding means are provided on and integral with the peripheral portions of the flanges 64, 66, for catching and

holding loose coils which may shift away from the main or body portion of the wire when the latter becomes slack. The said means comprises axially and radially inwardly curved and disposed annular beads 82, 84 having an appreciable cross sectional diameter, said beads comprising at least a partially circular cross section and constituting continuations of the conical flanges 64, 66 and the convex surfaces thereof respectively. The beads 82, 84 are wholly positioned axially inward of the convex surfaces and the conical surfaces of revolution of the flanges, and jut out from said convex surfaces to provide abutment shoulders of appreciable height, thereby to halt and hold the loose coils of wire. Several such loose coils are indicated at 88, 90 in FIG. 7.

Whereas the spool construction illustrated in FIGS. 7 and 8, as well as that of the previous figures, may be advantageously fabricated as metal stampings, it is within the scope of the invention to form the spools of other materials, such as plastic moldings or the like.

In accordance with the invention, a number of spools as provided herein may be secured together in end-to-end relation whereby multiples of smaller quantities of wire may be supplied while still retaining a complete continuity, without breakage of the wire where it joins the individual quantities and spools. Such organization is illustrated in FIG. 9, wherein a winding mandrel 94 mounts a pair of spools 96, 98 having adjoining peripheral portions 100, 102 secured together as by welding or brazing material 104, or else by a suitable adhesive or cement. In FIG. 9, the spool 98 is shown as having been filled with wire, and the spool 96 shown at the commencement of the winding of wire thereon. A joining length of wire 104 represents the last coil which has been placed on the spool 98 and the beginning coil which starts the winding of the spool 96.

I have found that under certain circumstances where the wire has sufficient diameter to enable it to readily withstand breakage, the winding of the spools 96, 98 may be carried out by a continuous process, without halting the mandrel 94. During such process no breakage of the joining wire length 104 will occur. Also, in the event that relatively fine or small-diameter wires are to be wound, the winding process may still be continuous, and a discontinuity of the wire between the spools will occur automatically, by breakage of the joining piece 104, but such breakage will not prevent the spool 96 from being wound. In other words, the mandrel 94 need not be stopped to start the winding of the spool 96 even though the wire length 104 breaks during the cross over of the traverse.

By virtue of the fact that the spools 96, 98 have a smaller axial dimension than the spools of the preceding embodiments of the invention, the securing of several such narrower spools in end-to-end relation may be readily effected without giving rise to complications in the winding or spooling equipment. The spool of FIGS. 7 and 8, being devoid of the cylindrical body portion previously described in connection with the spool of FIGS. 1-5, may be made of a lighter gage metal. Thus, less material is required not only because of the lesser thickness of the sheet, but also because of the absence of the added stock represented by the cylindrical portions.

The smaller spool of FIGS. 7 and 8 may hold, for example, a 50 pound quantity of wire, and two such spools secured together as illustrated in FIG. 9 may hold a total of 100 pounds. Thus, smaller quantities are made available as represented by the individual, smaller spools whereas continuity of the wire may still be had where multiples of the smaller quantities are provided by the use of multiple spools.

As provided by the invention, the adherence to a single standard size cylindrical body portion (as regards diameter and length), and the varying of sizes of the conical end flanges enables spools of different capacities to be had while at the same time all of such spools may be

accommodated on a single type and size mandrel. Even with the simple press assembly operation involved with the construction of FIGS. 5, 7 and 8 the two sheet metal shells may be identical to each other whereby but a single set of forming tools is required to fabricate them. With the present organization any two shells of the same size and category may be selected at random and assembled, to form the spools.

Variations and modifications may be made within the scope of the claims, and portions of the improvements may be used without others.

I claim:

1. Wire spooling equipment comprising in combination:

(a) a wire and cable spool having coil-resting and nesting peripheral interior end portions and including a pair of shells comprising conical flanges having their small-diameter portions connected to dispose the flanges in coaxial relation, said flanges extending in directions away from each other and having smooth axially inner convex surfaces defining conical surfaces of revolution,

(b) axially and radially inwardly protruding means on and integral with the peripheral portions of the flanges, for catching and holding loose coils of wire which may shift away from the body portions of the spool when the wire becomes slack, said means including axially and radially inwardly curved and disposed annular beads of appreciable cross sectional radius and of at least partially circular cross section, said beads comprising continuations of the conical flanges and convex surfaces thereof and being substantially wholly positioned axially inward of the inner convex surfaces and conical surfaces of revolution of the flanges, and abruptly jutting out from said convex surfaces to provide abrupt and relatively steep abutment shoulders of appreciable height to halt and hold the said loose coils of wire,

(c) a mandrel passing through said spool,
(d) means on said mandrel, engaging the spool and mounting the same for rotation with the mandrel,

(e) said shells being formed of separate pieces of sheet metal and comprising radially inwardly extending flanges at their small diameter portions, said flanges being joined to secure the shells in coaxial alignment,

(f) said annular beads being hollow and having a substantially completely circular cross section.

2. A spool as in claim 1, wherein:

(a) the means securing together the radially intumed flanges comprises an integral projection formed on one radially intumed flange and a through hole in the other radially intumed flange, through which latter the projection is forced and press-fitted.

3. A spool as in claim 2, wherein:

(a) the edges of the hole of the said other radially intumed flange are drifted in a direction away from the said one radially intumed flange, thereby to present sharp retainer corners adapted to bite into and retain against removal the said projection.

4. A spool as in claim 2, wherein:

(a) the said other radially intumed flange has an integral fastener projection, and
(b) the said one radially intumed flange has a through hole receiving and holding the said fastener projection the latter being press-fitted in the hole and held therein by said press-fit.

5. Wire spooling equipment comprising, in combination:

(a) a wire and cable spool having coil-resting and nesting peripheral interior end portions and including two pairs of shells each pair comprising:

(1) conical flanges having their small-diameter portions connected to dispose the flanges in coaxial relation, said flanges extending in direc-

tions away from each other and having smooth axially inner convex surfaces defining conical surfaces of revolution,

(2) axially and radially inwardly protruding means on and integral with the peripheral portions of the flanges, for catching and holding loose coils of wire which may shift away from the body portions of the spool when the wire becomes slack, said means including axially and radially inwardly curved and disposed annular beads of appreciable cross sectional radius and of at least partially circular cross section, said beads comprising continuations of the conical flanges and convex surfaces thereof and being substantially wholly positioned axially inwardly of the inner convex surfaces and conical surfaces of revolution of the flanges, and abruptly jutting out from said convex surfaces to provide abutment shoulders of appreciable height to halt and hold the said loose coils of wire,

(b) and means securing together two large-diameter peripheral portions of the pairs of shells to effect a coaxial relationship therebetween and to form two end-connected spools each of which is adapted to receive a similar quantity of wire,

(c) a mandrel passing through said spool,

(d) means on said mandrel, engaging the spool and mounting the same for rotation with the mandrel,

(e) said shells being formed of separate pieces of sheet metal and comprising radially inwardly extending flanges at their small diameter portions, said flanges being joined to secure the shells in coaxial alignment,

(f) said annular beads being hollow and having a substantially completely circular cross section.

6. Wire spooling equipment comprising, in combination:

(a) a wire and cable spool having coil-resting and nesting peripheral interior end portions and including a pair of shells having substantially cylindrical body portions,

(b) each body portion at one end of the shell having means securing the body portions to each other in end-to-end coaxial relation,

(c) the other ends of the shells having integral axially out-turned conical sheet-metal flanges extending axially away from the cylindrical body portions and having smooth axially inner convex surfaces defining conical surfaces of revolution,

(d) axially and radially inwardly protruding means on and integral with the peripheral portions of the flanges, for catching and holding loose coils of wire which may shift away from the body portions of the spool when the wire becomes slack, said means including axially and radially inwardly curved and disposed annular beads of appreciable inside diameter and of substantially circular cross section, said beads comprising continuations of the conical flanges and convex surfaces thereof, and being wholly positioned axially inwardly of the inner convex surfaces and the conical surfaces of revolution of the flanges and jutting out from said convex surfaces to provide abutment shoulders of appreciable height to halt and hold the said loose coils of wire,

(e) a mandrel passing through said spool,

(f) means on said mandrel, engaging the spool and mounting the same for rotation with the mandrel,

(g) said shells being formed of separate pieces of sheet metal and comprising radially inwardly extending flanges at their small diameter portions, said flanges being joined to secure the shells in coaxial alignment,

(h) said annular beads being hollow and having a substantially completely circular cross section.

7. Wire spooling equipment comprising in combination:

- (a) a wire and cable spool having a coil-resting and nesting peripheral interior end portions and including a pair of sheet-metal shells having substantially cylindrical body portions, 5
- (b) each body portion at one end having means securing the body portions to each other in end-to-end coaxial relation,
- (c) the other ends of the shells having integral axially out-turned conical sheet-metal flanges extending away from the cylindrical body portions and having smooth axially inner convex surfaces, 10
- (d) axially and radially inwardly protruding means on and integral with the peripheral portions of the flanges, for catching and holding loose coils of wire which may shift away from the body portions of the spool when the wire becomes slack, said means including axially and radially inwardly curled and disposed hollow annular beads of appreciable inside diameter and of substantially circular cross section, said beads being wholly positioned adjacent the axially inner convex surfaces of the flanges, jutting out at said convex sides and providing abutment shoulders of appreciable height to halt and hold the said loose coils of wire, 25
- (e) said conical flanges having portions which are located substantially radially inward of the means for catching and holding loose coils of wire and which are offset radially inward to provide annular coil- 30

nesting grooves adjoining the annular beads formed by the curled peripheries, said grooves being disposed in and being accessible at the convex axially inner surfaces of the flanges,

- (f) said beads and grooves being constituted of single curl formations at the peripheries of the flanges, each of said curl formations comprising a substantially circular-section portion and an arcuate-section portion, said portions being integral with each other,
- (g) a mandrel passing through said spool,
- (h) means on said mandrel, engaging the spool and mounting the same for rotation with the mandrel.

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MERVIN STEIN, *Primary Examiner*.