DEVICE FOR REPAIRING WIRE SPOOLS

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ABSTRACT

The invention is a repair device for a spool on which a wire, cable or the like may be wound. The spool includes two parallel, spaced apart circular sidewalls which are connected by a transverse coaxial shaft. The shaft includes an axial bore and each sidewall includes an axial aperture having a smaller diameter than the bore to thereby define a circular rim at the intersection of the shaft with each sidewall. The repair device comprises a circular end cap which has a diameter substantially the same as the diameter of the sidewalls and an arrangement for securing the end cap to the spool adjacent one of the sidewalls. In the event one of the sidewalls becomes broken, the end cap can be secured to the spool adjacent the broken sidewall to thereby repair the spool.
DEVICE FOR REPAIRING WIRE SPOOLS

[0001] This application is based on and claims priority from U.S. Provisional Patent Application No. 61/698,093 filed on Sep. 7, 2012.

BACKGROUND OF THE INVENTION

[0002] The present invention relates to a device for repairing spools which comprise two parallel sidewalls and a central shaft on which wire, cable, or the like may be wound. More particularly, the invention relates to a repair device which includes an end cap which is secured to the spool over a broken sidewall to thereby enable the spool to continue to be used.

[0003] Multi-spool caddies conveniently allow a user to carry and dispense multiple spools of wire, cable or the like. Typically, multi-spool caddies include a rod on which a row of spools is mounted and a frame on which the rod is supported. The rod is inserted through the axial centers of the spools and the ends of the rod are supported by the frame. While such an arrangement provides for a simple, cost-effective device, it also presents several drawbacks. For example, if a spool in the middle of the row runs empty, the adjacent spools must be removed in order to access the empty spool. In addition, as wire is being pulled from the spool, the spool may freewheel on the rod and unwind the wire faster than desired, which may result in tangling of the wire.

[0004] These limitations are addressed by applicant’s U.S. Pat. No. 6,523,777, which is directed to a multi-spool wire caddy in which the spools are supported on their sidewalls rather than through their axial centers. This caddy comprises three parallel fixed rods on which the sidewalls of the spools are supported and at least one movable rod which can be pivoted out of position to allow the spools to be inserted into and removed from the caddy. With this arrangement, multiple spools need not be removed when replacing a single empty spool.

[0005] Although this arrangement is of great convenience to the user, one particular problem arises as a consequence of the use of the wire spools being rotatably supported on their sidewalls. In use of a wire spool, one or both sidewalls may become broken. As a result, the damaged wire spool may rotate awkwardly against the fixed rods and cause the wire to dispense at an irregular rate or prevent the wire from dispensing entirely.

SUMMARY OF THE INVENTION

[0006] In accordance with the present invention, these problems are overcome by providing a spool repair device which comprises an end cap that can be secured to the broken sidewall. The end cap has substantially the same diameter as the unbroken sidewall to ensure that the repaired spool rotates properly within the multi-spool caddy. When a sidewall becomes broken, the end cap can be attached to the spool over the broken sidewall to restore the outer diameter of the spool and thereby allow the spool to rotate normally against the fixed rods of the multi-spool caddy. This solution provides a simple and economical means for repairing a damaged wire spool.

[0007] These and other objects and advantages of the present invention will be made apparent from the following detailed description, with reference to the accompanying drawings. In the drawings, the same reference numbers may be used to denote similar components in the various embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 is a perspective view of a first embodiment of the wire spool repair device of the present invention shown in conjunction with an exemplary wire spool having a broken sidewall;

[0009] FIG. 2 is a rear perspective view of the wire spool repair device shown in FIG. 1;

[0010] FIG. 3 is a front perspective view of the wire spool repair device shown in FIG. 1;

[0011] FIG. 4 is a side view of the wire spool repair device of FIG. 1 shown mounted to the wire spool, which is shown in cross section;

[0012] FIG. 5 is a front elevation view of the wire spool repair device shown in FIG. 4;

[0013] FIG. 6 is a cross sectional view of a second embodiment of the wire spool repair device of the present invention shown mounted to an exemplary spool having a broken sidewall;

[0014] FIG. 7 is a side elevation view of the plug member of the wire spool repair device shown in FIG. 6;

[0015] FIG. 8 is a front elevation view of the plug member shown in FIG. 7;

[0016] FIG. 9 is a cross sectional view of a third embodiment of the wire spool repair device of the present invention shown mounted to an exemplary spool having a broken sidewall;

[0017] FIG. 10 is a front elevation view of the wire spool repair device shown in FIG. 9;

[0018] FIG. 11 is a rear perspective view of a fourth embodiment of the wire spool repair device of the present invention;

[0019] FIG. 12 is a front perspective view of the wire spool repair device shown in FIG. 11;

[0020] FIG. 13 is a cross sectional view of the wire spool repair device of FIG. 11 shown mounted to an exemplary spool having a broken sidewall;

[0021] FIG. 14 is a front elevation view of the wire spool repair device shown in FIG. 13;

[0022] FIG. 15 is a cross sectional view of a fifth embodiment of the wire spool repair device of the present invention shown mounted to an exemplary spool having a broken sidewall;

[0023] FIG. 16 is a front elevation view of the wire spool repair device shown in FIG. 15;

[0024] FIG. 17 is a perspective view of another embodiment of the wire spool repair device of the present invention;

[0025] FIG. 18 is a front elevation view of the end cap component of the wire spool repair device shown in FIG. 17;

[0026] FIG. 19 is an enlarged, rear perspective view of the end cap component shown in FIG. 18;

[0027] FIG. 20 is a partial cross sectional view of the wire spool repair device of FIG. 17 shown mounted to an exemplary wire spool having a broken sidewall; and

[0028] FIG. 21 is a front elevation view of the wire spool repair device shown in FIG. 20.

DETAILED DESCRIPTION OF THE INVENTION

[0029] A first embodiment of the spool repair device of the present invention is shown in FIGS. 1-5. The spool repair device of this embodiment, generally 10, is shown in conjunction with a typical spool 12 on which wire, cable or the like can be wound. The spool 12 includes two circular sidewalls 14 which are joined by a transverse coaxial shaft 16. As
shown more clearly in FIG. 4, the shaft comprises an axial bore 18 and each sidewall 14 comprises an axial aperture 19 having a smaller diameter than the bore to thereby define a circular rim 20 at the intersection of the shaft with each sidewall. For purposes of better illustrating the benefits of the invention, the right-hand sidewall 14 of the spool 12 shown in FIGS. 1 and 4 is depicted as being broken, that is, with a top portion thereof having been broken off.

[0030] The spool repair device 10 includes a circular end cap 22 and means for securing the end cap to the spool 12 adjacent the broken sidewall 14. The end cap 22 includes a diameter D₁, which as shown in FIGS. 1 and 4 is substantially the same as the diameter D₂ of the sidewalls 14. As a result, when the end cap 22 is secured to the spool 12, the end cap will in effect substitute for the broken sidewall 14 in retaining the wire, cable or the like on the shaft 16 and in supporting the spool for rotation on the rods of a wire spool caddy of the type disclosed in the aforementioned U.S. Pat. No. 6,523,777.

[0031] Referring specifically to FIGS. 2 and 4, in this embodiment the means for securing the end cap 22 to the spool 12 comprises an expandable anchor member 24 and means for expanding the anchor member. The anchor member 24 is positioned coaxially with the end cap 22 and is connected to or formed integrally therewith. In one embodiment of the invention, both the end cap 22 and the anchor member 24 are made of a suitable plastic material and are formed as one piece in a single injection molding process. The anchor member 24 includes a generally cylindrical body portion 26 having a diameter slightly less than the diameter of the rim 20. The body portion 26 is preferably comprised of a number of longitudinal body segments 28, in this case two, which are arranged around the axis of the end cap 22. Also, an enlarged diameter lip 30 may be provided on the distal end of each body segment 28.

[0032] The means for expanding the anchor member 24 may include, e.g., a nail, a pin or, as shown in the Figures, a screw 32, which is configured to be inserted through a corresponding axial hole 34 in the end cap 22 and then between the body segments 28. The screw 32 may be self tapping, or a threaded hole (not shown) may be formed in the body 26 coaxially with the hole 34 to accommodate the screw.

[0033] In use of the spool repair device 10, the anchor member 24 is inserted through the aperture 19 and into the bore 18 of the shaft 16 until the end cap 22 is positioned firmly against the broken sidewall 14. The screw 32 is then inserted into the hole 34 and advanced between the body segments 28. This action causes the screw 32 to radially expand the body segments 28 until the lips 30 engage the inner diameter surface of the shaft 18 and/or the body segments engage the rim 20. In this condition, the end cap 22 is securely connected to the spool 12 and will bear the weight of the wire, cable or the like on the rods of the wire spool cart.

[0034] A second embodiment of the spool repair device of the present invention is shown in FIGS. 6-8. The spool repair device of this embodiment, generally 100, is similar in many respects to the spool repair device 10 described above. In the present embodiment, however, the means for securing the end cap 22 to the spool 12 comprises a separate plug member 102. The plug member 102 includes a radial flange 104, a generally cylindrical body portion 106 having a number of enlarged diameter lips 108 formed thereon, and an axial bore 110 which extends through both the flange and the body portion. The body portion 106 may be formed from an elastically deformable material, such as rubber, or from a more rigid plastic material, in which event the body portion is ideally comprised of a number of spaced-apart longitudinal body segments 112 which are arranged around the axis of the plug member 102. Forming the body portion 106 in this manner allows the body segments 112 to contract radially to thereby permit the body portion 106 to be inserted through the hole 34 and the aperture 19.

[0035] In use of the spool repair device 100, the end cap 22 is aligned with the broken sidewall 14 and the plug member 102 is inserted through an enlarged diameter hole 34 and the aperture 19 and into the bore 18 of the shaft 16. A suitable expansion device, such as a screw 114, is then inserted into the bore 110 of the plug member 102 to maintain the body segments 112 in their expanded position (FIG. 6). As shown in FIG. 6, the distance between the flange 104 and the lips 108 corresponds approximately to the combined thickness of the end cap 22 and the sidewall 14. Therefore, when the body segments 112 are expanded, the plug member 102 will be secured to the spool 12 and the flange 104 will maintain the end cap 22 against the broken sidewall 14.

[0036] A third embodiment of the spool repair device of the present invention is shown in FIGS. 9 and 10. The spool repair device of this embodiment, generally 200, is similar in many respects to the spool repair device 100 described above. In the present embodiment, however, the plug member 102 is configured to be inserted into the bore 18 before the end cap 22 is connected to the plug member. Thus, the distance between the flange 104 and the lips 108 is designed to be about the same as the thickness of the flange 14. In addition, the hole 34 in the end cap 22 need only be large enough to accommodate the screw 114.

[0037] A fourth embodiment of the spool repair device of the present invention is shown in FIGS. 11-14. Similar to the previous embodiments, the spool repair device of the present embodiment, generally 300, includes a end cap 22 and means for securing the end cap to the spool 12. In this embodiment, the means for securing the end cap 22 to the spool 12 comprises a cylindrical collar 302 and a number of preferably self-tapping screws 304. The collar 302 is positioned coaxially with the end cap 22 and extends transversely therefrom. In addition, the outer diameter of the collar 302 is designed to form a sliding fit within the aperture 19. Once the collar 302 is positioned within the rim aperture 19, the screws 304 are driven through corresponding holes in the end cap 22 and into the sidewall 14 or the rim 20 to secure the end cap to the spool 12. In this manner, the collar 302 will transfer the weight of the wire, cable or the like which is wound upon the spool 12 to the end cap 22 while the screws 304 will maintain the end cap against the broken sidewall 14. In this embodiment, an axial hole 306 may be provided in the end cap 22 and the collar 302 to enable a rod or similar such device to be inserted through the end cap and the spool 12.

[0038] Yet another embodiment of the invention is shown in FIGS. 15 and 16. In the spool repair device of this embodiment, which is indicated generally by reference number 400, the means for securing the end cap 22 to the spool 12 comprises a number of clips 402 which are arranged radially around the axis of the end cap. Each clip 402 comprises a head portion 404, the distal end of which is ideally beveled to enable the head portion to cam over the rim 20 as the clips are inserted through the aperture 19 and into the bore 18. In addition, the proximal end of the head portion 404 is configured to engage the back side of the rim 20 to ensure that the end cap 22 remains firmly attached to the spool 12. As in the
previous embodiment, an axial hole 406 may be provided in the end cap 22 to enable a rod or similar such device to be inserted through the end cap and the spool 12.

[0039] Referring now to FIGS. 17-21, a further embodiment of the spool repair device is shown which is particularly useful for spools which have experienced extensive damage. The spool repair device of this embodiment, generally 500, comprises two end caps 22 which are joined together by a transverse beam 502. As shown in FIG. 20, the beam 502 is designed with an outer diameter smaller than the diameter of the aperture 19 to enable the beam to be inserted completely through the shaft 16 of the spool 12. Once the beam 502 is positioned within the shaft 16, any of the means described above may be used to secure the end caps 22 to the beam. In this manner, the broken spool 12 will be sandwiched between the end caps 22, which will in effect substitute for the side walls 14. Therefore, the spool repair device 500 may be used when the spool 12 has been extensively damaged, such as when most or all of one or both side walls 14 have been broken off.

[0040] In the embodiment of the spool repair device 500 shown in FIGS. 19-21 the means for attaching each end cap 22 to the beam 502 comprises the expandable anchor member 24 described above. However, the spool repair device 500 may comprise additional features to aid in joining the end caps 22 to the beam 502. As shown in FIGS. 18 and 19, for example, each end cap 22 may be provided with two holes 504 straddling the anchor member 24 which align with corresponding holes 506 in the beam 502. Once the anchor member 24 is inserted into the beam 502, two screws (not shown) are driven into the holes 504, 506 to further secure the end caps 22 to the beam. In addition, the back side of each end cap 22 may be provided with a number of tabs 508 which are engaged by corresponding slots 510 in the beam 502 to prevent the end caps from rotating relative to the beam.

[0041] It should be recognized that, while the present invention has been described in relation to the preferred embodiments thereof, those skilled in the art may develop a wide variation of structural and operational details without departing from the principles of the invention. For example the different features of the various embodiments may be combined in a manner not described herein. Therefore, the appended claims are to be construed to cover all equivalents falling within the true scope and spirit of the invention.

1. A repair device for a spool on which a wire, cable, or the like may be wound, the spool including two parallel, spaced apart circular side walls which are connected by a transverse coaxial shaft, the shaft including an axial bore and each side wall including an axial aperture having a smaller diameter than the bore to thereby define a circular rim at the intersection of the shaft with each side wall, the repair device comprising:
   a circular end cap which has a diameter substantially the same as the diameter of the side walls; and
   means for securing the end cap to the spool adjacent one of the side walls;
   wherein in the event one of the side walls becomes broken, the end cap can be secured to the spool adjacent the broken side wall to thereby repair the spool.

2. The repair device of claim 1, wherein the securing means comprises:
   an expandable anchor member which is positioned coaxially with the end cap and is connected to or formed integrally therewith; and
   means for expanding the anchor member;
   wherein in use the anchor member is inserted through the aperture of the broken side wall and is expanded by the expanding means against at least one of the rim and the bore to thereby secure the end cap to the spool.

3. The repair device of claim 2, wherein the anchor member includes a generally cylindrical body portion which is configured to be inserted through the aperture.

4. The repair device of claim 3, wherein the body portion is comprised of a plurality of longitudinal body segments which are spaced radially around the axis of the end cap and which in use of the repair device are forced by the expanding means against at least one of the rim and the bore.

5. The repair device of claim 4, wherein each body segment comprises a radially extending lip located on a distal end thereof which in use of the repair device is forced by the expanding means against the bore.

6. The repair device of claim 4, wherein the expanding means comprises a screw which is configured to be inserted through an axial hole in the end cap and between the body segments to thereby expand the body segments against at least one of the rim and the bore.

7. The repair device of claim 1, wherein the end cap comprises an axial hole and the securing means comprises a plug member which is separate from the end cap, the plug member including a radially extending lip and a generally cylindrical body portion which is configured to be inserted through the hole and the aperture to thereby secure the end cap to the spool.

8. The repair device of claim 7, wherein the body portion includes at least one radially extending lip having a diameter which is larger than the diameter of the rim, and wherein the body portion is configured such that the lip will contract radially to permit the body portion to be inserted through the aperture.

9. The repair device of claim 8, wherein the distance between the flange and the lip is approximately the same as a combined thickness of the side wall and the end cap.

10. The repair device of claim 9, wherein the body portion is comprised of a plurality of longitudinal body segments which are spaced radially around the axis of the plug member and are configured to contract radially inwardly to thereby allow the lip to be inserted through the aperture.

11. The repair device of claim 10, wherein the plug member further comprises:
   a bore which extends axially through the flange and the body member; and
   an expansion device which is configured to be inserted into the bore to maintain the body segments in an un-contracted position.

12. The repair device of claim 11, wherein the securing means comprises:
   a cylindrical collar which is positioned coaxially with the end cap and is connected to or formed integrally therewith, the collar forming a sliding fit with the aperture; and
   a number of screws which, after the collar is inserted into the aperture, are inserted through corresponding holes in the end cap and screwed into at least one of the side walls or the rim to thereby secure the end cap to the spool.

13. The repair device of claim 12, further comprising an axial bore which extends through the end cap and the collar and through which a support rod for the spool may be inserted.
14. The repair device of claim 1, wherein the securing means comprises:
  a plurality of cups which are arranged radially around the axis of the end cap and are connected to or formed integrally therewith;
  wherein the cups are configured to contract radially inwardly to pass through the aperture and then expand radially outwardly to thereby secure the end cap to the spool.

15. The repair device of claim 14, wherein each clip comprises a head portion having a proximal end which is configured to engage a side of the rim opposite the end cap.

16. The repair device of claim 14, further comprising an axial bore which extends through the end cap and between the clips and through which a support rod for the spool may be inserted.

17. A repair device for a spool on which a wire, cable or the like may be wound, the spool including two parallel, spaced apart circular sidewalls which are connected by a transverse coaxial shaft, the shaft including an axial bore and each sidewall including an axial aperture having a smaller diameter than the bore to thereby define a circular rim at the intersection of the shaft it each sidewall, the repair device comprising:
  two circular end caps which each have a diameter substantially the same as the diameter of the sidewalls;
  a beam having a length approximately the same as the distance between the sidewalls and an outer diameter less than the diameter of the apertures; and
  means for securing each end cap to a corresponding end of the beam;
  wherein in the event one or both of the sidewalls becomes broken, the beam can be inserted through the shaft and the end caps secured to the beam adjacent the sidewalls to thereby repair the spool.

18. The repair device of claim 17, wherein each securing means comprises:
  an expandable anchor member which is positioned coaxially with the end cap and is connected to or formed integrally therewith; and
  means for expanding the anchor member;
  wherein in use the anchor member is inserted through the aperture of the sidewall and is expanded by the expanding means against an axial bore of the beam to thereby secure the end cap to the beam.

19. The repair device of claim 18, wherein each end cap comprises a plurality of holes which are arranged radially around the anchor member and are aligned with matching holes in the beam, and wherein each securing means further comprises a number of screws which are driven into the aligned holes to further secure the end cap to the beam.

20. The repair device of claim 19, wherein a side of each end cap adjacent the beam comprises a number of tabs which engage corresponding slots in the beam to prevent the end caps from rotating relative to the beam.

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