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(54) **POST INSTALLATION CURED BRAIDED CONTINUOUS COMPOSITE TUBULAR**

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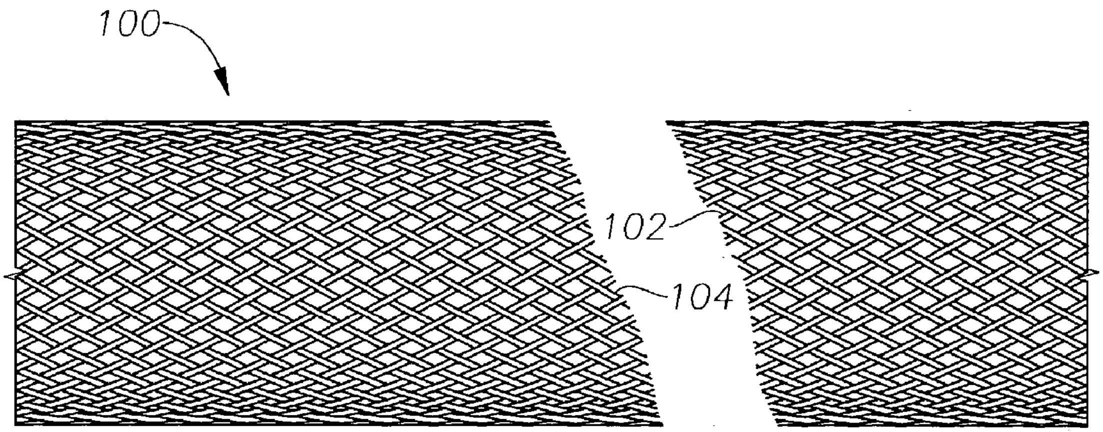
(57) **ABSTRACT**

A method for providing a barrier at a predetermined location in downhole operations comprises: providing a first tubular sleeve of a woven material comprising a plurality of fibers in a braided arrangement and including a conductor, impregnating the sleeve with a curable resin, radially enlarging the sleeve at the predetermined downhole location, and curing the resin. The present method can also be used to provide a barrier at a desired location within a wellbore while drilling, to restrict sand flow into a wellbore while allowing fluid flow into the wellbore, or to protect a metallic sand screen by employing the composite braided tubular sleeve as a protective shroud.



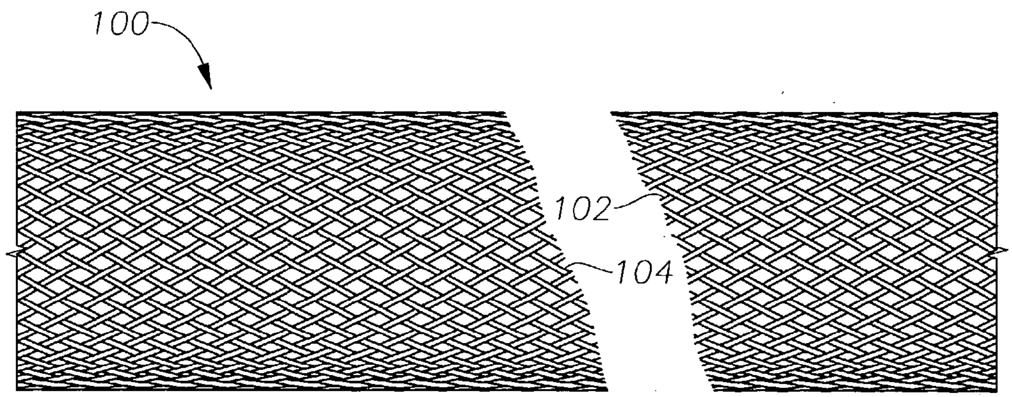


Fig. 1

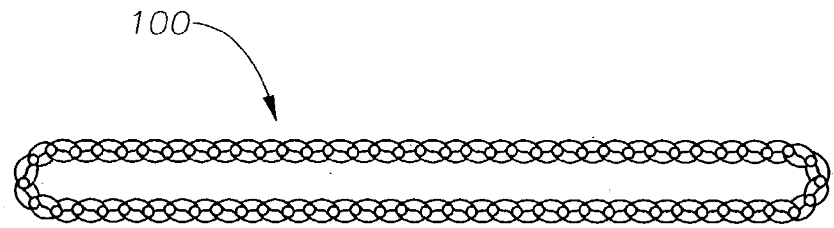


Fig. 2

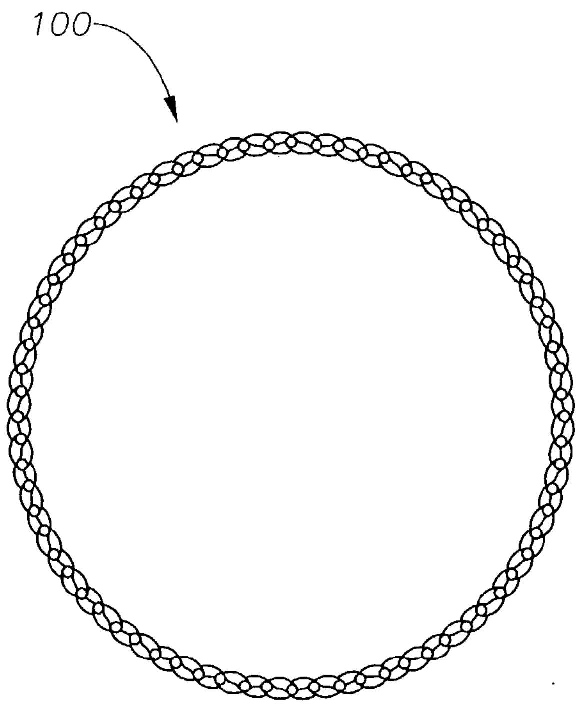


Fig. 3

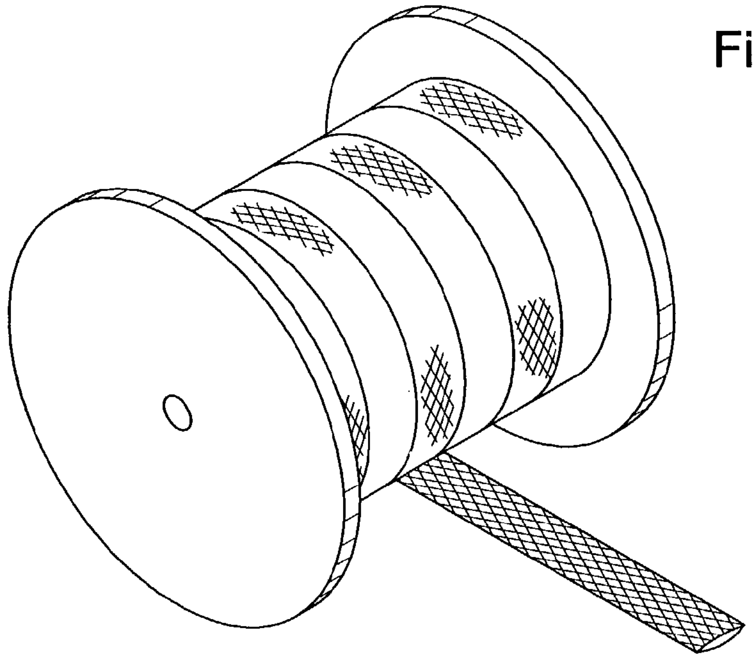


Fig. 4

Fig. 5

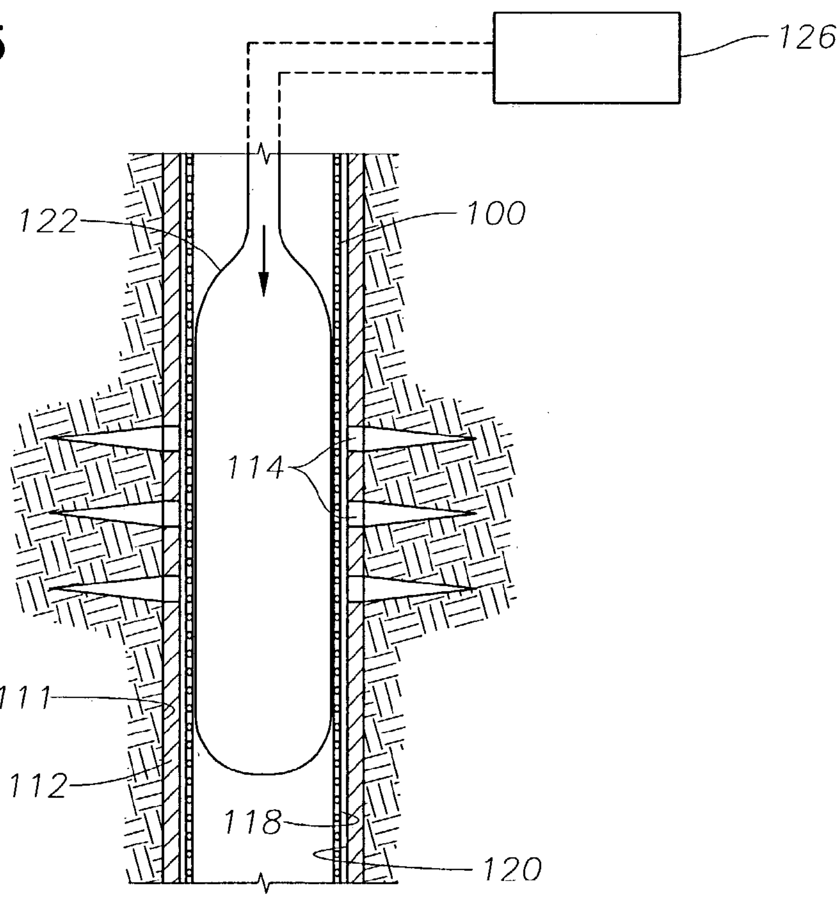


Fig. 6

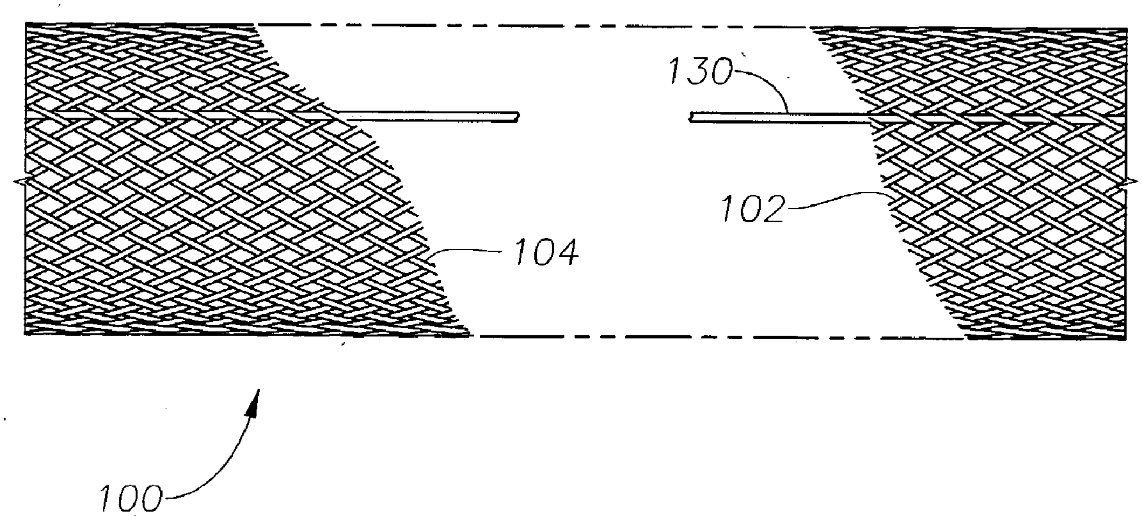
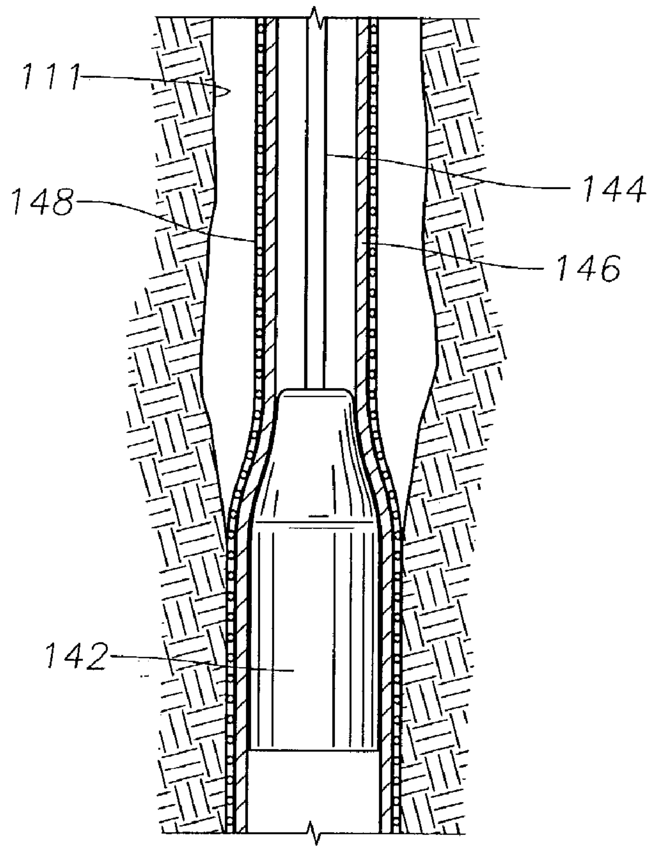


Fig. 7



POST INSTALLATION CURED BRAIDED CONTINUOUS COMPOSITE TUBULAR

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] Not applicable.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not applicable.

TECHNICAL FIELD OF THE INVENTION

[0003] The present invention relates to sealing and conveying fluids, maintaining borehole integrity and transmitting power and data signals within a well bore.

BACKGROUND OF THE INVENTION

[0004] In the present description, the terms "casing" and "tubing" refer to generally cylindrical pipes conventionally used to convey fluids in a wellbore. A wellbore is a hole drilled in the earth such as for the production of hydrocarbons, geothermal energy, water and other fluids as well as for injection of fluids into the earth.

[0005] Wells are typically drilled using a drill bit at the end of a length of tubing. During drilling, a drilling fluid, such as mud, is pumped down through the tubing and flows up the annulus between the tubing and the borehole wall. After a desired length of borehole has been drilled, a casing is placed in the hole and sealed against the borehole wall. The casing may be installed in order to isolate the natural formation fluids from the pressure of the drilling fluid, including but not limited to drilling mud, water, air, and foams, to prevent fluid intrusion into the wellbore (from a water producing zone, for example), or to prevent fracture of the formation by the pressure exerted by the drilling mud or loss of that mud into the formation. Likewise, because the wellbore may pass through several distinct geological formations, each of which may contain its own formation fluids, casing may be installed and sealed against the borehole wall in order to isolate the formations from each other. During drilling of highly deviated wellbores, casing may also be installed in order to prevent collapse of the wellbore.

[0006] In some situations, there may be localized regions where the casing does not seal the formation but where sealing is desired. These situations include but are not limited to: areas where pipe has been intentionally perforated, areas where corrosion or mechanical damage has resulted in loss of pressure and fluid integrity, and areas where additional mechanical support is required in order to ensure pressure integrity. In many instances, it is desirable to be able to quickly set a temporary or permanent conduit for these and other purposes.

[0007] Another function that is often desirable downhole relates to controlling the flow of particulate matter into or out of the well. One example is the need to install screens to prevent formation sand from flowing into the wellbore. Such screens allow fluid flow but restrict the movement of the particulates. The present invention allows the mesh size of the sand screen to be adjusted to a desired level. For example, expanding the braided sleeve such that the helically wound fibers lie at substantially 45° to each other provides a maximum mesh size. Other configurations of the same sleeve provide smaller mesh sizes, down to virtually zero.

[0008] In addition, data obtained from measuring devices located in a wellbore can be valuable during drilling and production. Measurement of parameters such as temperature, pressure, fluid composition, status of downhole equipment, geophysical surveys during production, stresses and forces on pipes and equipment can be taken at various depths in the wellbore, including at or near the drill bit or over the production interval, and are useful and important over the lifespan of a wellbore.

[0009] It is also desirable to transmit power into a wellbore in order to energize downhole equipment and sensors. It is also desirable to locate sensors in various locations within the wellbore, and to have sensors integrated into the conductor or the pipe wall—such as fiber optic distributed temperature or strain sensing systems. Data transmission and power transmission into and out of a wellbore is challenging because of the difficulty in installing continuous electrical or optical fiber conductors (hereafter referred to as conductors) in the downhole drilling and production environment. Typically, casing and tubing are manufactured in short lengths that are assembled at the well.

[0010] There are shortcomings with various methods employed within the current art to assure a continuous electrical or optical conductor. Conductors and sensors that are installed externally to the casing or production string, are subject to damage during installation. In addition, the installed conductors or sensors must assure isolation of wellbore fluids between zones, or between the wellbore and the surface. Conductors that are installed internal to the production tubing can interfere with the flow of wellbore fluids and intervention operations. If the pipe is jointed, it may not be practical to integrate the conductor into the pipe wall because of the complexity of connections.

[0011] A relatively new method of installing wellbore casing is through the use of expandable tubulars to reduce borehole sizes and the number of diameter transitions in deeper wells. The tubing is expanded downhole by pulling a mandrel through the bore. Thus, with an expandable tubular cased well, it is not feasible to install a conductor internal to the wellbore, and the likelihood of damage during installation and communication between zones is increased if installed externally.

[0012] For all of these reasons, there remains a need for a device that will allow installation of a pipe for sealing and fluid conveyance, where the installation is relatively easy. It is further desirable to provide a such a pipe that incorporates wires or fibers for data and power conveyance, even if the pipe will be expanded by a mandrel after installation.

[0013] One technique that has been proposed for sealing casing sections downhole, which is described in J. L. Saltel et al., "In-Situ Polymerization of an Inflatable Sleeve to Reline Damaged Tubing and Shut-Off Perforations," Offshore Technology Conference, pp. 1-11 (May 1996). A cable carrying seven electrical power conductors is used to lower an inflatable sleeve which carries a permanent sleeve (comprised of resins, fibers, and elastomers) downhole. The inflatable sleeve is pressurized to push the permanent seal against the inside surface of the casing. Electric power provided down the wireline from the surface is used to generate heat to increase the temperature of the resin for a sufficient period of time to cross link (or "cure") the resin in the permanent sleeve. The permanent sleeve is left downhole to maintain a seal over perforated sections of the casing.

[0014] Nonetheless, there is still a need for an expandable casing that can be set quickly. In addition, there is a need for a system that provides integrated conductors that can withstand drilling and the downhole environment and are easily positioned, and for a system that improves the effectiveness and efficiency of expandable tubulars downhole.

[0015] Methods of integrating the conductors into continuous coiled tubing and other spoolable products have been developed. Two examples are disclosed in U.S. Pat. No. 6,148,866, entitled "Composite Spoolable Tube," and U.S. Pat. No. 5,542,472, entitled "Metal Coiled Tubing with Signal Transmitting Passageway." Nonetheless, the devices disclosed in those patents are limited by their use of coiled tubing. These products have diameter limitations of about 4.5-inch OD as a result of maximum allowable spooling strain and thus are not suitable when larger diameters are desired.

SUMMARY

[0016] The present invention provides a method for installation of a light weight, high strength, and high temperature continuous conduit for fluid conveyance that is extremely compact prior to installation.

[0017] In one embodiment, the present invention includes the application of a tubular braided sleeve that may be installed in a folded state and inflated or expanded in situ, along with a curable resin that may be applied to the sleeve at any time including prior to installation or after inflation. Uses of the present invention include but are not limited to: primary casing or tubing, repairs to casing or tubing, sealing of damaged casing or tubing, sealing of perforated or otherwise non-pressure tight pipe, support for pipe, and other uses related to the sealing and conduction of fluids inside a wellbore.

[0018] The sleeve of the present invention comprises a braided sleeve made from a plurality of elastic and non-elastic filaments in a tubular configuration. Like woven materials, braided fibers are mechanically interlocked with one another. Because all the fibers within a braided structure are continuous and mechanically locked, the braided structure is highly efficient in distributing loads. Because all the fibers in the structure are involved in a loading event, braid absorbs a great deal of energy as it fails. Braided structures also have superior fatigue resistance. While micro-cracking may occur in a braided structure, failure propagation tends to be arrested at the intersections of the reinforcing fibers.

[0019] The preferred tubular braided sleeve is flexible and may be transported, handled and installed in a flat configuration. Multiple sleeves can be utilized if desired, in order to provide for a thicker finished conduit. During installation, the sleeve is preferably inflated by either a temporary bladder, a permanent fluid tight layer in the sleeve, or by other mechanical means such as a mandrel drawn through the inner diameter of the sleeve. A bladder layer is typically polymeric in nature.

[0020] The sleeve of the present invention is often used in conjunction with a resin or other curable agent that can solidify and set the sleeve into a desired tubular cross section. The curable agent, typically a thermoset polymer resin, is preferably impregnated into the tubular braided sleeve prior to installation, such as during manufacture, but can alternatively be introduced to the sleeve at any point in the process, including during or after installation and inflation. The curable agent with which the sleeve is impregnated preferably includes a mixture of resin and a curing agent. The mixture is cured to form a hardened epoxy layer after exposure to heat.

[0021] Implementations of the invention may include a local heat source for generating heat energy to cure the curable agent impregnated in the sleeve.

[0022] In one preferred embodiment, a longitudinal cable may be utilized to support the tubular braided sleeve during installation. Such a cable may be external or internal to the sleeve and may be removed after installation and curing of the resin. In other embodiments, metallic conductors or optical fiber may be incorporated into the sleeve to provide for signal and data communication to downhole equipment and sensors as well as sensors in the wall of the cured tubular sleeve.

[0023] Implementations of the invention may include applications external to metallic casing. In one application, the casing is a metallic expandable tubular, used in well construction for reducing or eliminating diameter transitions, such as in a monobore well. The tubular braided sleeve expands during the casing expansion. This is particularly useful in combination with embedded metallic conductors or optical fiber for use in conductors because of the difficulty in providing for signal and data communication in monobore wells. The tubular braided sleeve may be used to reinforce the metallic expandable casing, reducing the weight and thickness requirement for the metallic expandable casing for a given structural capacity. A thinner wall will result in a reduction of the force and pressure required to expand the metallic expandable casing as well as the time required to accomplish that expansion. These factors may also allow for a larger diameter change during expansion of the metallic expandable casing.

[0024] One configuration for installation of the present invention is to install a metallic casing inside the sleeve prior to the curing process. Alternatively, the sleeve may be run into the wellbore on the outside of a string of metallic or fiberglass pipe that will also be permanently installed.

[0025] Another use for the present invention is as a means of installing and fixing in place a composite screen for the purposes of particulate control, more specifically for confining sand to the formation while allowing the production fluid to flow out of the formation into the wellbore. The tubular braided sleeve may also be used as a protective device for conventional metallic screens to reduce the risk of damage during handling and installation.

DETAILED DESCRIPTION

[0026] For a more detailed understanding of the present invention, reference is made to the accompanying drawings, in which:

[0027] **FIG. 1** is a perspective view of a braided sleeve in accordance with a preferred embodiment of the present invention;

[0028] **FIGS. 2 and 3** are schematic end views showing the sleeve of **FIG. 1** in flat and expanded configurations, respectively;

[0029] **FIG. 4** is a perspective view illustrating the present sleeve stored on a spool;

[0030] **FIG. 5** is a schematic cross-section of a sleeve in accordance with an embodiment of the invention being used to seal a section of previously perforated or damaged casing;

[0031] **FIG. 6** is an elevation of a braided sleeve including a longitudinal conductor in accordance with an alternative embodiment of the invention; and

[0032] **FIG. 7** is a schematic cross-section of a sleeve in accordance with an embodiment of the invention being expanded in conjunction with an expandable casing using a mandrel.

DETAILED DESCRIPTION

[0033] The present invention refers to applications of a tubular braided sleeve such as the one shown in **FIG. 1**. The braided sleeve **100** preferably comprises a plurality of monofilament (?) fibers **102** and **104** braided or woven to form a continuous tube. As is known in the art, fibers **102** are wound in a clockwise direction while fibers **104** are wound in a counterclockwise direction. The fibers can be braided biaxially or triaxially and can be formed of any suitable material, including glass fiber, carbon fiber, aramid, and the like. Because of the flexibility of the individual filaments, the tubular sleeve can be stored and manipulated between a first, unexpanded position, wherein the tube is substantially flat, and a second, expanded position in which the tube forms a substantially round cylinder. In addition, because the fibers forming the tube can move relative to each other, the tube can be shifted through a range of configurations. At one extreme, the length of the sleeve is at a maximum and the circumference of the tube, whether flattened or rounded, is at a minimum. At the other extreme, the length of the sleeve is at a maximum and the circumference of the sleeve, whether flattened or rounded, is at a minimum. Referring briefly to **FIG. 2**, the braided sleeve **100** is shown in the flat or unexpanded position. Similarly, **FIG. 3** depicts sleeve **100** in an expanded configuration and illustrates how, when so expanded, the sleeve forms a cylindrical, tubular shape. The ability to transport and store the tubular braided sleeve in the flat position allows for handling of the sleeve with significantly reduced space requirements. For example, the flattened sleeve can be conveniently stored on a spool, as illustrated in **FIG. 4**.

[0034] A curable resin (not shown), which may be applied to the fibers of tubular sleeve **100** at any time including prior to installation or after inflation is used to harden the sleeve in the desired expanded shape. The curable resin may incorporate multiple components such as curing agents to facilitate curing. The curable resin, typically a thermoset polymer resin, is impregnated into the tubular braided sleeve and hardened, typically by application of additional heat, radiation or steam The curable resin may be introduced to the sleeve at any point in the process: prior to installation, during installation, or after installation and inflation. In some applications, the braided sleeve may be used without resin. The curable resin may simply harden so as to render the braided sleeve stiff or rigid, or it may seal the woven fibers of the braided sleeve so that it forms a fluid-impermeable tube.

[0035] Some embodiments of the invention may include a local energy source for generating heat to cure the curable agent impregnated in the sleeve. The local source of heat may be a localized exothermic chemical reaction, steam, heat generated by electrical resistance, or any other process typical for curing thermoset resins. The localized exothermic chemical reaction may be the curing of casing cement in the vicinity of the sleeve, or may be any other suitable, strategically positioned chemical reaction. Because wellbore temperatures may vary along the length of the tubular braided sleeve, the amount of heat applied to cure the resin may be varied by variation in the composition or location of the energy source. Also, the chemistry of the curable resin and curing agent(s) may be varied along the length of the sleeve to provide a desired heat profile and to account for variation in temperature or other environmental conditions.

[0036] The article of the present invention may be shifted from its flattened state to a rounded stated using a bladder or inflation of the tubular braided sleeve. If used, the bladder preferably comprises a temperature-resistant polymeric material.

[0037] In one embodiment of the application of the present invention, shown in **FIG. 5**, tubular sleeve **100** is used to seal a section of previously perforated or damaged casing **112**. This embodiment is also representative of sealing a lost circulation zone in an open hole. In this embodiment, the objective is to control or eliminate fluid flow and fluid pressure communication between the formation **110** and the wellbore **111** in a well where the casing **112** has been perforated so as to form a plurality of perforations **114**, or where a wellbore has become or is predicted to become unstable. To seal the perforated casing, tubular braided sleeve **100** is installed in the perforated area, expanded and cured in such a manner that the outer surface **118** of sleeve **100** is in contact with the inside surface **120** of casing **112**. In one embodiment, tubular sleeve **100** (including the curable resin and any curing agents) may be provided with an inner inflatable bladder **122** or other interior impermeable layer. Sleeve **100** and bladder **122** are lowered into the wellbore to the depth at which it is desired to seal the casing. Sleeve **100** is then inflated by application of a fluid (not shown), pressurized by a device **126** at the surface of the well, acting on interior bladder or impermeable layer **122**. Alternatively, sleeve **100** can be expanded outwardly against the casing by drawing a mandrel (not shown) through the sleeve.

[0038] The tubular sleeve is then preferably hardened using a localized application of heat. After the resin is cured and the tubular sleeve has hardened, the inflatable bladder (if used) may be withdrawn.

[0039] Other applications of the present invention include patching a water-producing zone during the drilling phase of a wellbore, placing the sleeve over a low fracture gradient zone to enable drilling to continue without setting a liner or additional casing string. The present invention may also be utilized to stabilize a wellbore from collapse and to place across a loss circulation zone. Further, the present invention may be placed in air or foam drilled holes and used as part of a sand control device. Any of the applications of the present invention may be temporary or permanent. Removal after temporary installation can be achieved by drilling out the hardened sleeve.

[**0040**] If desired, multiple sleeves **100** can be utilized so as to provide a thicker finished conduit. Multiple sleeves may be applied by sequential operations of installation of a sleeve, inflation of the sleeve, curing of the resin, and withdrawal of the bladder (if used) or simultaneously by installation of multiple concentric sleeves. As above, each sleeve can be inflated by either a temporary bladder, a permanent fluid tight layer in the sleeve, or other mechanical means such as a mandrel drawn through the inner diameter of the sleeve.

[**0041**] In a further embodiment, metallic conductors or optical fiber may be incorporated into the sleeve so as to provide a signal and data communication link to downhole equipment and sensors and/or sensors embedded in or affixed to the wall of the cured tubular sleeve. The sleeve provides a robust, protected conduit for conductors and fibers in an otherwise hostile environment. As shown in **FIG. 6, a** longitudinal conductor **130** comprising a metallic wire or bundle of wires, which can alternatively comprise a optical fiber or bundle of fibers, can be incorporated into the uncured tubular braided sleeve and become set in place when the sleeve is cured. In the embodiment shown in **FIG. 6**, the conductor **130** runs parallel to the axis of the sleeve. Although not wound helically, conductor **130** is preferably woven into the helically would fibers **102, 104**. Alternatively, the conductor(s) may be woven into the fibers of the sleeve in a helical manner. Connectors (not shown) for extending the conductor or optical fiber can also be incorporated into the ends of the sleeve.

[**0042**] In still another embodiment, implementations of the invention may include applications external to metallic casing or sand screens. In one such application, shown in **FIG. 7**, the casing comprises a metallic expandable tubular **146**, used in well construction for reducing or eliminating diameter transitions, such as in a monobore well. In this application, the sleeve may be run into the well prior to placement of the metallic casing or can be inserted into the well on the outer diameter of the metallic casing. In order to maintain a continuous sleeve, a longitudinal or helical seam may be required that is either stitched or adhered together during installation. The tubular braided sleeve **148** expands as the casing or screen is expanded by the drawing of a mandrel **142** which is pulled toward the surface using a cable or wireline **144**. This configuration is particularly useful in combination with embedded metallic conductors or optical fiber for use in conductors because of the difficulty in providing for signal and data communication in monobore or reduced diameter transition wells. Because the structural support provided by the tubular braided sleeve may reduce the forces and stresses on the metallic expandable casing, one advantage of the present invention is to reduce the weight and thickness requirement for the metallic expandable casing or screen thereby decreasing the forces and pressure required to expand the metallic expandable casing or screen as well as the time required to accomplish that expansion. These factors may also allow for a larger diameter change during expansion of the metallic expandable casing or screen. The heat required for curing can be provided by circulating high temperature fluids within the bore of the tubular, by electrical resistance heating of conductors embedded in the composite braid, by an exothermic reaction of casing cement in the vicinity of the sleeve, or by any other practical means.

[**0043**] In another embodiment of the invention, for use as production tubing or casing in deep wells, an internal cable (not shown) is placed within the tubular braid in order to support the tension loading during installation. The internal cable may be metallic, high performance polymer, or other material capable of bearing high longitudinal tensile stress. The internal cable is preferably incorporated into the braid to distribute the load due to the weight of the sleeve to the cable and may optionally also support the weight of a device at the bottom of the sleeve, such as a bottom hole assembly. Similarly, a longitudinal cable may be utilized to support the tubular braided sleeve during installation. Such a cable may be external or internal to the sleeve and may be removed after installation and curing of the resin.

[**0044**] Another use for the present invention is as a means for installing and fixing in place a composite screen for the purposes of particulate control, more specifically for confining sand to the formation while allowing the production fluid to flow out of the formation into the wellbore. Current sand screens are manufactured as multiple layers of corrosion resistant steel expanded metal and wire screens. A composite braided sleeve, or multiple braided sleeves, can be employed as a sand screen. A tubular braided sleeve can also be used as a protective shroud or layer over conventional metallic screens. The composite braided tubular sleeve could also incorporate metallic and/or fiber optic conductors and/or sensors into the fabric to make a smart sand screen.

[**0045**] The braiding configuration can easily be optimized for the necessary mesh size as required to minimize particulate flow into the wellbore. It may also be possible to provide an adjustable mesh size by axially compressing or expanding the mesh to change the mesh size to allow for screen cleaning by backflushing the screen. The braided sleeve impregnated with a resin can be used as a means for providing a composite screen that can be inflated either mechanically or hydraulically (using a bladder inside to expand). Once the sleeve is in contact with the formation face and allowed to set, it would act as a sand control device that conforms to the wellbore.

[**0046**] During drilling operations, a patch of braided sleeve can be used to cover a water-producing zone or a low fracture gradient zone, or can be placed within a horizontal wellbore to stabilize the wellbore against collapse. The braided sleeve can be placed around the drill string and expanded at the pre-specified location.

[**0047**] While preferred embodiments of the present invention have been disclosed and described herein, it will be understood that variations and modifications can be made without departing from the scope of the invention. For example, one or more of the various embodiments described above can be combined. The preceding discussion is not intended to limit the claims that follow. In addition, unless specifically so stated, the sequential recitation of claims is not intended be a requirement that the steps be performed in any particular order, or that one step be completed before another step begins.

What is claimed is:

1. A method of providing a barrier at a predetermined location in downhole operations, the method comprising:

a) providing a first tubular sleeve of a woven material comprising a plurality of fibers in a braided arrangement, said tubular sleeve including a conductor selected from the group consisting of electrical conductors and optical fibers;

b) impregnating the sleeve with a curable resin;

c) radially enlarging the sleeve at the predetermined downhole location; and

d) curing the resin.

2. The method according to claim 1 wherein step d) is accomplished by providing an exothermic reaction near the sleeve.

3. The method according to claim 1 wherein step d) is accomplished by curing cement near the sleeve such that heat from the cement curing cures the resin.

4. The method according to claim 1, further including providing at least a second tubular sleeve that is coaxial with the first tubular sleeve.

5. The method according to claim 1 wherein the conductor is an optical fiber.

6. The method according to claim 1 wherein the conductor includes at least two of: electrically conducting wires for data transmission, optical fibers for data transmission, and electrically conducting wires for power transmission.

7. The method according to claim 1 wherein the conductor includes at least one sensor.

8. The method according to claim 1, further including the step of installing the sleeve on the outer diameter of an expandable metallic casing or screen.

9. The method according to claim 8, further including expanding the expandable casing or screen, wherein the sleeve expands during the expansion of the metallic casing.

10. A method of installing a tubular member in a wellbore, the method comprising:

a) providing an expandable tubular member;

b) providing a flexible tubular sleeve around the tubular member, the sleeve comprising a plurality of fibers woven in a braided arrangement and a curable component;

c) installing the expandable tubular member in the wellbore;

d) expanding the expandable tubular member and flexible tubular sleeve in the wellbore; and

e) curing the curable component of the tubular sleeve so as to form a rigid sleeve.

11. The method according to claim 10 wherein the tubular braided sleeve is installed in the wellbore simultaneously with the expandable metallic casing or screen.

12. The method according to claim 10 wherein the tubular braided sleeve is installed in the wellbore after the expandable metallic casing is placed in the well.

13. The method according to claim 10 wherein step e) is accomplished by providing an exothermic reaction near the sleeve.

14. The method according to claim 10 wherein step e) is accomplished by curing cement near the sleeve such that heat from the cement curing cures the resin.

15. The method according to claim 10 wherein the tubular braided sleeve includes at least one of: electrically conducting wires for data transmission, optical fibers for data transmission, sensors, and electrically conducting wires for power transmission.

16. A method of providing a barrier at a desired location within a wellbore while drilling, comprising:

providing a tubular sleeve of a biaxially woven material;

positioning the sleeve at the desired location;

impregnating the sleeve with a curable resin;

radially expanding the sleeve at the desired location; and

curing the resin.

17. The method of claim 16 wherein the desired location is in a water-producing zone and the cured sleeve forms a water barrier.

18. The method of claim 16 wherein the desired location is in a low fracture gradient zone.

19. The method of claim 16 wherein the wellbore is air or foam drilled.

20. The apparatus of claim 16 where sleeve is expanded using a fluid.

21. A method for restricting sand flow into a wellbore while allowing fluid flow into the wellbore, comprising

providing a braided tubular sleeve;

positioning the sleeve at a desired location where it is desired to restrict sand flow;

impregnating the sleeve with a curable composition;

expanding the sleeve such that it contacts the borehole wall; and

curing the curable composition so as to set the sleeve such that liquids can pass through the set sleeve but particulates cannot.

22. The method according to claim 21, further including the step of cleaning the sleeve by providing a fluid flow from the inside of the sleeve outward through the sleeve.

23. A method for protecting a metallic sand screen by employing a composite braided tubular sleeve as a protective shroud.

* * * * *