United States Patent

[11] 3,631,933

[72] Inventor **John Dennis Bryant**
Route 3, Hawkinsville Road, Macon, Ga. 31206

[21] Appl. No. **746,471**
[22] Filed **July 22, 1968**
[45] Patented **Jan. 4, 1972**

[54] **FLUID FLOW SYSTEM FOR WELLS**
13 Claims, 15 Drawing Figs.

[52] **U.S. Cl.** **175/57,** 61/72.2
[51] **Int. Cl.** **E21b 7/00**
[50] **Field of Search** 175/57, 103; 52/108; 61/72.1, 72.2; 182/41

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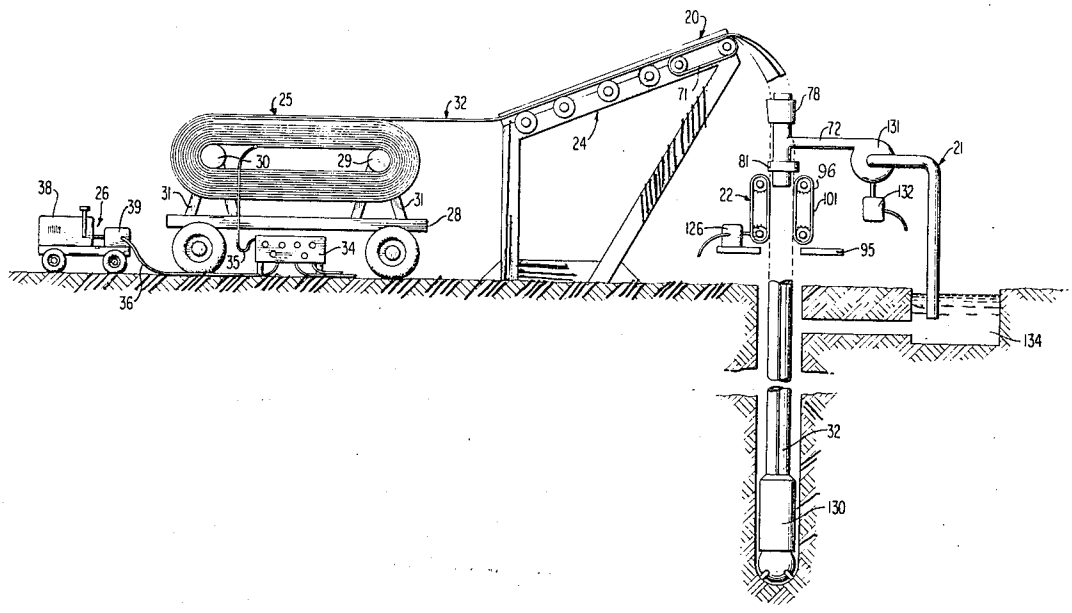
Primary Examiner—Nile C. Byers, Jr.
Attorney—Jones & Thomas

ABSTRACT: A fluid flow system for wells, including a conduit openable along its length and having a digging apparatus connected to one end of the conduit. Means are provided for progressively feeding the conduit into a well and for progressively closing the length of the conduit as it is moved into the well. The conduit is closed about a motive fluid supply duct which extends from the open portion of the conduit into the closed portion of the conduit at the ground level of the well, to supply motive fluid to the digging apparatus.



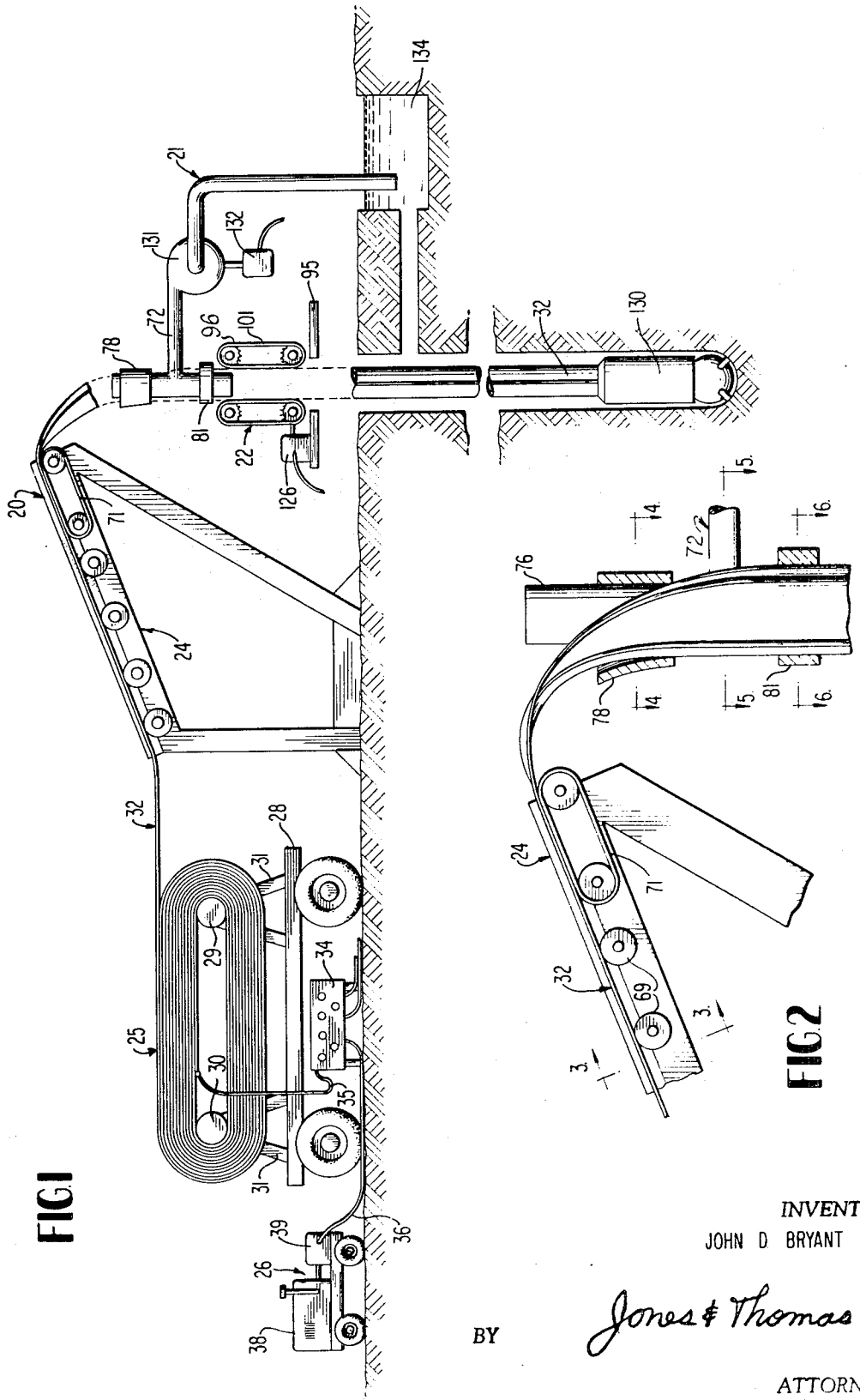


FIG1

FIG2

INVENTOR
JOHN D BRYANT

BY Jones & Thomas

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FIG.3

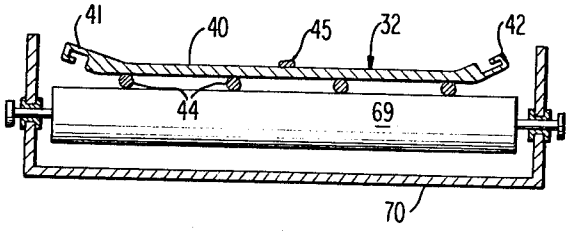


FIG.4

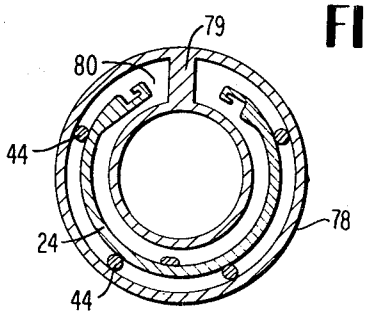
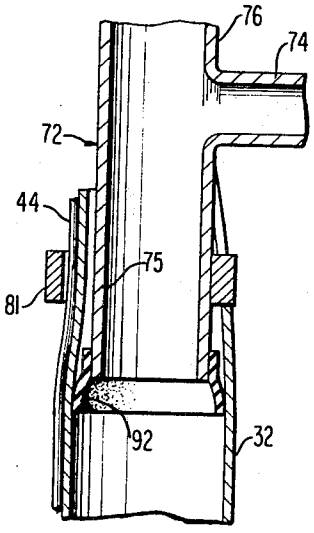


FIG.7



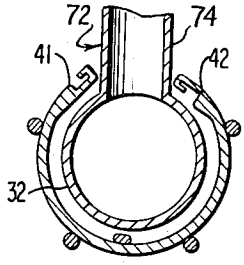


FIG.5

FIG.6

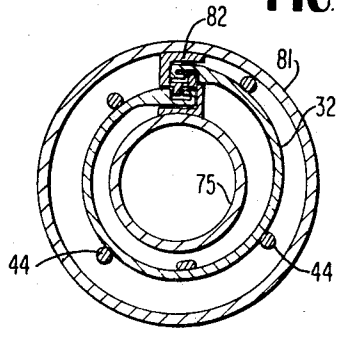
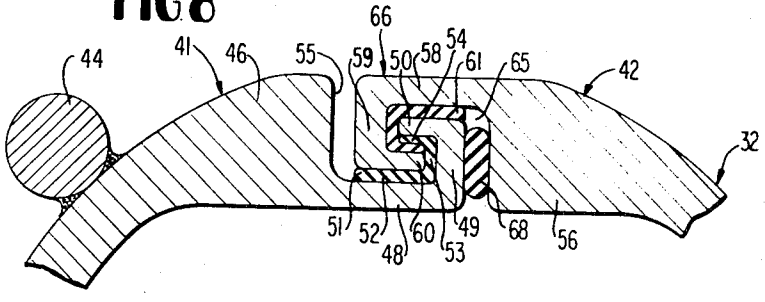
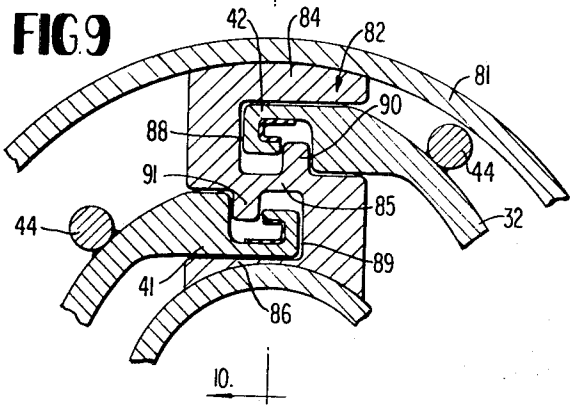


FIG.8



10.

FIG.9



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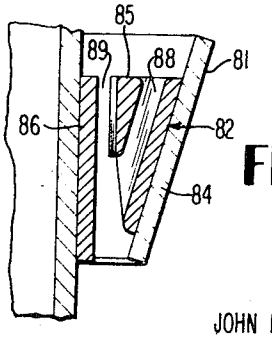

FIG.10

INVENTOR
JOHN D. BRYANT

BY Jones & Thomas

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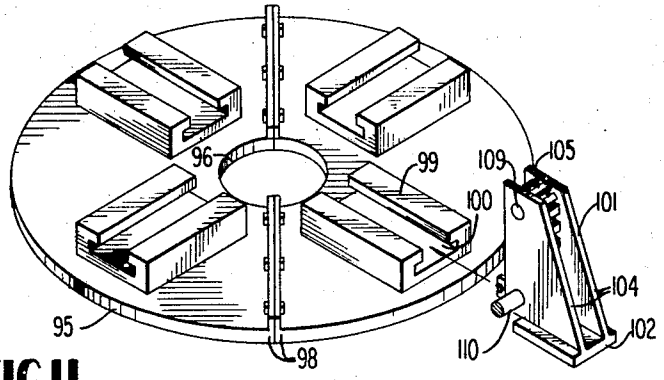


FIG.11

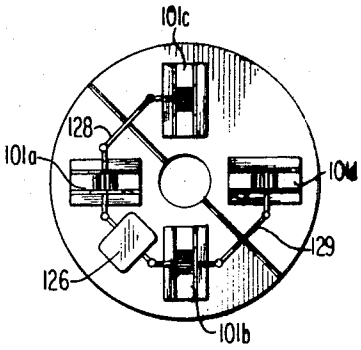


FIG.12

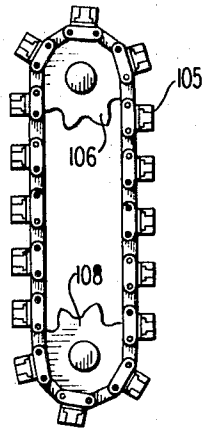


FIG.13

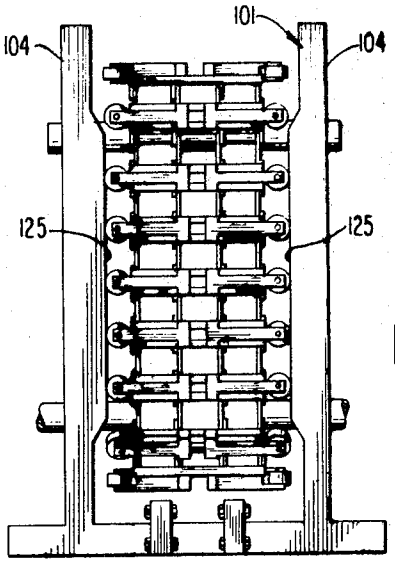
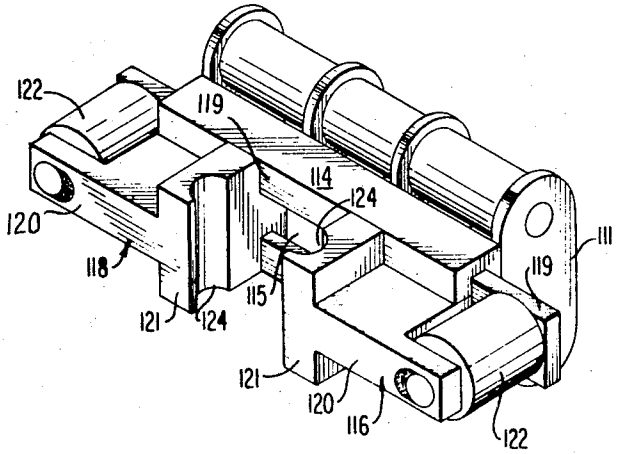


FIG.14



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INVENTOR
JOHN D. BRYANT

BY Jones & Thomas

ATTORNEYS

FLUID FLOW SYSTEM FOR WELLS

BACKGROUND OF THE INVENTION

When digging a well, a drill or digging head is connected to a length of conduit and lowered into the ground to perform the digging function. As the digging head removes the material from the bottom portion of the well, additional conduit must be added to the well-digging apparatus in order to continue to lower the digging head into the ground. When adding additional conduits to the well-digging apparatus, the digging function must be terminated and the various connections to the conduits of the well-digging apparatus disconnected from the conduits of the well-digging apparatus, and reconnected to the new conduits. Of course, this connection and reconnection must be repeated as the well deepens, which necessitates frequent termination of the digging operation, substantial loss of time, and the attention of a number of skilled laborers at the digging site.

When underwater wells are being dug, the well-digging operation is more complicated since the heavy conduits required to dig the well are more cumbersome and dangerous to handle when the digging operation is controlled from the surface of the water.

When digging a well from the ground surface or from the surface of a body of water, the inconvenience of having to add additional conduit to the well-digging apparatus requires the control apparatus to be useable at various different heights with respect to the ground or water level, so that the control apparatus virtually follows the well conduit system toward the surface of the ground or water, whereupon it is removed and joined to the next added conduit. Thus, the control structure for digging wells must be versatile which adds to its expense. Furthermore, the supervisor of the well-digging operation must coordinate the well-digging operation with the supply of additional conduits and the timing of adding additional conduits to the digging apparatus.

SUMMARY OF THE INVENTION

Briefly described, the present invention comprises a fluid flow system for wells, or the like, which allows the digging head of the well to continuously operate while additional length of conduit is added to the conduit system of the well. The conduit is openable along its length, and is normally stored in opened, flat configuration. As the conduit is fed toward its point of use, it is closed along its length about a fluid supply conduit in such a manner that the fluid supply conduit supplies fluid only to the closed portion of the openable conduit. Thus, the fluid flow system can be progressively and continuously extended or shortened without interrupting the supply of motive fluid from the fluid supply conduit, as may be desired.

Thus it is an object of this invention to provide a fluid flow system useable with well-digging apparatus that allows the digging function of the well-digging apparatus to be carried on continuously and without interruption as the digging head moves to a deeper depth within the ground.

Another object of this invention is to provide a fluid flow system which allows fluid to be delivered to a remote point that moves progressively away from the source of fluid, without interrupting the supply of fluid.

Another object of this invention is to provide a method and apparatus for digging wells and which allows the digging function of the digging head to continue without interruption, and which continuously and progressively adds additional conduit to the conduit of the well-digging apparatus.

Another object of this invention is to provide a method and apparatus for conveniently, expediently, and inexpensively digging a well from the ground surface, or from the surface of a body of water above the ground.

Other objects, features an advantages of the present invention will become apparent upon reading the following specification, when taken in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a schematic elevational view, with parts broken away, of the fluid flow system.

FIG. 2 is a detail showing of the manner in which the conduit is formed with portions of the structure removed and shown in cross section, for clarity.

FIG. 3 is a cross-sectional view of the conduit and conveyor, taken along lines 3—3 of FIG. 2.

FIG. 4 is a cross-sectional view of the openable conduit, the fluid supply conduit, and the forming sleeve, taken along lines 4—4 of FIG. 2.

FIG. 5 is a cross-sectional view of the openable conduit and the fluid supply conduit, taken along lines 5—5 of FIG. 2.

FIG. 6 is a cross-sectional view of the of the openable conduit, fluid supply conduit, and conduit-closing element, taken along lines 6—6 of FIG. 2.

FIG. 7 is a side cross-sectional view of the motive fluid supply conduit and the openable conduit, showing the manner in which the motive fluid supply conduit is sealed to the openable conduit.

FIG. 8 is a detail showing of the seam of the openable conduit.

FIG. 9 is a detail showing of the seam-closing element, showing the manner in which the closing element guides the seam sections of the openable conduit into closed relationship with each other.

FIG. 10 is a side cross-sectional view of the seam-closing element, taken along lines 10—10 of FIG. 9.

FIG. 11 is an exploded perspective view of the conduit support platform and one of its conduit gripping mechanisms.

FIG. 12 is a top plan view of the conduit supply platform and conduit-gripping mechanisms.

FIG. 13 is a side elevational view of the gripping chain of the conduit gripping mechanism.

FIG. 14 is a front elevational view of the conduit-gripping mechanism.

FIG. 15 is a perspective of one link of the gripping chain of the conduit-gripping mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now in more detail to the drawing, in which like numerals indicate like parts throughout the several views, FIG. 1 shows well-digging apparatus **20** which includes fluid flow system **21** conduit support apparatus **22**, conduit-conveying apparatus **24**, conduit supply **25**, and power source **26**.

Conduit supply **25** includes a mobile platform **28** having a pair of conduit supply reels **29** and **30** supported in cantilever fashion by supports **31**. Conduit **32** is wound about supply reels **29** and **30** in its flat configuration. The free end of conduit **32** is extended up over conduit-conveying apparatus **24**, while the innermost end of conduit **32** is connected to control panel **34** by means of connecting conduit **35**. Power source **26** is connected to control panel **34** by means of connecting conduit **36**. Power source **26** includes an internal combustion engine **38** and power supply means **39**, which may include a pump and/or an electric generator, or any other motive power means.

As is shown in FIG. 3 conduit **32** includes body portion **40** having seam strips **41** extending along opposite edges, and support cables **44**. Support cables **44** are bonded to and extend the entire length of body portion **40**, and are disposed exteriorly along conduit **32** when closed. Power supply conduit **45** also extends along the length of body portion **40**, and is positioned inside conduit **32** when closed. When conduit **32** is opened and extended to a flat configuration, it can be stored about conduit supply reels **29** and **30** in a minimum of space since the "dead" space or space defined within a tubular conduit is not also stored.

As is shown in FIG. 8 seam strips **41** and **42** of conduit **32** are constructed so that they can be joined together, to close conduit **32** along its length. Seam strip **41** includes enlarged heel **46**, base **48**, locking strip **49**, and toe **50**. Insert **51** also includes base **52**, locking strip **53** and toe **54** which conform

with base 48, locking strip 49, and toe 50, and these elements together form socket 55 of seam strip 41. Seam strip 42 is faced in the opposite direction from seam strip 41 and includes oppositely facing heel 56, base 58, locking strip 59, toe 60, and insert 61, all of which function to form socket 65. Sockets 55 and 65 are sized and shaped to be placed in locked engagement with each other, as is shown in FIG. 8, with the toe and locking strip of each seam strip projecting into the socket of the opposite seam strip. In this manner seam 66 is formed, which maintains conduit 32 in a closed or annular configuration. In order that seam 66 be fluidtight, resilient strip 68 extends along the inside surface of heel 56 of seam strip 42. Resilient strip 68 is compressed when seam strips 41 and 42 are placed in locking engagement, and helps to form a fluid seal along the entire length of seam 66.

Support cables 44 are spaced across the width of body portion 40 of conduit 32, with one support cable 44 being positioned next adjacent seam strips 41 and 42. As is shown in FIGS. 2 and 3, conduit-conveying apparatus 24 includes a series of rollers 69 supported by U-shaped housing 70. Support cables 44 of conduit 32 contact rollers 69 and guide conduit 32 toward conveyor 71. Conveyor 71 is positively driven to aid the movement of conduit 32 along conveying apparatus 24.

As is shown in FIGS. 2 and 7, motive fluid conduit 72 is positioned adjacent and slightly below conduit-conveying apparatus 24, and includes supply leg 74, sealing leg 75, and tool leg 76. Conduit forming sleeve or collar 78 extends around tool leg 76 motive fluid conduit 72 and, as it shown in FIG. 4, is connected to tool conduit 76 by support flange 79 which extends along the length of tool leg 76, and which is positioned on the side of tool leg 76 away from conduit-conveying apparatus 24. Forming sleeve 78 is generally of annular configuration, and is of larger diameter at its upper edge than at its lower edge, so that it forms with tool leg 76 of motive fluid conduit 72 a C-shaped space 80 of converging cross-sectional area. Conduit 32 is fed from conveying apparatus 24 into forming sleeve 78 and about motive fluid conduit 72, so that conduit 24 is urged toward its closed condition as it passes through the converging C-shaped space of forming sleeve 78. As conduit 24 passes through forming sleeve 78, its support cables 44 bear against the inside surface of forming sleeve 78, so that the major portion of the friction contact between conduit 32 and forming sleeve 78 is felt by support cables 44.

After conduit 24 passes through forming sleeve 78, its seam strips 41 and 42 pass on opposite sides of supply leg 74 of motive fluid conduit 72 (FIG. 5), and then pass through closing collar 81. As is shown in FIGS. 2, 6, 9 and 10, closing collar 81 is generally concentric with sealing leg 75 of motive fluid conduit 72. Closing element 82 is positioned below supply leg 74 of motive fluid conduit 72, within closing collar 81. As is shown in FIGS. 9 and 10 closing element 82 is generally S-shaped, including outer leg 84, intermediate leg 85, and inner leg 86. Intermediate leg 85 is shorter than either of outer leg 84 or inner leg 86, and legs 84, 85, and 86 define grooves 88 and 89 which receive seam strips 41 and 42 of seam 66 of conduit 32. Outer leg 84 converges toward inner leg 86 (FIG. 10), and intermediate leg 85 is tapered along its length and foreshortened, so that seam strips 41 and 42 are guided into locking connection with each other. Closing collar 81 functions to keep conduit 32 properly oriented about sealing legs 75 of motive fluid conduit 72, and support cables 44 continues to absorb primary frictional contact between conduit 32 and closing collar 81. Protrusions 90 and 91 extend on opposite sides of intermediate leg 85, and are positioned to project into the socket of each seam strip 41 and 42, to properly position seam strips 41 and 42 in closing element 82.

As is shown in FIG. 7, sealing leg 75 of motive conduits 72 terminates in annular seal 92. Annular seal 92 extends about the exterior edge of sealing legs 75, and flares into engagement with the inside surface of conduit 32. In this manner, conduit 32 is maintained in sealed relationship with motive fluid conduit 72, and when fluid pressure is built up within motive fluid conduit 72 and the closed portion of conduit 32, annular seal 92 will be urged into tighter more positive engagement with the inside surface of conduit 32. Of course, the seal created by annular seal 92 with conduit 32 is a sliding seal, which permits conduit 32 to move along the length of sealing leg 75.

As is shown in FIG. 1, conduit support apparatus 22 is positioned below motive fluid conduit 72 and includes support platform 95 and conduit-gripping mechanisms 96. As is shown in FIGS. 11–15, support platform 95 is generally of annular configuration and defines central opening 96 through which conduit 32 passes. Support platform 95 is constructed in two pieces, and abutting flanges 98 are bolted together, so that the the halves of support platform 95 can be disconnected from each other and removed from about conduit 32.

Support shoes 99 are spaced about support platform 95 at intervals corresponding to the spacing of support cables 44 about conduit 32. Support shoes 99 each define a slot 100. Conduit-gripping mechanisms 101 each include base 102 which is slidable into the slots 100 of support shoes 99. Support walls 104 extend upwardly from base 102, and gripping chain 105 is supported between support walls 104. Sprockets 106 and 108 are supported in spaced relationship between walls 104 by means of axle 109 and drive shaft 110, respectively. Gripping chain 105 is extended around sprockets 106 and 108. As is shown in FIG. 15, each link 111 of gripping chain 105 supports a gripping unit 112 which is constructed to grasp a support cable 44. Each gripping unit 112 includes a support slide 114 connected to the vertical plates of chain link 111, and each support slide 114 defines slot 115 which extends laterally of each chain link 111. A pair of grippers 116 and 118 identical to each other and are placed in facing relationship about a support cable 44. Each gripper 116 includes an enlarged base 119 received in slot 115 of support slide 114, body portion 120 which projects through the opening of slot 115 away from base 119, gripper foot 121, and cam follower 122. Gripper foot 121 defines arcuate groove 124 in its face, to extend around the curvature of a support cable 44 of conduit 32.

As is shown in FIG. 14, each sidewall 104 of conduit-gripping mechanism 101 includes an inwardly facing cam surface 125 which is spaced to engage the cam follower 122 of each gripper 116 as each link 111 of gripping chain 105 moves along its inside flight. Thus, each gripper foot 121 will be moved into engagement with a support cable 44.

As is shown in FIG. 12 the drive shaft 110 of each conduit-gripping mechanism 101 is driven by power unit 126. Power unit 126 is directly connected to the drive shafts 110 of adjacent conduit-gripping mechanisms 101*a* and 101*b*, and connecting links 128 and 129 are connected to the drive shafts 110 of conduit mechanisms 101*a* and 101*b* and function to transmit the rotary motion to conduit-gripping mechanisms 101*c* and 101*d*. Of course, conventional universal joints are connected to the drive shafts 110.

As is shown in FIG. 1, a drilling head or unit 130 is connected to the lower end of conduit 32,. Pump 131 is powered from motor 132 and functions to draw fluid from reservoir 134 and charge motive conduit 72 with fluid. The fluid flows from supply leg 74 and downwardly through sealing leg 75, and into conduit 32. The fluid flowing through conduit 32 eventually reaches drilling head 130. Drilling head 130 can be the type which is operated by the fluid pressure in conduit 32, or operated by fluid pressure or electricity supplied from control panel 34. The power transmitted to drilling head 130 from control panel 34 is transmitted through connecting conduit 35 to the end of conduit 32, and through power supply conduit 45 (FIG. 3) along the length of conduit 32. The motor for conveyor (FIG. 2), and motors 126 and 132 for conduit support apparatus 22 and pump 131 are powered from control panel 34 by other conduits.

OPERATION

When well-digging apparatus **20** is to be placed in operation, digging head **130** is placed over the area of the ground where the well is to be dug, and conduit **32** extended from conduit supply **25** over conveying apparatus **24**, through conduit-forming sleeve **78**, through closing collar **81**, and cables **44** of conduit **32** are run through and gripped by conduit-gripping mechanism **101** of conduit support apparatus **22**. Conduit **32** is then connected to drilling head **130**, and the assembly is complete and ready for operation.

The operator of the drilling apparatus stands at control panel **34** to operate the various components. The motors for driving pump **131**, conveyor **71**, and conduit-gripping mechanism **101** are controlled at control panel **34** so that the drilling head **130** is controlled and coordinated with the various other elements of the apparatus.

As drilling head **130** increases the depth of the well being dug, additional length of conduit **32** is progressively and continuously fed from conduit supply **25**, over conduit-conveying apparatus **24**, and through conduit-forming sleeve **78**. Conduit **32** is stored in a flat configuration on conduit supply **25** and passes up over conveying apparatus **24** in a substantially flat configuration (FIG. **3**), and when conduit **32** approaches conduit-forming sleeve **78**, begins to assume a concave or crescent configuration (FIG. **4**). Seam strips **41** and **42** of seam **66** pass on opposite sides of supply leg **74** of motive fluid conduit **72** (FIG. **5**), and as conduit **32** continues in a downward direction, it passes through closing collar **81**, where closing element **82** urges seams strips **41** and **42** together and into closed relationship with each other (FIGS. **8**, **9** & **10**). As conduit **32** continues to move into a downward direction, its inside surface engages annular seal **92** (FIG. **7**), where sealing leg **75** of motive conduit **72** is sealed to the inside surface of conduit **32**. Thus, the fluid flowing from pump **131** into motive fluid conduit **72** will pass in a downward direction through conduit **32** toward drilling head **130**.

Conduit support apparatus **22** is located adjacent the lower portion of sealing leg **75** of motive fluid conduit **72**, so that support cables **44** of conduit **32** are grasped and supported by conduit-gripping mechanism **101** as conduit **32** passes about annular seal **92**. The placement of conduit support apparatus **26** in this position assures positive positioning of conduit **32** in the area of annular seal **92**, so that a positive seal is always maintained during the feeding of conduit **32** into the well. Also, when conduit **32** is being withdrawn from the well, conduit-gripping mechanism **101** will function to positively left conduit **32** back over annular seal **92**. Under normal conditions, conduit **32** will be charged with fluid pressure from pump **131** when conduit **32** is being moved in a downward direction during the drilling operation; however, when conduit **32** is being lifted out of the well, there will usually be no need to positively charge conduit **32** with motive fluid for drilling head **130**. Thus, seal **92** will be urged by fluid pressure into positive sealing relationship with conduit **32** when conduit **32** is being moved in a downward direction about the periphery of the seal, and the pressure will generally be relieved from motive fluid conduit **72** and seal **92** when conduit **32** is being lifted back about seal **92**. Thus, closing collar **81** and closing element **82** function to progressively close or open conduit **32**, while seal **92** functions to maintain a sliding sea with the inside surface of conduit **32**. In the meantime, uninterrupted communication is maintained between pump **131** and drilling head **130**, and between drilling head **130** and control panel **34**.

Tool leg **76** of motive fluid conduits **72** is provided in order that tools varying in nature can be inserted downwardly through sealing leg **75** of motive fluid conduit **72** and through the closed portion of conduit **32**, toward the bottom of the well. In this manner a core sample can be retrieved from the well, or various other testing or adjusting functions can be carried on. Of course, in most instances tool leg **76** will be merely plugged so that the fluidtight integrity of motive fluid conduit **72** will be maintained; however, it will be possible to utilize a tool with conduit **32** without interrupting the flow of liquid from pump **131**, if the tool so used does not require breaking the seal of tool leg **76**. In this manner, the continuous operation of drilling head **130** will not be interrupted.

Conduit-gripping mechanisms **101** are structured so that conduit **32** can be moved under positive control in a downward or an upward direction. Since each conduit-gripping mechanism **101** is individually supported by conduit support platform **95** by means of support shoes **99**, if one of conduit-gripping mechanisms **101** malfunctions, it can be removed from conduit support platform **95**, and the remaining ones of conduit-gripping mechanisms **101** can continue in their operation. Furthermore, while conduit-gripping mechanisms **101** have been positioned about the upper surface of conduit support platform **95**, it will be understood by those skilled in the art that similar support shoes **99** can be connected to the bottom surface of conduit support platform **95**, and duplicate conduit-gripping mechanisms **101** positioned within these support shoes, to double the number of gripping mechanisms, and the amount of support provided conduit **32**.

When conduit **32** has been depleted from conduit supply **25**, mobile platform **28** can be replaced with another mobile platform with a full supply of conduit **32**, and the free end of the new supply of conduit can be connected with the preceding length of conduit. Thus, additional length of conduit **32** can be provided, as desired. Of course, it is anticipated that each mobile platform **28** will contain a large amount of conduit **32**, so that frequent addition of conduit **32** will not be required.

At this point it should be apparent that the invention disclosed provides the function of continuously supplying fluid through a conduit to the delivery end of the conduit while additional lengths of the conduit are continuously and progressively added. The advantages of this arrangement are readily apparent when the fluid flow system is utilized with well-digging apparatus. The digging function can be carried on without interruption, and the conduit can be extended virtually without limitation. The supply of additional conduit is compact since the conduit is stored in a flat configuration so that the space normally defined by a circular conduit is not also occupying storage space. The conduit can be wound on a single drum, over a pair of conduit supply reels as shown in the drawing, or wound in a random fashion without the benefit of reels or drums. The position of support cables **44** on the outer surface of the conduit is such that the support cables will bear primarily all of the sliding friction of the conduit as it is moved through the well-digging apparatus, and the construction of conduit support apparatus **22** is such that various components of this apparatus can fail without detriment to the remaining components. The structure of the tube is such that it can be withdrawn at a rapid rate from the well and wound in a flat configuration into a supply reel, thus eliminating the necessity of stacking and handling rigid conduits.

While a single embodiment of the invention has been disclosed, it should be understood that other obvious variations and modifications of the invention may be made without exceeding the disclosed concepts. For instance, while only single tube is disclosed, concentric tubes or several laterally spaced tubes may be utilized. The tube may be formed with more than a single seam along its length, and the electric or hydraulic power line can be placed externally of the tube.

It will be obvious to those skilled in the art that many other variations may be made in the embodiment chosen for the purpose of illustrating the present invention without departing from the scope thereof as defined by the appended claims.

I claim:

1. A fluid flow apparatus comprising a partially closed conduit openable and closeable along its length, digging apparatus or the like at a closed end of said conduit, movable gripping means operatively related to said conduit for moving said conduit along it length, means adjacent and operatively related to said movable gripping means for progressively opening said

conduit along its length when moved in a first direction along its length and for progressively closing said conduit along its length when moved in the opposite direction along its length, and fluid flow means operatively related to said opening and closing means, and extending into the closed portion of said conduit from the opened portion thereof constructed and arranged to flow fluid through the closed portion of said conduit as said conduit is moved along its length.

2. The invention of claim 1 and wherein said fluid flow means includes tool-insertion means for inserting a tool or the like into the closed portion of said conduit.

3. The invention of claim 1 wherein said conduit comprises seam strips along its length, and said means for progressively closing and opening said conduit comprises means for progressively urging said seam strips into closed relationship with each other to form said conduit or progressively separating said seam strips to open said conduit.

4. The invention of claim 1 wherein said fluid flow means comprises a fluid duct projecting lengthwise into the closed portion of said conduit from the opened portion of said conduit, and a sealing member coextensive with said fluid duct and engaging the inside surface of the closed portion of said conduit.

5. The invention of claim 1 wherein said conduit includes at least one cable member connected to and extending along its length, and wherein said means for moving said conduit along its length comprises means for gripping said cable member to raise and lower said conduit.

6. The invention of claim 1 and further including supply means operatively related to said opening and closing means for storing and supplying the opened portion of said conduit in an approximately flat configuration, conveying means positioned between said supply means and said opening and closing means for progressively orienting and feeding the opened conduit in a direction toward said opening and closing means, and forming means operatively related to said conduit opening and closing means for curving the conduit into a concave substantially closed configuration prior to closing the conduit.

7. Well-digging apparatus comprising a conduit openable along its length, movable gripping means for moving said conduit along its length in an approximate vertical direction, means adjacent and operatively related to said movable gripping means for progressively opening and closing said conduit as said conduit is moved along its length, means operatively related to said opening and closing means for continuously flowing fluid through the closed portion of said conduit as said conduit is moved along its length, and digging apparatus or the like connected to the closed end of said conduit.

8. The invention of claim 7 wherein said means for continuously feeding fluid to the closed portion of the conduit comprises a pipe member extending from outside the openable conduit axially into the closed portion of the openable conduit.

9. The invention of claim 7 wherein said conduit comprises at least one cable member attached to the exterior surface of and extending along the length of said conduit, and said means for moving said conduit along its length in an approximate vertical direction includes gripping means for gripping said cable member and for moving said cable member and said conduit in a vertical direction.

10. The invention of claim 9 wherein said gripping means comprises a continuous chain, movable clamping members connected to said chain, and cam means for moving said clamping members into gripping relationship with said cable member.

11. A method of digging a well comprising continuously flowing motive fluid through the closed portion of a conduit openable along its length into the ground to a drilling head, continuously lowering the conduit and drilling head into the ground as the well deepens without interrupting the flow of fluid through the conduit or the operation of the drilling head, and continuously forming additional length of conduit at the surface of the well as the conduit and drilling head are lowered into the well.

12. The invention of claim 11 wherein the step of continuously forming additional length of conduit comprises retrieving a conduit opened along its length from a storage area, extending the conduit in a downward direction over the well, and progressively closing the conduit along its length as the conduit is lowered into the well.

13. Apparatus for supplying fluid to a movable consumption area comprising a conduit closeable along its length, conveying means operatively related to said conduit for extending the conduit in its opened configuration generally toward the movable consumption area, movable gripping means operatively related to said conduit for moving said conduit toward and away from the consumption area, means operatively related to said movable gripping means for closing and opening the conduit along its length as the conduit passes a predetermined point, and means operatively related to said opening and closing means for continuously supplying fluid to the closed portion of the conduit from the opened portion thereof as the conduit is moved toward or away from the movable consumption area.

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