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(71) Applicant: **Halliburton Energy Services, Inc.**
Duncan, Oklahoma 73536 (US)

(72) Inventor: **Allison, David B**
Duncan, Oklahoma 73533 (US)

(74) Representative: **Wain, Christopher Paul et al**
A.A. Thornton & Co.
235 High Holborn
London WC1V 7LE (GB)

(54) Well treatment apparatus and method

(57) Well treatment chemicals (120) are delivered to a downhole region (122) of a wellbore by positioning a pipe string (118) in the wellbore, the pipe string including a well treatment device (110) containing at least one well treatment chemical, and releasing the chemical into the region.

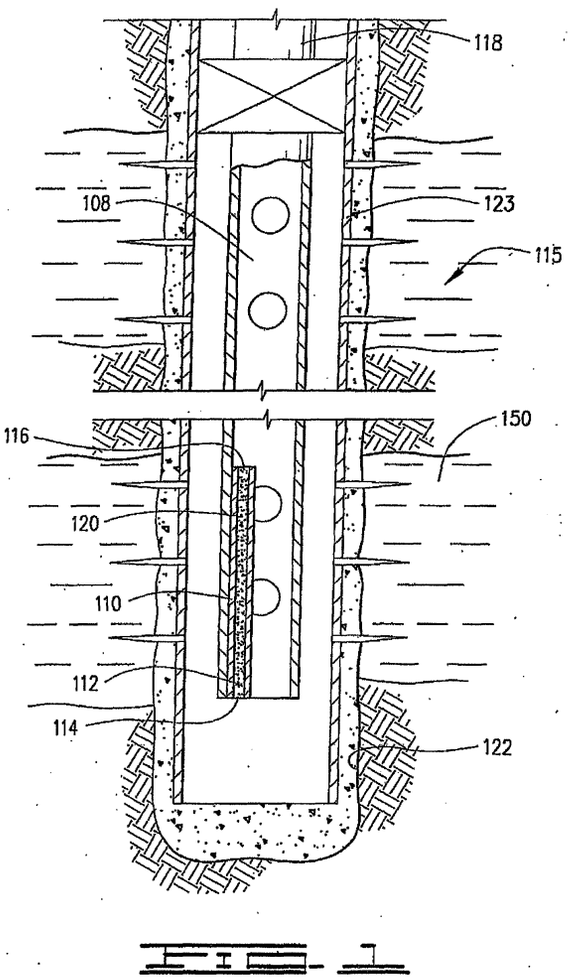

FIG. 1

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Description

[0001] This invention relates to a method and apparatus for delivering well treatment fluids to a downhole region of a wellbore.

[0002] Hydrocarbon production from a well is a complex and costly operation. To improve wellhead economics, modem production processes use a variety of well treatment chemicals to treat common problems encountered during hydrocarbon production. Commonly encountered problems include the production of scale producing compounds, wax buildup and corrosion. To solve this wide variety of problems, the oil industry has developed several categories of well treatment chemicals. A non-inclusive classification of well treatment chemicals includes: scale inhibitors, biocides, corrosion inhibitors, hydrogen sulfide scavengers, well tracing materials and de-waxing agents.

[0003] Although well treatment chemicals resolve the specific problem encountered downhole, the treatment process does add additional costs to well operations. For example, a scale inhibiting treatment requires the cessation of production and injection of a scale inhibitor. Treatment processes such as pumping, also known as the squeeze process, dump bailing or other means of well intervention requires additional personnel and use of specialized equipment not normally maintained at the wellhead. For example, the squeeze process injects scale inhibitor, under pressure, into a producing formation. Subsequent oil production carries the scale inhibitor out of the formation with the produced fluid. The scale inhibitor alters the chemistry of the produced fluid precluding precipitation of scale on the interior of the pipe string.

[0004] The lost production time associated with the squeeze process adds a significant financial burden to well operations. In a high production well, the loss of production for a single day generally represents several tens of thousands of dollars. For a low production well, the costs associated with extra personnel, chemicals and equipment may exceed the income generated by several months of production. Clearly, the ability to perform well treatment methods without interrupting well operations will improve wellhead economics.

[0005] We have now devised a method and apparatus for delivering well treatment chemicals to a downhole region of a wellbore.

[0006] In one aspect, the present invention provides a method of delivering well treatment chemicals to a downhole region of a wellbore, which method comprises positioning a pipe string in the wellbore, the pipe string including a well treatment device containing at least one well treatment chemical, and releasing the well treatment chemicals.

[0007] In another aspect, the invention provides a downhole well treatment system comprising a pipe string; at least one well treatment device carried by the pipe string; and at least one well treatment chemical located within the well treatment device.

[0008] The method of the current invention places at least one well treatment chemical in at least one well treatment device. The well treatment device is incorporated into a pipe string. Preferably, the interior of the well treatment device is in fluid communication with the interior of the pipe string. The pipe string is positioned within a wellbore, which penetrates at least one subterranean formation. Following positioning of the pipe string, the well treatment chemicals are released.

[0009] The invention also provides a method of controlling the delivery of well treatment chemicals to a downhole region of a wellbore by providing at least one valve in the device, which valve is selectively movable between an open position and a closed position. When in the open position, the valve permits fluid communication between the interior of the well treatment device and the interior of the pipe string. The interior of the pipe string is also in fluid communication with the wellbore. As fluid passes through the pipe string, the well operator controls the release of the well treatment chemical by selectively opening and closing the valve on the well treatment device.

[0010] In the downhole well treatment systems of the invention, the pipe string includes at least one well treatment device having at least one reservoir. Stored within the reservoir is at least one chemical suitable for treating a downhole condition or the wellbore.

[0011] The downhole well treatment system may further comprise a selectively activated downhole well treatment system. In this embodiment, the well treatment device has at least one valve selectively movable between a closed position and an open position. Placing the valve in the open position provides fluid communication between the reservoir located within the treatment device and the interior of the pipe string. The interior of the pipe string is also in fluid communication with the wellbore.

[0012] Further, the present invention provides a method of inhibiting the formation of scale on a pipe string or other downhole metallic components. The method comprises placing at least one scale inhibiting chemical within at least one well treatment device. The well treatment device is attached to a pipe string. Following loading of the well treatment device with the scale inhibiting chemical, the pipe string is positioned in a wellbore. Subsequently, the scale inhibiting chemical is released at a downhole region of the wellbore. Generally, the scale inhibiting chemical is released during production of fluids from a subterranean formation penetrated by the wellbore.

[0013] Still further, the invention provides a passive downhole well treatment system utilizing existing downhole devices. A non-exclusive list of downhole devices useful in the current invention may include: side pocket mandrels, sand control screen devices, steel tubing, velocity tubing strings, siphon tubing strings, fiberglass tubing, tubings made of composite materials, dump bail-

ing devices, plastic tubing or similar devices. As recognized by one skilled in the art, the listed devices contain void spaces or a reservoir or the equivalent thereof suitable for holding the desired materials. Additionally, these devices easily enable placement of the desired material in the fluid flow stream. Thus, the devices allow for the slow evolution of the desired materials into the produced fluids or gases.

[0014] In order that the invention may be more fully understood, reference will be made to the accompanying drawings, wherein:

Fig. 1 is a side cross-sectional view of one embodiment of well treatment device of the invention.

Fig. 2 is a side cross-sectional view of another embodiment of well treatment device of the invention.

Fig. 3 is a side cross-sectional view of a well treatment device of the invention fitted with a valve on one end and a cap on the opposite end.

Fig. 4 is a side cross-sectional view of one embodiment of the invention where the well treatment device is located within a side pocket mandrel.

Fig. 5 is a bottom view of an embodiment of the current invention.

I. The Well Treatment System

[0015] The present invention provides a well treatment system 115 for delivering well treatment chemicals 120 to a downhole region. Well treatment system 115 improves wellhead economics by delivering necessary well treatment chemicals 120 without interrupting production operations. Well treatment system 115 includes a well treatment device 110 suitable for incorporation into a conventional pipe string 118. The current invention is useful in all types of wells including but not limited to cased and uncased wells as well as vertical and directionally drilled wells. As used herein, the term "downhole region" includes the subsurface portion of a wellbore 122, any subsurface production zones and the hardware associated with operating the well.

[0016] The current invention will be described with reference to Figs. 1-5. Fig. 1 depicts wellbore 122 penetrating at least one subterranean formation 150. A casing 123 is cemented in wellbore 122. Positioned within wellbore 122 is pipe string 118. Incorporated into pipe string 118 is well treatment system 115. The method of incorporating and positioning well treatment system 115 on or in pipe string 118 will be determined from well to well based on the intended use of well treatment system 115. For example, well treatment system 115 may be attached to the interior or exterior of pipe string 118 or may actually form part of pipe string 118 as described below with reference to Fig. 4. The method of attachment or incorporation is not critical to the current invention.

[0017] As shown in Fig. 1, a rod, pipe, tube or other similar structure having a passageway 112 extending from a first open end 114 to a second open end 116 provides the structure of well treatment device 110. The configuration shown in Fig. 1 has the advantage of simplicity and availability. Further, those skilled in the art of oil production can easily attach well treatment devices 110 to pipe string 118. Although Fig. 1 depicts a cylindrical member, such as a pipe, tube or conduit, the physical configuration of well treatment device 110 is not critical to the current invention.

[0018] When incorporated into pipe string 118, well treatment device 110 provides a means for delivering well treatment chemicals 120 to a downhole region of wellbore 122. As shown in Fig. 1, passageway 112 provides a storage area for well treatment chemicals 120. Further, open ends 114 and 116 of passageway 112 provide fluid communication between the interior passageway 112 of well treatment device 110 and wellbore 122. In this manner passageway 112 provides a reservoir 112 for storage of well treatment chemicals 120. Optionally, well treatment device 110 may be permanently sealed at either end 114 or 116.

[0019] Fig. 1 depicts one preferred configuration of well treatment system 115 with well treatment device 110 located on the interior of pipe string 118. This configuration shields well treatment device 110 from casing joints (not shown) and other downhole hazards that may damage well treatment device 110 during positioning downhole. However, the functionality of well treatment device 110 does not depend upon the location and method of incorporating well treatment device 110 into pipe string 118. Rather, the current invention provides the well operator with the flexibility to incorporate well treatment device 110 as part of pipe string 118 in any manner that provides fluid communication between reservoir 112, the interior of pipe string 118 and/or wellbore 122. For example, Fig. 1 depicts well treatment device 110 attached to the inner wall of a tubular device 108, which is connected to pipe string 118. Tubular device 108 may be any downhole apparatus including but not limited to a filter, a perforated pipe or a liner.

[0020] In general, well treatment system 115 may utilize any component incorporated into pipe string 118 having sufficient space to accommodate well treatment device 110. For example, U.S. Pat. No. 5,934,376, incorporated herein by reference, provides an improved well completion apparatus in the form of a slotted liner having an internal sand screen. The apparatus described by the '376 patent has sufficient void space to accommodate well treatment device 110. Therefore, well treatment 115 system of the type described herein can be prepared by incorporating well treatment device 110 into the well completion device of the '376 disclosure.

[0021] A non-exclusive list of pipe string 118 components suitable for forming well treatment system 115 would include: sand control screen devices, prepacked well filters, steel tubing, velocity tubing strings, coiled tubing, siphon tubing strings, fiberglass tubing, tubings

made of composite materials, dump bailing devices, sand control screens, plastic tubing or similar devices. In general, the component of pipe string 118 must provide a reservoir 112 for containing the desired well treatment chemicals 120. Additionally, the well treatment device 110 must be suitable for placement in the flow stream thereby permitting fluid contact with well treatment chemicals 120 and the evolution of desired well treatment chemicals 120 into the produced fluids or gases.

[0022] As previously noted, the physical configuration of well treatment device 110 may vary depending on the application and manner of incorporation within the pipe string 118. For example, an alternate embodiment of the well treatment device 110 of the current invention is identified in Fig. 2 as 210, in connection with a well treatment system 215. Well treatment device 210 comprises a channel attached to the exterior of pipe string 218; yet, well treatment device 210 provides the same function as well treatment device 110. Well treatment device 210 provides a reservoir 212 for well treatment chemicals 220. Further, open ends 214 and 216 of well treatment device 210 permit fluid communication between the reservoir 212 and wellbore 222. Further, if necessary to improve fluid communication, perforations (not shown) may be cut in either well treatment device 110 or 210.

[0023] In another aspect, the present invention provides well treatment systems 315 capable of regulating the release of well treatment chemicals 320. As shown in Fig. 3, well treatment system 315 includes the use of a well treatment device 310. Well treatment device 310 comprises a passageway 312 between ends 314 and 316 and a valve 324 at end 314 and a sealing means such as a cap 326 or other suitable sealing mechanism at the opposing end 316. Valve 324 is movable between a closed position and an open position. When in the open position, valve 324 provides fluid communication between passageway 312 and the wellbore (not shown in Fig. 3). Thus, valve 324 provides the ability to regulate the release of well treatment chemicals 320 from passageway 312.

[0024] Any valve suitable for use downhole will perform satisfactorily in the current invention. A non-exclusive list of suitable valves would include: dynamic pressure variance activation, passive pressure activation, temperature activated, electronically activated, seismically activated, flow constituent activated, pH activated, sonically activated, acoustically activated, and mechanically activated. One skilled in the art will be able to use valves of this nature and other similar valves in the practice of the current invention.

[0025] Preferably, the operator will manipulate valve 324 by means of a non-intervention mechanism such as pressure pulses, seismic signal or other similar signal. However, operational control of valve 324 may also be provided by any one of the following or similar type devices: mechanical activation device attached to slick line, electric wireline, coil tubing or other means to physically manipulate valve 324 to the desired position. Upon activation, valve 324 opens thereby permitting passing fluid to contact well treatment chemicals 320. Alternatively, a second valve 324 can be substituted for cap 326.

[0026] Fig. 4 depicts yet another embodiment of well treatment system 415. The system of Fig. 4 permits quick and easy replacement of spent well treatment devices 410. The well treatment system 415 disclosed in Fig. 4 comprises a well treatment device 410 and a side pocket mandrel 430 incorporated into a pipe string 418. When configured in this manner, well treatment system 415 permits retrieval and replacement of well treatment devices 410 using currently available technology. For example, U.S. Pat. No. 5,797,453 (the '453 patent), incorporated herein by reference, demonstrates the retrieval of a gas lift valve from a side pocket mandrel. As shown in the '453 disclosure, a latch carried by the upper end of the gas lift valve enables retrieval of the gas lift valve by a downhole tool. The technique taught by U.S. Pat. 5,797,453 applies equally well to the retrieval of well treatment device 410 fitted with a latch 432.

[0027] Thus, when configured as depicted in Fig. 4, the current invention provides an extremely flexible well treatment system 415. The system shown in Fig. 4 uses a modified gas lift valve as well treatment device 410. This embodiment of the current invention enables the well operator to quickly substitute well treatment chemicals 420 in response to a change in downhole conditions. Retrieval and replacement of well treatment device 410 can be carried out by one skilled in the art using common downhole tools as described in the '453 patent. As in the previously described well treatment systems 415, well treatment system 415 includes a well treatment device 410 having a passageway 412 or reservoir 412. Located at end 416 of well treatment device 410 is latch 432 and optionally located at the opposing end 414 is a valve 424.

[0028] Fig. 5 depicts a bottom view of another embodiment of the current invention. As shown in Fig. 5, several well treatment devices 110 may be positioned within pipe string 118. In this instance, well treatment devices 110 are located between a shroud 124 and wire wrap 126. In Fig. 5, well treatment devices 110 are spaced at regular intervals within pipe string 118; however, the current invention is not limited to a particular spacing.

[0029] Additionally, Fig. 5 demonstrates the use of conventional pipe string 118 components to form well treatment device 110. For example, the structural elements 128 normally used to position wire wrap 126 away from a perforated base pipe 130 may be hollow tubes. Perforated base pipe 130 includes perforations 132. These hollow areas allow structural elements 128 to also operate as well treatment devices 110. Further, the current invention contemplates combining wire wrap 126 and perforated base pipe 130 to form the components of well treatment device 110. In this arrangement, well treatment chemicals 120 are placed between wire

wrap 126 and perforated base pipe 130 during pipe string 118 assembly. Thus, wire wrap 126 provides fluid communication between wellbore 122 and well treatment chemicals 120. Likewise, perforated base pipe 130 having perforations 132 provides fluid communication between the interior of pipe string 118 and well treatment chemicals 120. Additionally, well treatment devices 110 may be positioned between shroud 124 and wire wrap 126.

[0030] Clearly the current invention contemplates several different embodiments of well treatment system 115. The drawings and foregoing discussion are merely intended to describe the current embodiments and are not intended to limit the scope of the attached claims.

[0031] Well treatment chemicals 120 suitable for use in the current invention include any compound or group of compounds necessary to solve or prevent a downhole problem or a problem in a pipe string 118 or for any other desired purpose. For example, the following classes of chemicals are commonly used in the downhole environment: scale inhibitors, paraffin deposition inhibitors, viscosity breakers, gas hydrate suppressors, emulsion breakers, oxygen scavengers, oxidizers, esters, corrosion inhibitors, hydrogen sulfide scavengers, biocides and ashless dispersants. The inventors anticipate the continued development of additional chemicals to address downhole problems. Virtually any new class of chemicals developed for downhole use and capable of being stored in reservoir 112 or equivalent will be suitable for inclusion in the current invention. Therefore, the above classifications merely represent chemicals suitable for use in the current invention and do not limit the invention in any manner.

II. Process for Chemically Treating a Well

[0032] With continued reference to the drawings, the following discussion will describe the novel method for delivering well treatment chemicals 120 to a downhole region of wellbore 122. The current inventive method utilizes the well treatment systems described above. The actual configuration of the well treatment system 115 is not critical to the current invention. Rather, the current invention merely requires that well treatment system 115 provide fluid communication between the reservoir 112 of the well treatment device 110, the interior of the pipe string 118 and/or wellbore 122. For conciseness, the remainder of this discussion will focus primarily on well treatment system 115 incorporating well treatment device 110; however, the processes described herein apply equally well to the configurations depicted in Figs 2-5 and other embodiments of the current invention.

[0033] Based on a prior characterization of wellbore 122 and/or subterranean formation 150, the well treatment device 110 is loaded with the desired well treatment chemicals 120. The methods of this invention are not limited to the use of a single class of chemicals. Provided the chemicals are compatible, multiple classes of chemicals may be loaded simultaneously within reservoir 112. Alternatively, when well treatment system 115 is configured as shown in Fig. 5, different well treatment chemicals 120 may be spaced around pipe string 118 in separate well treatment devices 110.

[0034] A non-limiting list of chemical classes suitable for use in the current invention would include: scale inhibitors, paraffin deposition inhibitors, viscosity breakers, gas hydrate suppressors, emulsion breakers, oxygen scavengers, oxidizers, esters, corrosion inhibitors, hydrogen sulfide scavengers, biocides, well tracers and ashless dispersants. Additionally, the processes of the current invention should also be suitable for downhole delivery of well treatment chemicals 120 developed in the future.

[0035] The fitting of well treatment device 110 on pipe string 118 normally follows the loading of the desired class of well treatment chemicals 120 in well treatment device 110. The particular method for incorporating well treatment device 110 into pipe string 118 is not critical to the current invention. In general, well treatment device 110 can form part of pipe string 118 or other device located downhole. Alternatively, well treatment device 110 may be attached to a component forming a part of pipe string 118 or other device located downhole. Further, as discussed above, existing components of pipe string 118 may be adapted to function as well treatment device 110. For example, Fig. 1, depicts well treatment device 110 attached to the inner wall of tubular device 108. Tubular device 108 may be any downhole apparatus including but not limited to a filter, a perforated pipe or a liner. In contrast, Fig. 2 depicts well treatment device 110 as being attached to the external portion of pipe spring 218. Additionally, Fig. 4 shows another embodiment of the current invention wherein well treatment device 410 is incorporated into side pocket mandrel 430. In all instances, reservoir 112 or its equivalent is in fluid communication with wellbore 122 or is provided with the means, e.g. valve 424, to permit such fluid communication. The means of attachment to pipe string 118 may be any procedure or configuration commonly used in construction of pipe string 118 including but not limited to welding, threaded connections, "clamped on," "locking ring," friction grip, or a custom mating means. Finally, the process has been described with the step of filling reservoir 112 prior to placement of well treatment device 110 on the pipe string 118. However, circumstances may dictate loading reservoir 112 after incorporation of well treatment device 110 into pipe string 118.

[0036] Following incorporation of the well treatment device 110 into pipe string 118, pipe string 118 is positioned within wellbore 122 according to techniques well known to those skilled in the art. The type of wellbore 122 is not critical to the current invention. Wellbore 122 may be cased or uncased. Additionally, the processes of the current invention will find equal application in both vertical and directionally drilled wells. Further, the wells may be used for producing hydrocarbons or for subter-

ranean injection of fluids, solids or gases.

[0037] Once pipe string 118 has been positioned within wellbore 122, release of the well treatment chemicals 120 will occur when passing fluids enter reservoir 112 contacting well treatment chemicals 120 held therein. Therefore, the well treatment method of the current invention works equally well in both production and injection wells. In an injection well, fluid injected downhole contacts well treatment device 110 and well treatment chemicals 120 contained therein. The injected fluid subsequently carries well treatment chemicals 120 into subterranean formation 150.

[0038] When used in a production well, well treatment device 110 releases well treatment chemicals 120 into the produced fluids. Once in the produced fluid stream, well treatment chemicals 120 may either react with the produced fluid or may treat the surfaces of pipe string 118.

[0039] For example, produced fluids of many wells frequently form scale on the interior of pipe string 118. The use of a scale inhibiting chemical treatment to counter this problem is well known as demonstrated by U.S. Patent Nos. 6,173,780; 4,357,248; 4,393,938 and 5,002,126 incorporated herein by reference. The current invention performs the scale inhibiting treatment without interrupting production operations. In the current invention, the method of precluding scale build up places a scale inhibiting compound in reservoir 112 (or equivalent) of well treatment device 110 (or equivalent). During production, produced fluids enter pipe string 118 and contact well treatment chemicals 120 held within reservoir 112 of well treatment device 110. In response to contact by the produce fluids or operator control, well treatment device 110 releases the scale inhibitor from reservoir 112. As the scale inhibitor blends into the produced fluids, it reacts with the scale generating compounds or treats pipe string 118 precluding the formation of scale on pipe string 118 and other metal components located in the downhole region. Thus, the current invention provides a process for simultaneously inhibiting the formation of scale and producing fluid from subterranean formation 150.

[0040] In an alternative embodiment of the current method, the process of delivering well treatment chemicals 320 to a downhole region includes the additional step of selectively releasing well treatment chemicals 320 into the passing fluid stream. In this embodiment of the current invention, well treatment system 315 is prepared and installed as described above. However, as shown in Fig. 3, well treatment system 315 has been modified by the addition of at least one valve 324 to well treatment device 310. When only one valve 324 is used, then the opposite end 316 of well treatment device 310 is preferably sealed or capped. Valve 324 provides the means for regulating fluid communication between reservoir 312, the wellbore (not shown in Fig. 3) and/or the interior of pipe string 318. Preferably, valve 324 is remotely activated from the surface by means well known in the art. For example, valve 324 may be controlled or activated by dynamic pressure variance activation, passive pressure activation, temperature activated, electronically activated, seismically activated or flow constituent activated. Activation of valve 324 between the closed and open positions permits the controlled release of well treatment chemicals 320 into either the subterranean formation, not shown, or the produced fluids.

[0041] In the embodiment of the current invention depicted in Fig. 4, the process of the current invention includes the step of retrieving and replacing well treatment device 410. In order to permit retrieval and replacement of well treatment device 410, well treatment system 415 has been modified by the addition of a means to permit subsequent retrieval and replacement of well treatment device 410. Preferably, well treatment device 410 is fitted with a latch 432 similar or identical to that commonly used on gas lift valves 424 located within standard side pocket mandrels 430. However, any other mechanism suitable for engagement by tools used to retrieve other downhole devices should work equally well in the process of the current invention. The ability to retrieve and replace well treatment device 410 provides the well operator with increased flexibility. In the event of a change in downhole conditions or the chemistry of the produced fluids, the operator can replace well treatment device 410 by use of standard tool retrieval techniques. Following retrieval, well treatment device 410, now loaded with the appropriate well treatment chemicals 420, can be placed downhole. This process also enables the replacement of spent well treatment devices 410.

[0042] The methods of the current invention provide several advantages over prior art methods. Of primary significance, the current invention enables the production of fluid during the well treatment process. Additionally, the current invention may extend the treatment time by choosing well treatment chemicals 420 for their ability to react with compounds produced from subterranean formation, not shown, to subsequently yield a desired well treatment compound. Alternatively, the well treatment compounds can be formulated to release only at a predetermined downhole temperature, pressure or pH. Thus, well treatment chemicals 120 remain in reservoir 112 or equivalent until the specific change in downhole conditions takes place. Occurrence of the specified change in downhole conditions triggers the release of the well treatment chemicals 120 to counteract the undesired condition.

Claims

1. A method of delivering well treatment chemicals to a downhole region of a wellbore, which method comprises positioning a pipe string in the wellbore, the pipe string including a well treatment device containing at least one well treatment chemical, and

releasing the well treatment chemicals.

2. A method according to claim 1, wherein an interior of the treatment device is in fluid communication with the wellbore.

3. A method according to claim 2, wherein the treatment device includes a valve moveable between an open and a closed position, wherein the open position permits fluid communication between the interior of the treatment device and the wellbore; and wherein release of the well treatment chemicals is achieved by selectively opening the treatment device to permit fluid communication between the interior of the treatment device and the wellbore.

4. A method according to claim 3, wherein the treatment device is selectively opened by means selected from dynamic pressure variance activation, passive pressure activation, temperature activation, electronic activation, seismic activation, flow constituent activation, pH activation, sonic activation, acoustic activation, and mechanical activation.

5. A method according to claim 1, 2, 3 or 4, including the additional step of retrieving and replacing the treatment device.

6. A method according to any of claims 1 to 5, further comprising the step of contacting the well treatment chemicals with a fluid passing through the pipe string, wherein the contact releases the well treatment chemicals.

7. A method according to claim 6, wherein the contacting step comprises contact with a production fluid and the well treatment chemical chemically reacts with at least one component of the production fluid.

8. A method according to any of claims 1 to 7, wherein the treatment chemical is selected from scale inhibitors, paraffin deposition inhibitors, viscosity breakers, gas hydrate suppressor, emulsion breakers, oxygen scavengers, oxidizers, esters, corrosion inhibitors, hydrogen sulfide scavengers, biocides and ashless dispersants, and any mixtures of two or more thereof.

9. A method according to any of claims 1 to 8, wherein the treatment chemical is released at a predetermined temperature, pressure or pH.

10. A downhole well treatment system comprising a pipe string; at least one well treatment device carried by the pipe string; and at least one well treatment chemical located within the well treatment device.

11. A system according to claim 10, wherein the well treatment device has at least one valve, the valve having a closed position and an open position and the interior of the treatment device is in fluid communication with the interior of the pipe string when the valve is in the open position.

12. A system according to claim 11, wherein the valve is selectively operable between the first and the second position.

13. A system according to claim 10, 11 or 12, wherein the treatment device is positioned within or on a pipe string component which is a prepacked well filter, a slotted liner, coiled tubing, side pocket mandrel, sand control screen device, steel tubing, velocity tubing string, siphon tubing string, fiberglass tubing, tubing made of composite material, dump bailing device or plastic tubing.

14. A system according to any of claims 10 to 13, wherein the well treatment chemical is selected from scale inhibitors, paraffin deposition inhibitors, viscosity breakers, gas hydrate suppressor, emulsion breakers, oxygen scavengers, oxidizers, esters, corrosion inhibitors, hydrogen sulfide scavengers, biocides and ashless dispersants, and mixtures of two or more thereof.

15. A system according to any of claims 10 to 14, which includes a means for controlling the release of the well treatment chemicals.

16. A system according to claim 15, wherein the means for controlling the release of the well treatment chemicals comprises a dynamic pressure variance activated valve, passive pressure activated valve, temperature activated valve, electronically activated valve, seismically activated valve, flow constituent activated valve, pH activated membrane, sonic activated valve, acoustically activated valve, or mechanically activated valve.

17. A system according to any of claims 10 to 16, wherein the treatment device is fitted with at least one latch.

18. A system according to any of claims 10 to 17, wherein the well treatment device is located on the exterior of the pipe string, or on the interior of the pipe string.

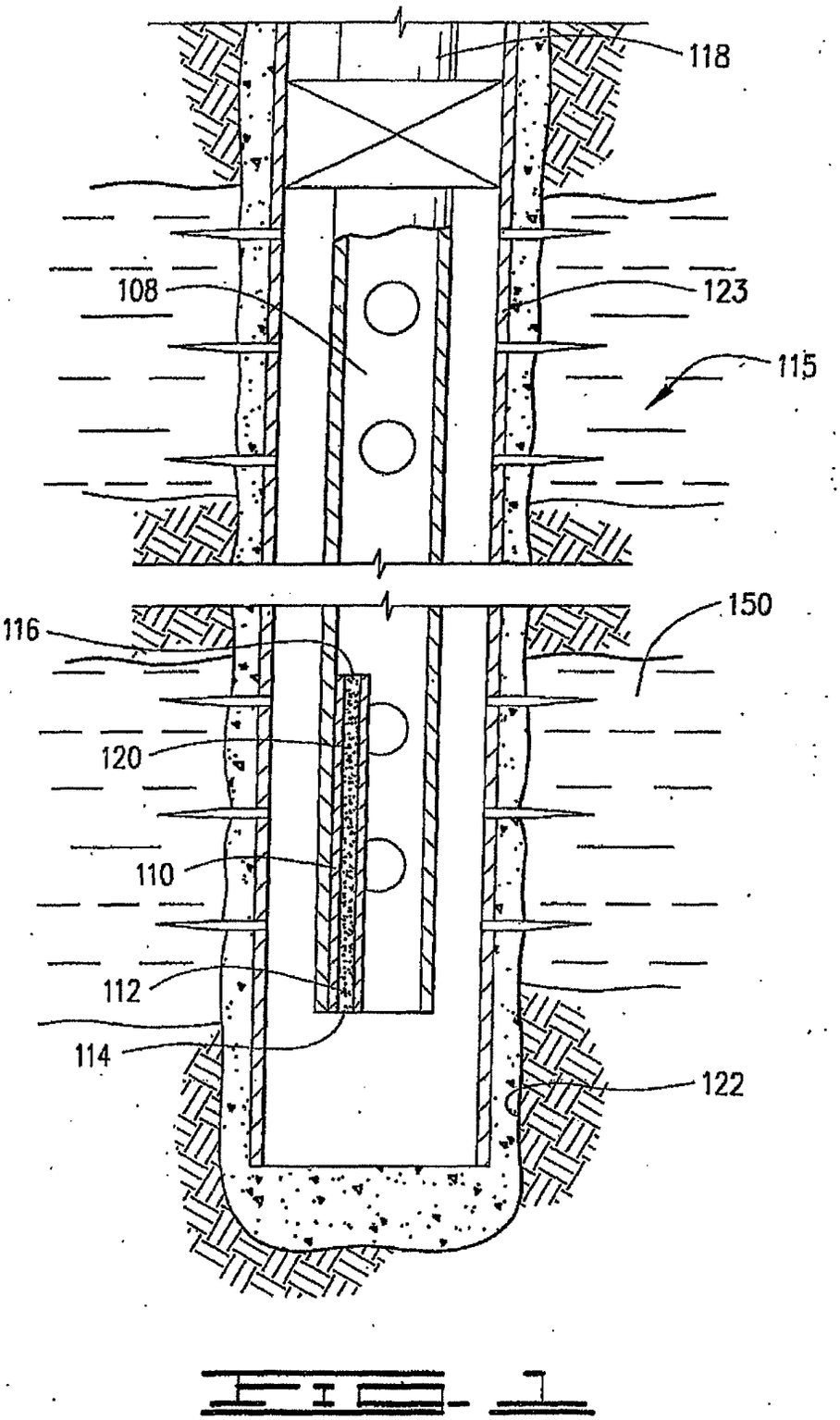
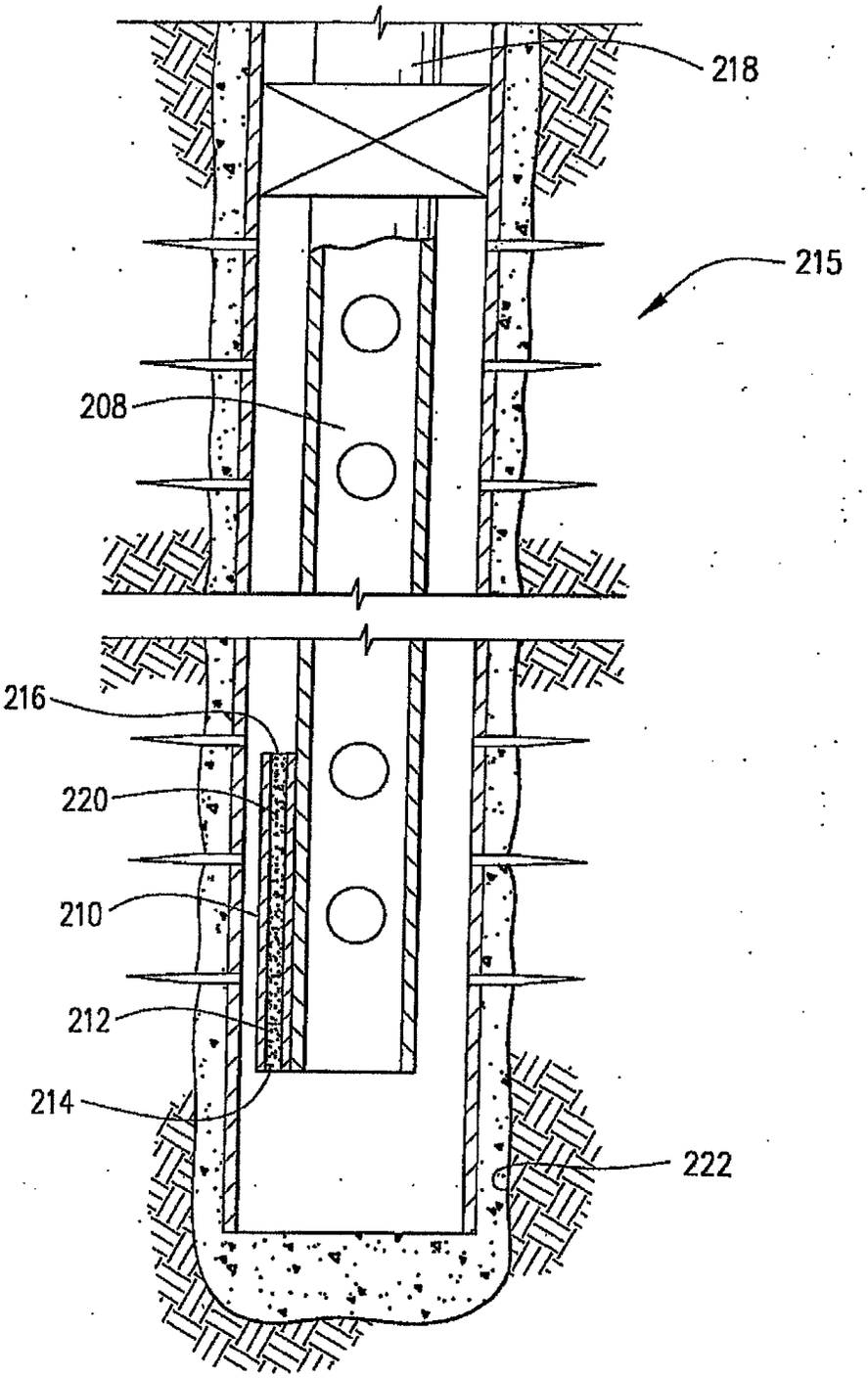


FIG. 1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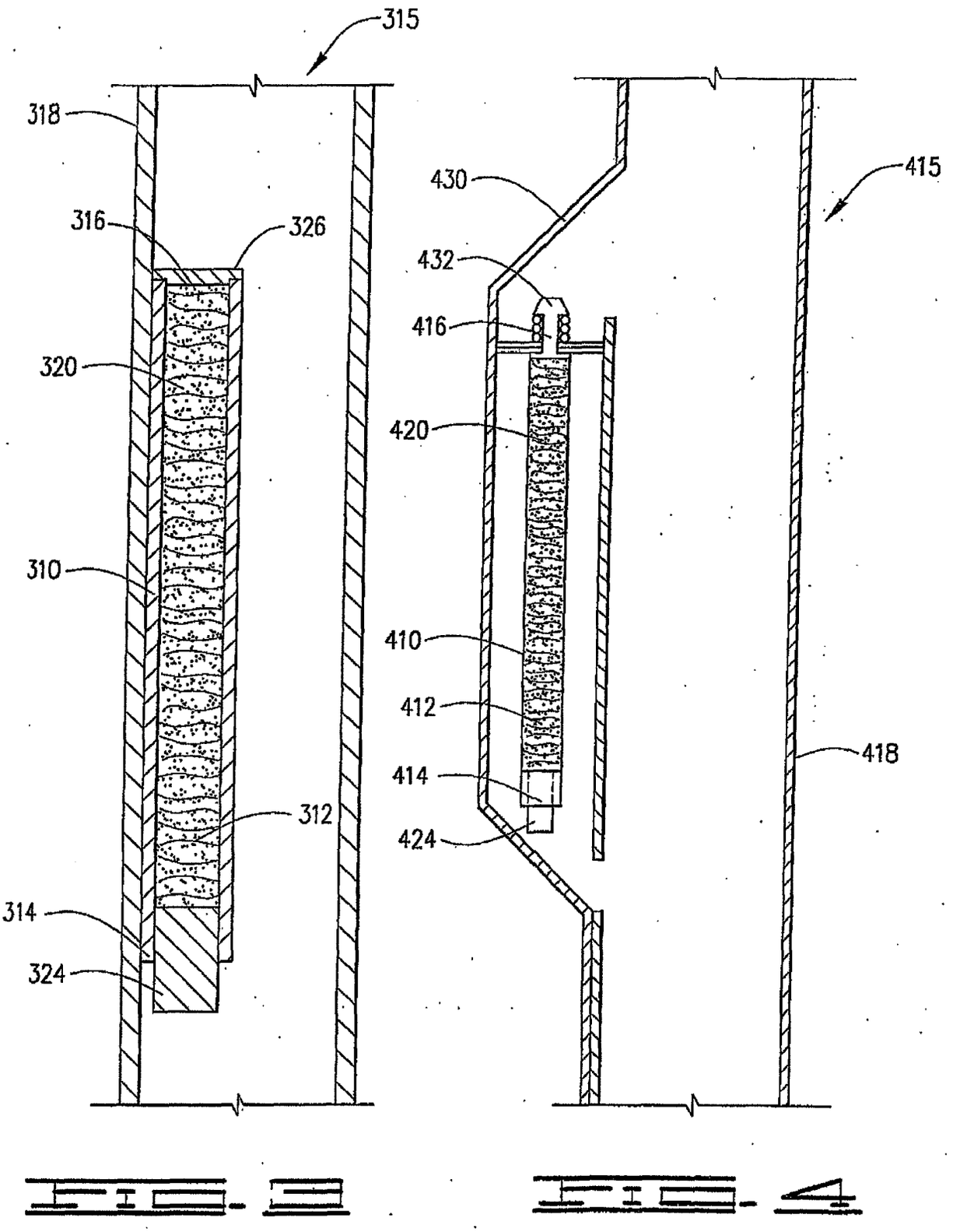
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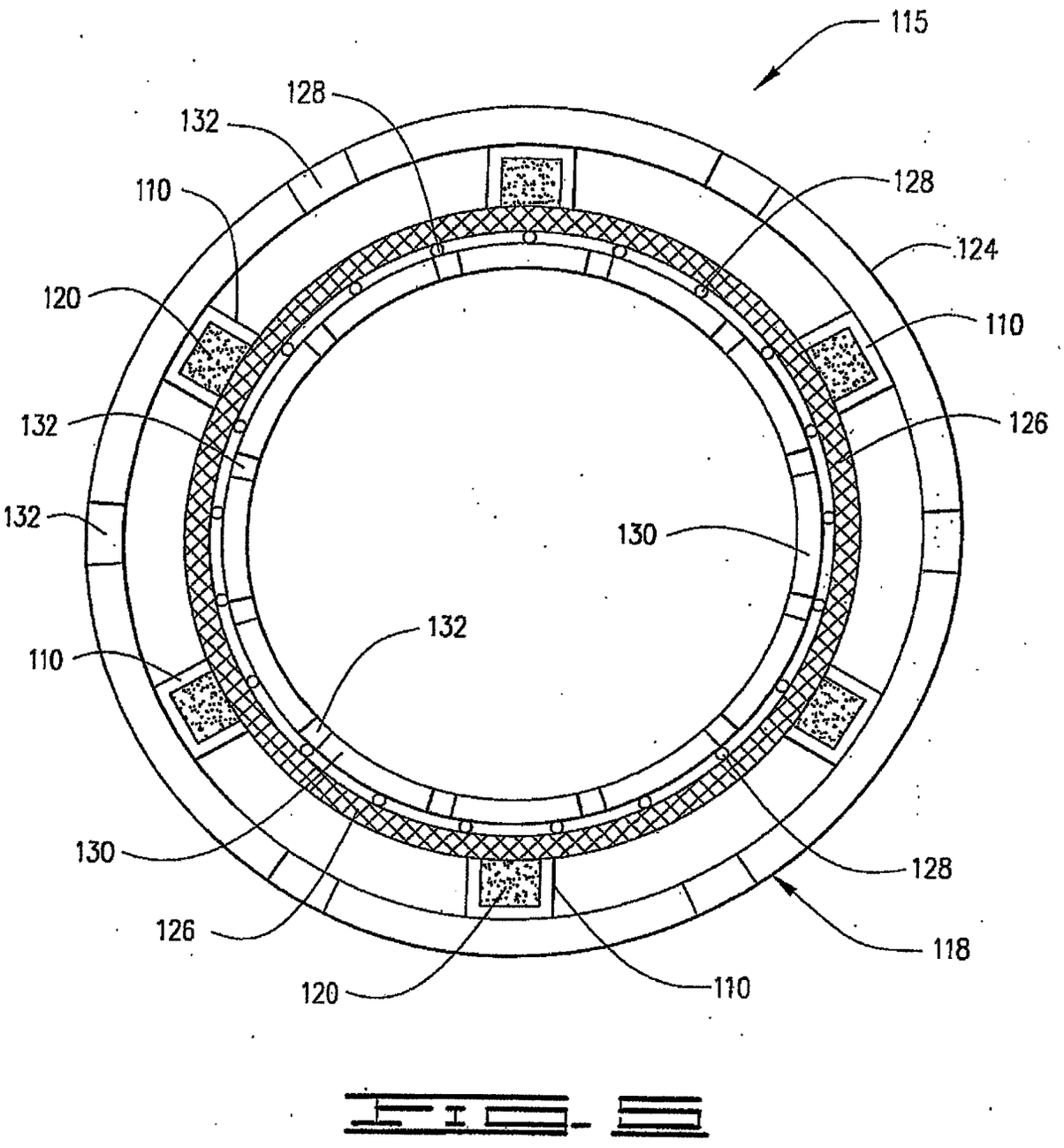
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EUROPEAN SEARCH REPORT

Application Number
EP 03 25 6142

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	WO 01 92685 A (SHELL CANADA LTD ;NEGRE JEAN ERIC (FR); KLOMP ULFERT CORNELIS (NL)) 6 December 2001 (2001-12-06) * page 1, line 22 - page 2, line 5; claim 4; figure 1 * * page 2, line 15 - page 3, line 30 *	1-5, 9-13,15, 16,18	E21B27/02 E21B41/02 E21B37/06 E21B43/25
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Place of search	Date of completion of the search	Examiner
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